

SCOMM

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stitute, living out
a van on a thousand dollars a
year.
"It's hard to make anybody be-
lieve the author of 'The Graduate'
needs money," he said Wednesday.
The novelist, whose hero in "The
Graduate," Benjamin Braddock,
struck a chord among young readers
with his post-graduate misery at his
parents' suburban home, has lived

...ever, Charles
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lieves in are principles he can't live
by any longer," said Webb's ex-wife
Fred, who has accompanied him
through two itinerant decades.

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"If he's hard up
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ward divestiture," said ...
who graduated with Webb from ...
liams College in 1961.
He said the couple's tendency to
rid themselves of property explains
why they gave their Hollywood house
to a real estate agent in the 1960s and
a home to the Massachusetts Audu-
bon Society in 1970.

**STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
Division of Land and Water Management
REQUESTS FOR AQUATIC FARM NOMINATIONS**

The Alaska Department of Natural Resources is seeking nominations for shellfish and sea vegetable farm areas in the state's coastal waters. Nominations should include a legal description, a map of the area, and an explanation of why areas should or should not be considered. The nomination period ends September 20, 1988. This is not an application period. An application period will be scheduled at a later date. To nominate, or for more information please contact:

Janet Burleson, Southeast Regional Office
Division of Land and Water Mgmt.
400 Willoughby
Juneau, Alaska 99801
(907) 465-3400

Publish: August 25, September 1, 1988



Alaska Department of
**NATURAL
RESOURCES**

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LABOR DAY DEADLINES

Mariculture tour fails to answer key economic questions, says Duncan

By CHUCK KLEESCHULTE

THE JUNEAU EMPIRE

Juneau Sen. Jim Duncan said he was dubious about the state launching a program to develop salmon mariculture before a recent trip to Norway.

And he said he's still dubious about moving too quickly to permit fin fish farming in Alaska now that he's returned.

"I felt all session this was an issue that we should go slowly on until we learned a lot more about how it will affect our natural fish stocks and fishermen. We have gained some answers, but we have a lot more to learn," said Duncan this morning.

Duncan, one of nine lawmakers who toured mariculture facilities in Norway and questioned European seafood wholesalers in Germany, said that last month's trip answered some questions about the size and methods of European mariculture operations and the jobs they create.

But he said the trip did not provide much information on the key economic issues: whether pen-reared salmon will compete with and detract from prices for Alaska's wild stocks.

Norway started salmon farming because of its weak natural salmon runs and because much of the country's tidelands are privately owned — the opposite of conditions in Alaska, said Duncan.

While Norwegians downplay any dangers of disease in pen-reared fish attacking wild salmon stocks, Duncan said he still believes more time is needed to research the questions about disease.

And the main issue, which may take far longer than another legislative session to study, is economic in

nature, he said.

"We need to find out definitely what the economic impact on existing wild stock sales will be if we get into mariculture, and we also need to know what the impact will be on the state's economy in general if we don't. We have to learn a lot more about the effects of fish farming in places where they still have healthy wild stocks," said Duncan.

He said a leading example is British Columbia — a region the legislature's two resource committees hope to study during the upcoming session.

Duncan said lawmakers learned mariculture is capital intensive and produces few direct jobs. For example, a typical Norwegian fish farm contains about 8,000 to 12,000 cubic meters of water costing about \$1 million to build. It has the capability of producing about 100 metric tons of fish a year, but can be operated by just four employees.

"Last year we received a number of comments about how we should get into mariculture since they could be 'mom and pop' size operations that would produce a number of new coastal jobs. The problem is that there won't be much direct impact on employment from fin fish farming," said Duncan.

He said in West Germany he spoke to a fish processor who assured him there will always be a market for Alaska's wild salmon, given concerns about the softer meat, more yellowish color and potentially lesser taste of pen-reared salmon. However, the processor could not say how many Alaska-caught fish may be displaced from European markets by the pen-reared fish, said Duncan.



EMPIRE FILE PHOTO

Juneau Sen. Jim Duncan: 'We have gained some answers, but we have a lot more to learn.'

He said lawmakers came back with better feelings about letting the state proceed this year into mariculture of shellfish stocks, like oysters, mussels and scallops. And he said the delegation also was interested in Norwegian efforts to grow lobsters and halibut in fish farms.

"Given the downturn in crab stocks, I would be real interested in seeing fish and game begin research

on mariculture of crab and lobsters in Alaska waters — to see whether such a thing is possible," said Duncan.

Duncan said the mariculture debate this session likely will center on whether the state should subsidize shellfish hatcheries, which are needed before oyster farming can expand, or whether to leave such developments to private enterprise.

Finfish Farming is a Dangerous Gamble With Alaska's Salmon Fisheries

by Earl E. Krygier

Alaska's commercial fishers oppose finfish farming in Alaska, because they depend upon wild salmon stocks. Others, including sportsfishers, conservationists, and even community groups have also stepped forward in opposition. This opposition arises not from one single issue, but rather from the cumulative effects of this proposed industry on the health and stability of the existing seafood industry in our state, and on the other users of marine resources.

Resolution of the mariculture debate will not be an easy accomplishment since it involves formulation of social policy questions such as the privatization of public resources, disposal of public lands and estuaries, and the effects which will be imposed on the current seafood industry. Even Cowper has indicated that he could not support any legislation which would include saltwater rearing of salmon.

What are the issues which have galvanized the statewide fishing industry into action against allowing this new industry? The fishing industry feels the value of shellfish and sea vegetables culture to the state and local communities outweighs the associated costs. These forms of mariculture will fit into the Alaskan style of life and economy, with few negative impacts on our existing socioeconomic structure. On the other hand, we strongly oppose the implemen-

tation of finfish farming in Alaska. Our opposition rests not on the concern over a single issue, but rather the cumulative effects.

Most fishers—who are good business people—believe that pen-rearing of salmon just doesn't make business sense in Alaska. Alaska produces 90 percent of all salmon landings in the United States which equates to 43 percent of the world's landings from wild, natural runs of salmon. We have a recovered and now healthy fishing and seafood industry, the value of which is too great to gamble with. When the possible benefits of salmon farming are weighed against the probable repercussions, the benefits to the people of the state just aren't there. Each side in this debate has called forth its experts to prove their points, and one thing is certain, there are a lot of gray areas.

The following is a brief list of our concerns and why we believe resolution is not at hand.

Competition for Funding

We are concerned over the cumulative negative impacts of salmon farming. Where will the resources come from to manage this prospective industry? Proponents suggest that their industry will take little from the existing system but, as most of us know, there are no free lunches out there. You just can't get

something for nothing as the fish farm promoters suggest. There will have to be government programs created or expanded to regulate fish farming practices and these regulatory programs will cost state dollars and state resources. The money and resources won't come from an increasing state budget and we know the new operations won't be paying taxes until they start showing a profit, which may well be many years down the road. Budgetary constraints will force legislators to view a fish as a fish.

It is a safe bet that the funds needed to manage this proposed industry will come out of current fish management programs. These are the same programs which are producing such a high rate of return to our state's economy, the same programs that are already being cut to the bone because of revenue shortfalls.

What happens when the budget of an agency such as the Department of Fish and Game is reduced? It affects its ability to make accurate resource management decisions. A lack of information on which to base sound management decisions encourages a tendency to manage the resource conservatively. This may appear good for the state, and is how any prudent manager would respond, but when one considers that a portion of the resource has been wasted when it could have been harvested, it becomes a loss to Alaska's fishers and economy.

For example, a recent analysis done for the Bristol Bay fishery indicated that for each additional \$86,000 put into the management program, management error decreased by one percent. In this fishery a one percent reduction in the catch represents a direct loss to fishers of \$2.76 million. If the funds had been available to reduce management error by one percent, Alaska would have seen at least a 3,000 percent return on investment. This does not include losses to the secondary and tertiary sectors of our economy in which these dollars would have circulated if the resource had been optimally managed.

Another striking example is what takes place in the annual Alaska Seafood Marketing Institute (ASMI) budget debate. ASMI has been one of our major tools to fight the worldwide market onslaught of farmed salmon. In a recent report prepared for the state titled, "World Markets for Salmon: Pen-Reared Salmon Impact," the Sea Fare Group concluded that "there is little doubt that farmed salmon does indeed compete with some species of wild Alaska salmon. And given current world salmon market and production trends, the competition can be expected to become increasingly stiff."

ASMI has begun to combat the impacts of pen-reared salmon on our traditional markets with a federal grant requiring state and matching funds. The Alaskan seafood industry has provided over \$1 million of this match, which along with \$495,000 of state funding qualifies ASMI to receive a federal grant of \$3.45 million. Without these matching dollars there would be no federal grant to offset the impacts on our foreign markets caused by farmed salmon, yet the Legislature had so many demands for funding that some contemplated not fully funding ASMI in 1989.

If, by chance, mariculture management funds did not come out of fishery management funds, they might come out of hatchery funding. This would be the ultimate irony--because if salmon farms get hatchery money, then fishermen will have to make up any deficits with more assessment taxes on themselves in order to keep these hatcheries open. In this case, fishermen would be financing the fish farm industry, an industry they don't want in the first place

and in which fact would be in direct competition with them.

Disease

We are concerned that allowing salmon farming in Alaska may lead to increased disease risks. Proponents of salmon farming suggest that the present disease and genetics policies of the state afford adequate protection. We agree that there are some reasonable protec-

"We submit that if salmon farming were to come to Alaska, we would see the industry dominated by a few wealthy individuals and multinational corporations predominantly from Norway."

tions under existing policies. We firmly believe, however, that there are many inherent dangers for our wild and enhanced stocks, once the profit motive is set free.

We contend that once private for-profit salmon farming is initiated, finfish farmers will be howling at the doors of the Legislature for reduced restrictions so they can meet their financial obligations. The expense of developing a salmon farm is particularly high, on average around \$1 million for a small net pen operation, while upland tank farms cost considerably more. Why do we say this? British Columbia had some stringent genetics and disease policies. Since they have allowed salmon farming, the farmers first complained that they couldn't get enough eggs. So eggs were brought in from outside B.C., moving them across boundaries which surpass prudent safeguards. Then they complained that Pacific salmon were not docile enough for animal husbandry and Atlantic salmon were needed to stay profitable. Because of the huge financial investment, an exception on the importation of exotics was allowed. Such foolishness has also occurred in the state of

Washington. And people wonder why we're concerned!

"Disease outbreaks have plagued the life of fish farmers through the years. The Hitra disease of Norway is clearly the most frequent cause of loss there...last year losses due to the disease and early slaughtering could be as high as 8,000 tons or \$65,000,000." (Ian Angus at the Sitka aquaculture conference 1987).

The proponents claim we have nothing to fear; they claim that there has never been an example of cultured fish infecting wild stocks. On the contrary, there are at least three examples. First, in the late 1960s Japan asked the state of Alaska for some sockeye eggs for culture purposes. We sent them, and in doing so introduced IHN to Japan's few natural sockeye stocks. Second, a Norwegian fish farmer (T. Bruusgaard) told me that the Hitra disease which is devastating farmed stocks is from Scottish smolts. This disease is now in the environment, so natural stocks must be infected. Third, mass infestation of Atlantic salmon by *Gyrodactylus salaris* has occurred in Norwegian hatcheries, fish farms, and most importantly, wild stocks. This freshwater parasite was brought into Norway from Scotland via fish farm hatcheries, some of whose smolts were released into natural systems where they infected wild stocks.

The current stringent regulatory safeguards on wild stocks are inadequate. It is our concern that regulations such as strictly forbidding the importation of non-indigenous or exotic species of fish, a primary safeguard in our present system, will fall by the wayside (as it has in other places) because the proposed industry is perceived as more important than some possible effects which may occur in the future.

Genetics

We are concerned with the maintenance of genetic integrity in our salmon stocks. Proponents of salmon farming claim that this is a non-problem. First they say that few if any fish will escape; second they say we already release a lot of hatchery fish--so what's the big deal? As we see it, it's a very big deal, especially when the numbers of farms increase.

Proponents claim they will produce thousands of jobs (advertisement in the

Anchorage Daily News), on the other they claim they will have little impact. Well, it can't be both ways. To produce thousands of jobs there will have to be hundreds of farms since the average farm only employs three to six persons. Hundreds of farms equates to millions of fish. Some might balk at such growth, yet this starry-eyed gold rush is exactly what occurred in British Columbia. Our concern is over the natural escape rate from salmon farms. As one B.C. farmer put it "I put a hell of a lot of smolts in and I only got two-thirds of them back. Where did they all go?"

The Norwegians can tell you where they end up; they have found a shockingly high percent (57% in one river) of "renegade" escaped salmon from their fish farms. It may only be a small percentage of fish which escape from each pen, but when the numbers of farmed fish are large enough, as they are in Norway, a small percentage is a lot of fish. Norway is concerned enough about the problem that a sperm bank has been initiated to assure maintenance of wild stock genes. Should we be less concerned?

Is there really a difference between these pen fish and those swimming in the wild? Yes there is. Wild stocks have developed over thousands of years, becoming adapted to their specific environment through natural selection. Salmon, because of their "homing" sense, will return to the natal streams to which their genes have adapted. Alaska ocean ranch hatchery fish also return "home" to their hatchery where they have been imprinted. The genetic characteristics which wild and ocean-ranch hatchery fish have are those of "survival in the wild", while those reared in salmon farms have genetic traits which are selected for animal husbandry (ones which adapt to confinement and docility). The possibility of wild stock dilution with farmed fish characteristics exists.

Water and Land Use Conflicts

Mariculture is not just another project like a log dump, but is a long term extraction of public lands and estuaries. Two of the major areas of conflict with salmon farming in the state of Washington and along the Sunshine Coast of B.C.

have been water and land use. There are no coastal areas of Alaska which are not utilized, and the issuance of mariculture use permits will entail the exclusion of some other users. Commercial fishers, sportsmen and sportswomen subsistence, and other non-consumptive users are all greatly concerned with the possible problems of a mariculture industry restricting their tidelands use. Most who testified at the legislative hearings touched on the need for clear land/water use regulations, in statute, as part of a mariculture bill.

Foreign or Corporate Ownership

We are concerned that promoters have greatly oversold the promise of salmon farming--the amount of employment it will provide and to what extent Alaskans will be involved. First, it should be pointed out that our current fishing industry already employs approximately 50,000 people directly; this does not include employment in associated support industries in all segments of our economy. The economic impact this proposed industry will have is the transfer of jobs and wealth from an established segment of the economy to a new, smaller group that may not even include Alaska residents.

Though proponents are selling the concept that the farms will be owned and run by local residents and be typical of small businesses like your local fishers or grocers, the real world depicts a different reality. Small, locally owned operations won't have a chance. Because of the start-up and operating costs involved, mom and pop-type Alaskan operations may, at most, be able to get their boots in the door. It is doubtful that they could stay afloat if hit with a disease outbreak or a downturn in the industry which all experts project in the next three to five years. We submit that if salmon farming were to come to Alaska we would see the industry dominated by a few wealthy individuals and multinational corporations predominantly from Norway.

As with most industries, fish farming is continually adapting to new technologies which reduce employment to remain profitable. This type of capital intensive industry is certainly not what most of our local community members

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can afford or are being promised.

At a seminar in Seattle this last year, John Spence from Hardy Seafoods, a thriving mariculture company in British Columbia, told the audience that "mom and pop operations were just a dream." He said these small operations are being bought up by larger organizations and that by 1990 the industry in B.C. would be controlled by 20 or so large companies.

In the October issue of *B.C. Business*, an article titled "The Norwegian Connection" states that since Canadian banks aren't willing to advance funds for mariculture development, Norwegian financial offers are eagerly accepted, and the Norwegians are now estimated to control 60 percent of the industry in British Columbia.

These financing packages also contain clauses which require the farmer to buy building facilities and supplies from Norwegian companies. The article goes on to state that should reality fail to live up to projected goals, the Norwegians could call in their mortgages and end up owning the industry in B.C. outright.

Market Impacts

Proponents profess first, that their product will not compete with our wild-caught product for a share of the world market; second, that even if Alaskan pen-reared salmon did compete with our wild product this competition would be such a small increment that it wouldn't make that much difference; and finally, that world seafood consumption is increasing. Our response to their first claim is we must realize that there is only one market for fish products in the world; fish of all kinds compete on this market. Since the volume of pen-reared salmon is projected to triple by 1990, salmon farm producers will look to new markets and product forms to keep pace with production. In order to remain profitable, they will have to try to take traditional markets away from our wild-caught product. For instance, farmers in Alaska would attempt to target markets like Japan which currently consumes 84 percent of our frozen salmon each year.

Second, as the supply of all fish products increases, the price paid by the

consumer will decline. As with all products, price is directly related to available supply. Since Alaskan pen-raised salmon will compete in the world market, increases in production will have a direct effect on the current price of the product.

Finally, with regard to the fact that worldwide seafood consumption is on the increase, it must be borne in mind that we are primarily concerned with the consumption of salmon and not of seafood in general. The market for salmon is a much more limited demographic market and even though it will share in the general increase in consumption, it is likely that its consumption won't keep pace with production to the extent that mariculture proponents would lead us to believe.

Pen-reared salmon production will cost the fishing industry through lost management, lost fisheries enhancement, and possible harmful effects on our wild stocks. It is ironic that not only would we pay for production through losses to our existing industry, but that the farmed product which we inadvertently help produce will further cut into the existing economy by competing with our wild product in the world markets.

Mariculture proponents are fond of saying that we have the right to fail; we, the fishermen say yes but not at our expense. We have in Alaska the last great wild salmon runs in the world. These runs are an important economic sector in this state and are proving to be Alaska's true permanent fund.

Pen-reared salmon compete with this resource and dilute the value of our already massive investments. No one can say for certain that no harm will come from pen-reared fish. It doesn't make good economic sense to gamble with Alaska's salmon fisheries without knowing what the stakes are. —APAJ

About the author: Earl Krygier is the Executive Director of the Alaska Trollers Association.

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Correction

On page 37 of the spring edition, Mr. Gorsuch's article should have read that there are 43 states, not 44, which elect attorney generals; and 7, not six, that appoint their attorney generals. We regret the error.

Finfish Farming Offers Opportunities For Alaska

by Rodger Painter

About three years ago, then-Governor Bill Sheffield appointed a diverse group of Alaskans to an aquaculture policy task force. The task force was composed of representatives of major interest groups--commercial fishers, private non-profit salmon ranchers, processors, municipalities, and three persons involved in mariculture. Its composition ensured that nothing too controversial might emerge.

The governor asked the group to arrive at a consensus on a policy for the development of a mariculture industry in Alaska. Not too surprisingly, this group of individuals with diametrically opposed positions couldn't agree on many things. One exception was that the most controversial issue--salmon farming--needed further study and discussion. This recommendation came after the task force was warned by a prominent aquaculture policy expert, Dr. Gerald Bowden, that the best way to kill an embryonic mariculture industry is to commission a study.

Dr. Bowden also told the task force that Alaska has the opportunity to become either the hammer or a nail in the sweeping changes aquaculture is bringing to world seafood markets. Alaska can protect its dwindling share of global markets by becoming a driving force in aquaculture production, or it can be hammered by other regions taking ad-

vantage of increasing consumer demand for fresh seafood.

Two and one-half years after the task force issued its recommendations, we're still talking, and studying, and talking about conducting even more studies, even though our bookshelves are already overflowing with reports. Meanwhile, Alaska's share of world seafood markets continues to erode while overall seafood consumption increases.

Policy Gridlock

Dr. Bowden and other aquaculture experts stress that the most important impediments to aquaculture development are regulatory and administrative in nature, not financing, market development, technology or research. Every successful aquaculture industry around the world has occurred in a region with supportive public policies.

Alaska has yet to come to grips with the most important aquaculture opportunity available on the horizon--finfish farming. Unable to come to a consensus during the 1987 session, the legislature approved a one-year moratorium on finfish farming, with the understanding that much work would be done over the interim.

Other than a junket to Norway to study salmon farming, nothing was accomplished by the legislature over the interim. In fact, the two committees

designated to tackle the issue never even met.

The result was that the information sitting on the table for consideration by policymakers continued to come primarily from supporters and opponents of finfish farming. Caught between the wildly conflicting claims and mounting pressure from both sides, the policymakers did what every good politician does during an election year on a controversial issue--punt.

The Mariculture Bill

A mariculture bill was passed in the 1988 legislature and has been signed into law (Senate Bill 514). It primarily imposed more restrictions on what already is allowed--shellfish and aquatic plant farming--and created a task force to study finfish farming during a two-year extension of the moratorium. SB 514 did give shellfish farmers some important gains:

Lease Preference. Shellfish farmers previously had no legal standing protecting work put into developing a site when they applied for a tideland lease; a speculator could offer a better lease fee to the state and be awarded a site into which the farmer had put years and thousands of dollars. SB 514 gives the farmer a preference.

Policy Statement. A policy statement favoring mariculture development

should help give agencies more direction in setting various policies affecting aquatic farms. SB 514 states: "It is the policy of the state to encourage the establishment and responsible growth of an aquatic farming industry, and that allocation of aquatic farming sites be made with full consideration of established and ongoing activities in an area."

Grandparent Clause. All shellfish farmers with a valid tideland permit will automatically qualify for a lease preference or permit on that parcel. SB 514 stipulates that the farmer "must agree that during the term of the lease or permit the person will not change the use of the site." This clause apparently is designed to protect against speculators who may wish to later modify a shellfish lease to farm salmon or other finfish.

Shellfish Hatcheries. SB 514 allows private for-profit shellfish and aquatic plant hatcheries. The state says current law does not provide for private for-profit hatcheries, although some attorneys counter that since private hatcheries are not prohibited by statute they are permissible.

Legal status. The legal status of aquatic plant and shellfish farming was firmly clarified in law.

Despite these attractive features, SB 514 was opposed by the Alaska Mariculture Association (AMA), Kodiak Mariculture Association, Alaskan Shellfish Growers Association, Resource Development Council, Kodiak Area Native Association, Alaska State Chamber of Commerce and individual shellfish farmers because of restrictive siting provisions and wide-ranging powers granted various state agencies.

The most objectionable provision to shellfish growers is a section which prompted weeks of debate before the Senate Resources Committee and had been stripped from a related bill. Under SB 514, the Department of Natural Resources (DNR) is required to:

"Divide the state into aquatic farming districts.

"Schedule at least one 60-day period per year in each district when tideland permit applications would be processed.

"Consult with the Alaska Department of Fish and Game (ADFG) and the Department of Environmental Conservation (DEC), then issue a preliminary finding proposing sites within the

district for which permits may be issued. This preliminary finding and other aquatic farming tidelands actions are subject to a broader statutory notice than requirements for any other state land action.

"Provide notice and hold a public hearing for all proposed permits, then identify eligible sites with specific conditions and limitations on farming activities."

"Caught between the wildly conflicting claims and mounting pressure from both sides, the policymakers did what every good politician does during an election year on a controversial issue--punt."

These siting provisions created considerable controversy because mariculture proponents said they are far more restrictive than what is applied to any other users of public water. The area-wide siting process was devised by DNR, but the agency testified against putting it into statute. AMA and other farmers preferred elimination of the process entirely.

SB 514 was also riddled with open-ended sections giving the agencies broad discretion in regulatory action. For example, ADFG "may attach conditions to a permit issued under this section that are necessary to protect natural fish and wildlife resources." While this sounds pretty reasonable, it also provides the agency with broad discretionary authority.

There are numerous examples of overkill in the legislation. For instance, detailed provisions on disease control and inspection provide a framework to be applied to all forms of mariculture, but most are mandatory procedures written primarily to protect wild stocks from salmon farming. Many of the precautions are unnecessary for shellfish

and aquatic plant farming.

The possibility of anything positive coming out of this effort was greatly diminished by the failure to fund the legislation. In a letter to legislative leaders, Governor Cowper said he was not planning to appoint members to the finfish farming task force until funding is made available. What does this mean for Alaska? Two more years of talking and no action while Alaska's opportunities in fish farming are stolen by such unlikely regions as Chile, Australia, Minnesota, South Dakota and California.

Seafood Markets

As Alaska attempts to diversify and expand its private industries, an obvious area of emphasis should be the seafood industry. The seafood industry has been a mainstay of Alaska's private economy since the late nineteenth century, and growing world demand for high value seafood promises great opportunity for expansion.

Commercial fishing has been plagued with cyclical fluctuations of natural stocks and the industry is having difficulty competing with rapidly increasing production from aquatic farms. Indeed, Alaska's share of U.S. and global seafood markets is slipping even as consumption of fisheries products rises.

A recent study prepared for the British Columbia Salmon Farmers Association by a noted U.S. seafood analyst, says farmed salmon is expected to account for 45 percent of U.S. consumption of fresh and frozen salmon by 1990.

The popularity of farmed salmon is apparent even in Alaska--the home of the world's largest salmon fishery--where it is featured in many restaurants and supermarkets. Some Alaskan seafood processors find they now have to purchase farmed salmon to satisfy the needs of their customers.

These facts underscore the importance of developing a strong diversified mariculture industry in Alaska; it is vital to the long-range viability of our seafood industry, as well as to our ability to create more private sector jobs tied to renewable resources.

The addition of a full line of mariculture products would allow Alaska to compete more effectively on world markets. By jointly marketing its wild

and farmed seafoods, Alaska would regain its competitive advantage through its ability to supply large volumes of seafood on a year-round basis.

Tremendous amounts of seafood currently are harvested during very short, intensive fisheries which create very small windows of opportunity for marketing fresh seafood.

While Alaska has the advantage of offering volume and competitively priced products, it currently cannot compete effectively for fresh markets with countries able to guarantee year-round deliveries of high quality fresh products.

One of the state's successful seafood processors recently explained to the Alaska State Chamber of Commerce how his company is marketing its products in Midwest supermarkets by utilizing a modular retail counter it calls the Alaska Seafood Express. The only non-Alaska seafood sold from the Alaska Seafood Express is farmed salmon because there simply is no reliable source of fresh product available during winter months.

A diverse mariculture industry also

would expand the variety of seafood available in Alaska by adding oysters, mussels, trout, Arctic char and other species. Aquatic farming could also expand the state's year-round supplies of scallops, shrimp, black cod, halibut and abalone. This flow of new product would allow Alaska's seafood processors to offer customers a broader array--and year-round supply--of high quality seafood.

Salmon Enhancement Programs

Alaska already has one of the world's most successful mariculture programs in the form of its network of state and private nonprofit salmon hatcheries. State and private hatchery operations this year handled some 1.5 billion salmon eggs and the return from these eggs in several years will add millions of fish to the catches of commercial and recreational fisheries.

These state and private hatcheries present one of Alaska's biggest public investments in any industry: voters approved \$56 million in general obligation bonds to build the public hatcheries.

Private operations have been loaned \$31.8 million (the present value of the loan portfolio is estimated at \$59.7 million), and another \$5.8 in operating funds and grants has been spent in support of private hatcheries in the past five years.

These hatchery programs have been called one of the best investments ever by the State of Alaska in terms of direct returns to the economy, but cutbacks in state spending threaten to close down many of the public facilities.

Repayment of the private loans will require the private hatchery systems to divert substantial amounts of fish from harvests by commercial fishermen for cost recovery programs by hatchery managers. One of the biggest potential sources of new funding for these public and private enhancement programs could be the sale of juvenile fish to Alaska salmon farmers.

The Alaska Department of Fish and Game estimated there were 88.6 million eggs surplus to the needs of state and private hatcheries in 1986. A 44 million pound salmon farming industry in Alaska would require roughly 10 million

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of these surplus eggs per year. Should the state or private hatcheries decide to utilize these surplus eggs to produce the juvenile fish (smolts) needed by salmon farmers, these sales could generate \$7 to 10 million annually. The additional investments required for operating hatcheries with surplus eggs would be minimal and would not divert from common property enhancement efforts.

Fish Feed Manufacturing

One of the significant spinoffs of a salmon farming industry is the manufacturing of fish feed. About half the operating expenses of fish farms are tied up in feed. A 44 million pound salmon farming industry in Alaska would require roughly 88 million pounds of fish feed a year (worth \$30-40 million) provided by regionally based meal plants. That much fish feed would require 264 million pounds of raw product (fish waste or whole fish). At six cents a pound (Washington state rates), fish processors could be paid \$15.8 million for waste they now have to spend money to dump in the ocean.

Production of fish feed can enhance the viability of shore-based surimi plants. Alaska's two largest surimi plants (located in Unalaska) already utilize their by-products to produce about 17.6 million pounds of fish meal per month, which now is sold to Taiwanese eel farmers. Export markets for Alaska-produced fish feed could be substantial. One of the major impediments to the growth of the British Columbia salmon farming industry is an adequate source of raw materials for production of fish feed.

A recent study completed for the B.C. Salmon Farmers Association said the province's salmon farms demand for fish feed is "projected to increase from about 11,000 tonnes in 1987 to about 86,000 tonnes in the year 2000." B.C. farming companies and fish feed manufacturers are actively scouting fish meal sources around the world. One company recently completed a deal to truck fish wastes from the east coast of Canada to B.C. for processing into meal.

With more than 3.5 billion pounds of fish waste generated by processing operations in our inshore and offshore waters, the opportunity for Alaska in

fish feed production is truly staggering. This opportunity is open whether or not Alaskans are allowed to farm finfish, but the value to the state would be multiplied many times over if we could convert the feed to fresh farmed salmon.

Tourism

One of the more unique applications for mariculture is a proposal by an Anchorage group, Indicator Inc., to

*"Alaska can protect its
dwindling share of global
markets by becoming a
driving force in
aquaculture production,
or it can be hammered by
other regions taking
advantage of increasing
consumer demand for
fresh seafood."*

construct a shrimp or salmon farm at the old Ship Creek hatchery near downtown Anchorage. The facility would utilize waste heat from a nearby power plant. The commercial farming operation would be a tourist attraction by incorporating glass sides in some of the rearing tanks and conducting a tour. A restaurant specializing in Alaskan farmed seafood would complete the package.

A Fairbanks couple, Andrew and Pam Wescott, have managed to secure licenses and permits for a commercial salmon farm operated in a spring-fed gravel pit on private land under a very narrow exception to the finfish moratorium. The Wescotts already operate a gold panning camp for tourists, and want to build a large freshwater salmon farm to attract visitors. The Wescotts are unlikely to get past the experimental stage under the terms of the moratorium.

Derivative Economic Benefits

Fish farming has a higher secondary economic impact than most of Alaska's primary industries because of the fairly large support structure required by these year-round activities. This has

particular significance for Alaska's regional hubs, particularly Anchorage, which is likely to be the state's biggest service center for aquatic farms.

One of the most important impacts would be in the transportation industry which would be bolstered by exports of fresh seafood during their slowest months.

Air cargo backhauls from coastal communities should improve air service to rural areas during the winter months, and allow fishers or small local processors better access to scheduled air service for sales of commercially caught seafood.

While there are no estimates for the amount of product a fully developed Alaskan mariculture industry could produce, a 44 million pound salmon farming industry alone could account for \$13.2 million in additional airline revenue at a 30 cents per pound rate.

Aquatic farming could also create a wide variety of other opportunities for support businesses. One example is the special shipping boxes used by salmon farmers to ensure delivery of the highest possible quality product. These boxes must be manufactured regionally because the styrofoam inserts are considered too bulky to ship empty. The technology and costs of producing these styrofoam inserts could allow smaller scale production on a regional basis.

Conclusion

A fully-developed mariculture industry would provide a year-round boost to Alaska's troubled private economy and could bring new investment dollars and jobs to rural villages and urban service centers. Other states and countries throughout the world have realized the economic importance of mariculture and are moving aggressively forward to support this development.

Alaska cannot afford to sit idly by and watch our seafood markets be displaced by foreign producers. Alaska must break its mariculture policy gridlock while it still has the opportunity to attain some of these benefits. It's about time we start to decide to become the hammer rather than a nail.

—APAJ
About the author: Rodger Painter is the founder and Executive Director of the Alaska Mariculture Association.

Norwegian Lagoon Management and Construction rearing halibut fry

Many years of research and testing to find a way of getting halibut to spawn under artificial conditions have now been crowned with success, according to a recent Norwegian Information Service bulletin. The Lagoon Management and Construction of Oygarden, in west Norway, reports that their brood fish have spawned naturally in large quantities. This means that Norwegian farming of halibut can quickly be extended to the desired quantities.

In its natural habitat, the halibut spawns at water depths of between 500 and 1,000 metres. The task for scientists has been to simulate the conditions found at these depths and, thereby, to stimulate the fish to spawn in a natural way. Thus far, spawning at the LMC facility has only taken place at night. About 80 percent of the eggs have been fertilized — a result which biologist and leader of the LMC project Vicor Oiestad describes as highly satisfactory. This indicates a high survival rate onwards to the fry stage, he says.

For LMC, this breakthrough means that the company will be able to supply 10,000 to 50,000 halibut fry as early as in September this year. There will be no difficulties in marketing this quantity since demand is high. The fish will be ready for slaughtering in four years' time and, by then, will weigh between 5 and 10 kilos. Scientists at LMC believe the growth period can be reduced considerably and the farmers' profitability can thus be increased.

Prospects for exports of Norwegian halibut in the \$100 million USD bracket by the 1990s to supply the U.S., Japanese and European markets with regular deliveries of top-quality fish now have a concrete reality.

Fishermen's News
May 1987

JUNEAU EMPIRE

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A golden opportunity

On Monday on this page, we printed a column by state Sen. Arliss Sturgulewski and state Rep. Johnny Ellis about mariculture, also known as fish farming. In their eyes – and in the eyes of many – mariculture offers a golden opportunity for Alaska.

There is little doubt they are right.

In the past decade, mariculture has grown from obscurity into a booming international business. It offers the opportunity of year-round production of fresh seafood in an industry that is traditionally seasonal, bolstering the markets that depend on natural seafood stocks caught by

“traditional” fishermen.

Simply put, mariculture offers Alaska an opportunity it can't refuse. In Norway, which leads the world in

fish farming, production has grown from 9.5 million pounds in 1980 to 121 million pounds this year. The annual growth rate is projected at 40 percent.

No matter how you look at it, that's strong. And it's getting stronger. Unless Alaskans get involved in a big way, they could be left standing on the shore.

“Alaska has the opportunity to become a hammer or a nail in the sweeping changes aquaculture is bringing to world seafood markets,” said a participant in a recent seminar on mariculture held in Juneau. “Alaska can protect its dwindling share of global markets by becoming a driving force in aquaculture production, or it can be hammered upon by other regions taking advantage of increasing consumer demand for fresh seafood.”

Mariculture, however, has met with some resistance in Alaska. Many fishermen see it as a threat to their livelihood. If fish are reared in pens, it's obvious a fisherman won't be needed to harvest them. Fishermen also think it is ironic that a state with so many fish – salmon, halibut and groundfish – should even consider farming more.

Yet, mariculture can do one thing “traditional” fishermen can't – provide a year-round supply of fresh fish. If set up properly, fish farming can fill in the gaps left by natural, fresh-caught fish, evening out the peaks and valleys of the market – and, not coincidentally, heading off foreign competition.

Fresh Alaska seafood has an international appeal. The development of mariculture, if pursued properly, can make fresh Alaska seafood, which is sought-after around the world, a year-round delicacy.

ISSUE: Mariculture wave of the future in seafood

26 June 1987

pccfa FRIDAY 26 June '87

Page 5

Farm Salmon Threat to Natural Stocks? According to the June 1987 issue of Fish Farming International, farm salmon that escape from their cages could be a threat to Norway's stock of wild salmon. The article "Farm Salmon Stock Fears in Ireland and Norway" (p.32) reports that "up to ten percent of Norwegian wild salmon have either escaped from farms or originate from smolts introduced into the rivers. These fish are said to be 'homeless' and choose their spawning rivers more or less by chance."

Lars Petter Hansen of the Norwegian Directorate of Nature Management has voiced alarm over what the farm salmon may be doing to wild stocks. "With the steady expansion of the salmon farming industry (production last year amounted to 45,000 tons), the number of escaped fish is expected to increase," said the article. "Norwegian and foreign scientists are concerned about the influence of these fish on natural stocks."

A 2-2-87

FAO sees key role for women in aquaculture

THIRTY women, assisted by a handful of men from FAO, recently completed four days of talks on the role of Women in Aquaculture, and the potential for a significant growth in their future participation.

The occasion was a workshop held in Rome and sponsored by FAO's Aquaculture Development and Coordination programme (ADCP) and the Norwegian International Agency for Development (Norad).

The 30 participants were invited because of their present active work in aquaculture. Among representatives from administration and technical research, there were owners and managers of fish farms, hatchery managers, extension agents, marketing specialists, credit and bank managers. And they came from many parts of the world.

The workshop was structured by ADCP in such a way that attention was focused on every level of aquatic farming, beginning with the consumer and pro-

ducer, and continuing through to management of the national industry and inter-regional affairs.

These levels, noted Dr. Colin E. Nash, Programme Leader of the ADCP and organiser of the workshop, were the principal components of the sector and helped the participants concentrate on the main issues of development.

As a result, the workshop made a number of recommendations which should benefit the participation of women in many areas.

The meeting was informed by eight working papers which had been prepared by specialists.

There were four papers on women as producers in West

Africa (Bernadette Trotter), Asia (Elivira Baluyut), Latin America (Margarita Lizarro) and the island communities (Ruth Busch). There were also four papers on other activities such as handling, processing and marketing (Petra Spielhoff), institutions and credit (Aida Librero), extension and training (Carole Engle) and in the professions (Carol Brown).

All the working papers and the summary of discussions of the six working groups will be produced by

ADCP and NORAD.

Summing up, Dr. Nash noted that the records show that women are very active participants in aquaculture, such as extensive production in rural areas, hatchery production, extension, research and even administration appeal greatly to women. There are still many constraints which must be overcome, but there is no question that the growth of aquaculture world-wide and the opportunities for the advancement of women are mutually beneficial.



Research worker in a Russian laboratory investigating the breeding and ranching of salmon. The key role of women in aquaculture now extends to every aspect of the world-wide industry.

Farm salmon stock fears in Ireland...

HAVING enjoyed its honeymoon with the press, in which aquaculture was hailed as Ireland's new "sunrise industry" in terms of job creation and export revenue, fish farming now seems to be coming in for a great deal of criticism, much of which is unfounded.

Writing in a recent issue of *Aquaculture Ireland*, Gerry Ross says that unfortunately most of the ammunition for this criticism seems to have been provided by the Central Fisheries Board (CFB) in its document *Inland Fisheries: Strategies for Management and Development* (FFI, March 1987).

However well intentioned this document was, it has given rise to a rash of articles which have caused concern among farmers planning to set up smolt hatcheries in freshwater, says Mr. Ross.

The CFB says it is parti-

cularly anxious about the environmental effects of cage rearing.

It is also concerned about the escape of farm strains into the wild or their release by owners or lessees of such systems, for enhancement purposes, which it is said, could affect the genetic integrity of the salmon stock.

Gerry Ross points out that perhaps it is time that somebody made public the fact that fish farmers are equally worried about the environmental effects of cage rearing, not only from a concern for the natural resources, but from the cold hard fact that their livelihoods depend on high water quality and the survival of their fish.

He says the newspaper he has read has mentioned that the main worry on smolt production units is not disease getting out (although this comes high up the list) but about disease getting in from wild stocks.

..and Norway

FARM salmon which escape from their cages could be a threat to Norway's stock of wild salmon, says researcher Lars Petter Hansen of the Directorate for Nature Management.

It is estimated that up to ten per cent of Norwegian wild salmon have either escaped from farms or originate from smolts introduced into the rivers. These fish are said to be "homeless" and choose their spawning rivers more or less by chance.

With the steady expansion of the salmon farming industry (production last year amounted to 45,000 tons),

the number of escaped fish is expected to increase. Norwegian and foreign scientists are concerned about the influence of these fish on natural stocks, said Mr. Hansen.

His organisation is preparing a model for use in distinguishing farm salmon from the wild fish.

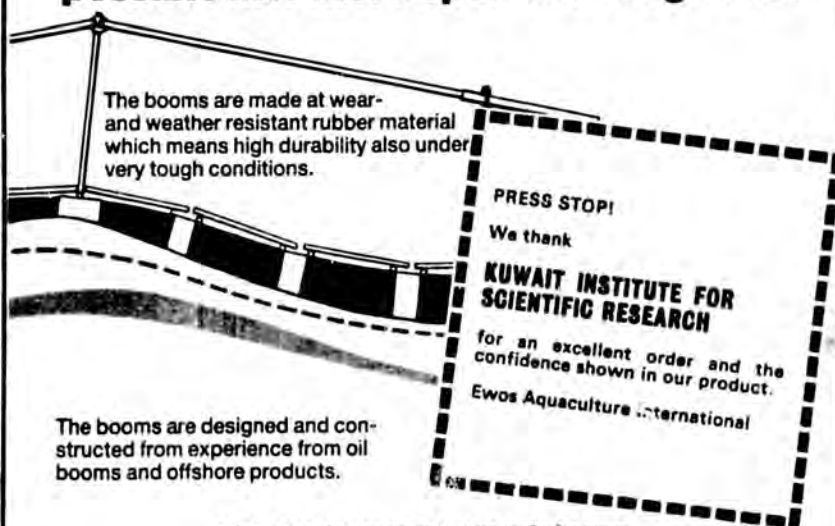
In an attempt to preserve the wild salmon, the Directorate for Nature Management is setting up a gene bank. It points out that even salmon breeders can benefit from returning to nature to draw on hereditary features that have more or less been lost in the process of changing Atlantic salmon into farm animals.

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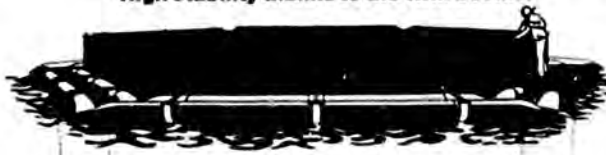
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LETTERS

Alaska should avoid problems of mariculture

Dear Editor:

Responding to the Aug. 17 article on salmon farming appearing in the Money section, there are several important points that deserve more complete coverage. For clarification, the farming of Atlantic salmon, *Salmo salar*, is, indeed, trout farming as this species is a close cousin to rainbow and cutthroat trout and not of the same genus as the salmon native to Alaska.

In much of Europe, where net-pen marine "salmon" aquaculture (mariculture) was pioneered, the runs of free-swimming anadromous salmonids were reduced by over-harvest, habitat destruction and pollution. Fisheries management was largely a case of too little too late, where Atlantic salmon were concerned.

Surprisingly, the author of the Aug. 17 article portrayed contemporary Ireland and Scotland as "bastions of the old wild fishery that catches salmon in oceans and rivers." This is not exactly the case. Salmonid enhancement, vis-a-vis

hatchery releases and stocking programs, contribute far more proportionally to the fishery of Ireland and Scotland than does wild spawning. Alaska's wild salmon fishery, by its sheer magnitude, makes the fishery of Ireland and Scotland appear tame by comparison.

The question facing Alaska on the issue of whether to accept or decline net-pen mariculture is largely one of compatibility. Now, on both sides of the Atlantic, net-pen operations are substituted for the foregone alternative of wild fishery production. That is, if the two can be compared at all.

Norway, a leader in net-pen mariculture, has its share of problems. The author of the fish farming article, a Mr. Burns, only briefly covered a few. The net-pen system, like raceway trout culture, is a biologically intensive form of crop production. Fish are extremely crowded. Demands for dissolved oxygen, waste removal and food are tremendous in the high density enclosures; as a result, fish are physically stressed and high rates of mortality due to disease can be virtually endemic. In his article, Mr. Burns takes care to point out several worst-case scenarios in Scotland, Ireland and British Columbia where disease forced firms into bankruptcy. But in Norway disease problems are being compounded by Atlantic salmon that have escaped confinement, diseases in tow, and pose a new man-made threat to the previous wild stocks

(Fisherman's News, July 1987).

Lastly, Mr. Burns' article shed the faintest glimmer of light on an especially poignant concern in the issue of whether "high risk" net-pen mariculture should be permitted in Alaskan waters. He writes of the need for "scientifically qualified managers, schooled in the problems that have caused failures elsewhere." Yet, in the Pacific Northwest, with the many well-meaning and talented fish culturists employed, disastrous fish kills still do occur and often are only a heartbeat away. With the few vaccines and antibiotics available for preventive and curative fish health-care, the arsenal has never been full.

So let us applaud the state legislature for imposing a one-year moratorium on net-pen mariculture and work to extend that moratorium. Let us support further the proven policy of state wild fish management and enhancement, together with non-profit association aquaculture. Be thankful for what you've got, Alaska.

Burl Sheldon
Wrangell

8/26/87
**JUNEAU
EMPIRE**

Deaver fights his own rights

They're at it again, except this time, when the going got tough, the judge closed the doors. Michael Deaver, a former aide to President Reagan, stands accused of lying to a House subcommittee and a grand jury investigating his lobbying firm. Jury selection in his trial began on Monday, but U.S. District Judge Thomas Penfield Jackson decided that the questioning of prospective jurors could take place behind closed doors.

Why? Because Mr. Deaver plans to use alcohol abuse as a defense for any "misstatements" he might have made. The jurors were to be asked what they thought about it. Such questions, Judge Jackson reasoned, might prove to be embarrassing.

Yes, they might, but that measure of

uncomfortableness must be weighed against the basic tenet that requires almost all judicial proceedings to be open to the public. That tenet protects the defendant's rights to a fair trial. If any or all portions of a trial are closed, the public's right to review each step of the proceedings is abridged. Once that review is diminished, so too are the defendant's rights to a fair trial by a jury of his peers.

During the process of screening prospective jurors, it is possible some uncomfortable or potentially embarrassing questions might arise, especially if a defendant plans to base his defense on the abuse of alcohol or some other drug.

But the possibility of embarrassment does not outweigh the certainty of doubt raised by closing to the public the screening of jurors.

ISSUE: Court rules jury selection must be public

MY TURN

By ARLISS STURGULEWSKI and JOHNNY ELLIS

After months of being buffeted by reports detailing Alaska's deepening economic woes, it might be easy to conclude our best long-term plan is to market the state as one large ghost town. You may have missed among the headlines the many modest signals that our economy is improving and diversification is more than a political buzzword.

Consider the mining industry in which two large-scale projects — Red Dog near Kotzebue and Greens Creek near Juneau — have been given the nod from investors, or the fishing industry which is enjoying near record prices and demand. Then there's the continued growth in tourism and steady recovery of markets for forest products.

These trends have been covered by the news media and are known to some Alaskans, but they somehow lack the appeal of the booms which have so typified our economy in the past. Let's face it, discovery of a new Prudhoe Bay makes better headlines than development of a couple of mines and steady expansion of tourism and fishing. The real solution to our current economic problems won't be solved by another boom, however.

The answer is solid, steady growth in a number of industries, particularly those offering opportunities for development of many small- to medium-sized businesses. One of the best economic development po-

tentials now available to Alaska is mariculture, or fish and shellfish farming. A recent fish farming seminar in Juneau sponsored by the Trade Commission of Norway underscored some of the reasons mariculture is an attractive option for Alaskans.

Norwegian salmon farming is one of the more amazing success stories in an industry that has achieved remarkable growth throughout the world. Production of Norwegian farmed salmon has grown from 9.5 million pounds in 1980 to a projected 121 million pounds this year; the annual production growth rate is running at 40 percent.

Norwegian officials say 3,000 people are directly employed in the industry. Indirect jobs push the total employment to 8,000 to 10,000. Mariculture offers something for both urban and rural Alaska; most of the direct farming jobs would be located in outlying communities while secondary jobs would be in the regional service centers. Increased seafood exports would strengthen Anchorage's bid to become a world seafood trade center.

The long-range outlook for Norwegian fish farmers is very good. This is because of genetic improvements in farming brood stock, aggressive marketing, quality control and a commitment to research. For example, after only a few years of large-scale production Norwegian salmon farmers have improved food conversion ratios to surpass those of poultry

farmers, the most efficient meat growers.

The participants in the Norwegian fish farming seminar in Juneau also presented a wide variety of technological innovations that suggest continued improvements are in store for salmon farmers. Discussed were concepts that would revolutionize fish farming techniques throughout the world, such as controlled environment fish culturing systems and farming in bays sealed off by non-physical barriers.

Other seminar participants described innovations in packaging, air transportation, feed technology and fish farming equipment that will allow the Norwegians to remain world leaders in mariculture. The Norwegians also appear to be close to large-scale commercial production of halibut, sole and cod. It is not in our interest to allow their penetration of American markets to go unchallenged.

One thing seems clear to many Alaskans who attended the seminar: Alaska has the capability to become a world leader in mariculture. Certainly there are many policy questions that must be answered, such as protection of the environment, control of disease, protection of existing uses of public water and how to recover state costs of regulating the industry. We have much to lose by not pursuing mariculture development.

As one seminar participant put it, "Alaska has the opportunity to become a hammer or a nail in the sweeping changes aquaculture is

bringing to world seafood markets. ... Alaska can protect its dwindling share of global markets by becoming a driving force in aquaculture production, or it can be hammered upon by other regions taking advantage of increasing consumer demand for fresh seafood."

The long-term health of our economy hinges in the vision and resourcefulness of Alaska entrepreneurs and the ability of government to work with the private sector to take advantage of opportunities such as fish farming. Mariculture development in Alaska is a unique situation; government isn't being asked to change world market conditions, offer subsidies or otherwise interfere in the marketplace.

The legislature is now studying methods of ensuring that development of this promising new industry proceeds in an orderly manner that will assure maximum economic benefits to Alaskans.

The positive signals we're now starting to see — growth in fishing, mining, tourism and timber — are only a beginning to full economic recovery. Mariculture offers us another building block for a healthy and diverse Alaskan economy.

State Sen. Arliss Sturgulewski, R-Anchorage, is chairman of the Special Committee on Local and Regional Economic Opportunity. State Rep. Johnny Ellis, D-Anchorage, is a member of the House Labor and Commerce Committee.

Mariculture: Can Alaska compete

Not unless it jumps in, backers say

By John Quinley
Times Writer

The last time Alaska took up farming in a big way the dreams of amber waves of grain turned into nightmares of debt.

The talk now is about mariculture, not agriculture, yet the mention of salmon farming brings an impassioned spectrum of reaction from fishermen, legislators and prospective investors.

What no one argues is that for at least a few years explosive growth in the production and sales of pen-raised salmon will continue. Norway is the unchallenged leader, but more than a dozen countries are farming salmon and most have an eye toward sales in the United States.

The tremendous production of farmed fish is expected to drive prices down for all fish and to compete directly with some of Alaska's harvest.

At issue is what slice, if any, Alaska will have of the market.

Proponents say the industry promises thousands of jobs for rural and urban communities. Salmon farming can be a new industry in a state shopping for alternatives to oil-based revenues, and it could have spinoff benefits for other businesses.

All this at a cost of minor disruption to traditional fisheries.

Opponents see Alaska unable to compete with producers located close to major markets, the specter of state participation reminiscent of loans made to boost agriculture, a tote-full of technical questions and a further drain on state funding to monitor commercial fishing.

Alaska's salmon production efforts to date primarily have been through state and private hatcheries and aquaculture programs, which release young salmon in lakes and streams. The juvenile salmon grow in fresh water, migrate to the ocean and return years later to their adopted homes and, presumably, to fishermen's nets.

Farm-raised salmon, by comparison, are in captivity their entire life. The fish are raised in net pens, fed a protein-rich mixture designed to give fast growth, grown to market size and harvested any time of the year to meet demand.

Fishermen who make their living in the traditional boat and beach fisheries generally take a dim view of mariculture. This spring they successfully lobbied the legislature for a one-year moratorium on the issuance of salmon farming permits, and they will fight efforts to institutionalize fish farming.

Their arguments are based largely on economics and biology.

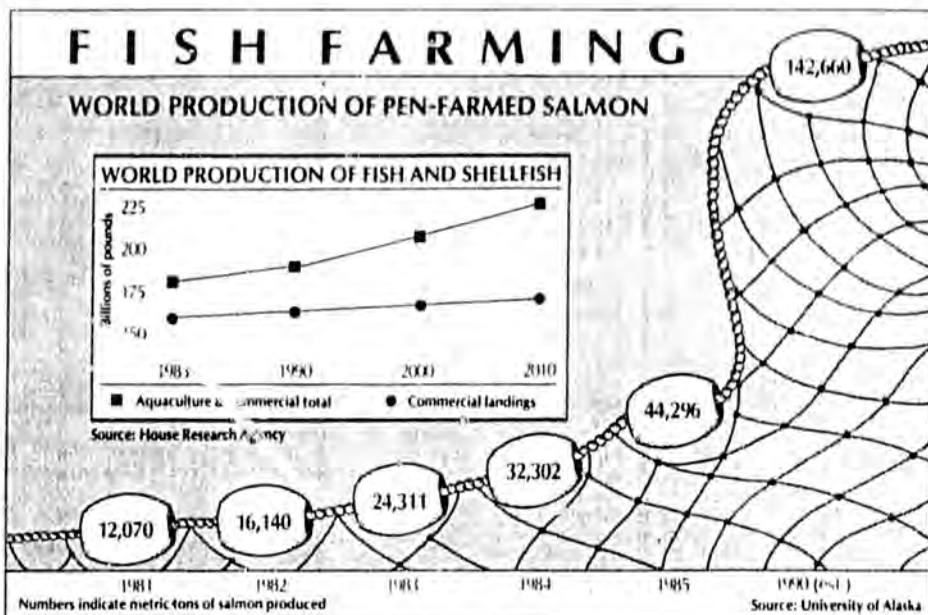
"By 1990, there will be a glut of fish on the market," said Kate Graham, executive director of United Fishermen of Alaska. If the legislature allows fish farming in Alaska, those pen-raised salmon "will be ready for market when there is a major glut," she said.

What would be the result of high supplies and low prices on the new businesses and Alaska?

"I think what will happen is the state will try to bail them out," Graham said. "In 1990, there will be even less revenue. Where will the money come from? What's not going to be funded if we're bailing out the family fish farmer?"

Several researchers also predict lower prices.

"While prices have been stable at about \$4.20 per pound for 9-11 pound Atlantic salmon for the past five years, prices cannot be expected to hold," ac-



According to a report by Curt Kearns done for the University of Alaska Sea Grant College program. "The rate of production is very high. Consequently, projections are for prices to soften by 1990."

Cheryl Sutton of the Kenai Peninsula Fishermen's Cooperative Association also questions the wisdom of mariculture in Alaska.

"I'm really concerned over the lack of coordination in fishery programs in the state," Sutton said. "We're the world leader with wild stock, and there are abundant opportunities to develop wild stock. Why go off in other directions with no basis in fact?"

"Certainly trollers will be the most affected group," said Earl Krygier, executive director of the Alaska Trollers Association. "I personally believe that when people start to look at the legislation, they will understand that recreation users and subsistence users will be greatly affected."

"The trollers will face more of the Draconian changes that new industry will bring," he said.

Farmed salmon compete most directly with premium wild species — the kings and cohos caught by trollers.

In 1986, Alaska fishermen harvested 23,800 metric tons of cohos and kings, about half the 48,600 metric tons of Atlantic farmed salmon produced, according to the House Research Agency.

Krygier acknowledges that trollers, who market high quality, fresh coho and king salmon, will be hurt by mariculture regardless of Alaska's involvement.

"The industry would be devastating in many facets," he said.

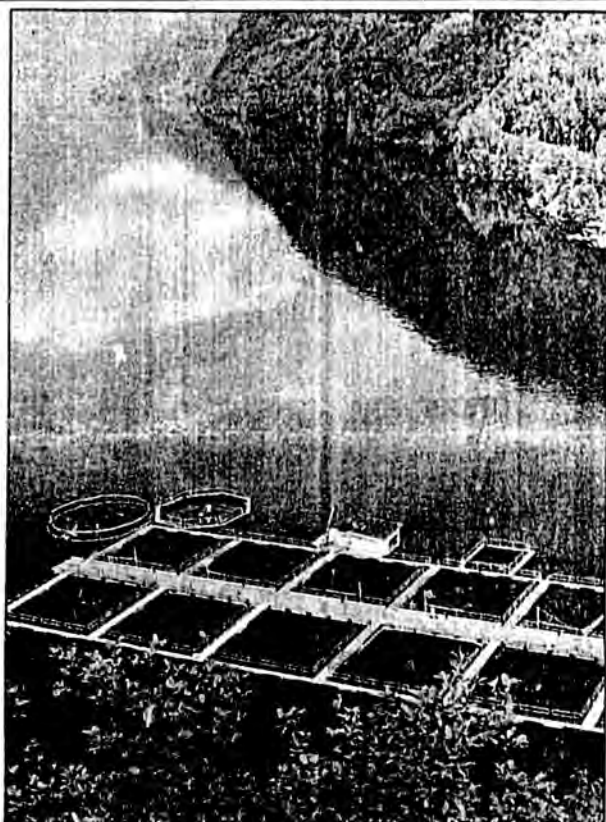
In hopes of clarifying a tangle of regulations about fish transport and land use, the legislature agreed this spring to the one-year moratorium on issuance of salmon-farming permits.

Next year, the mariculture question is likely to be high on the legislature's agenda.

"The first question is should Alaska be in mariculture," said Sen. Jim Duncan, D-Juneau, one of nine legislators who visited salmon farms in Norway last month. "If we will be, then we need to design legislation for siting, permits."

Other major issues to be addressed, legislators said, are conflicts over site use, how leases on state tidelands will be handled, quality control, disease control and marketing.

"The state needs to develop a comprehensive mariculture policy. Right now, it's handled through a variety of



Aerial view of salmon farm in Norway, world leader in salmon production.

regulations and laws that were designed for other purposes," Rodger Painter, executive director of the Alaska Mariculture Association, said.

"The result of that is a sometimes fragmentary program. . . . It's just difficult for agencies to carry out ambiguous laws, let alone for industry to make significant investments in something that's so gray," Painter said.

"We have all the natural features, but we also have a very viable commercial fishery here," Sen. Jan Faiks, R-Anchorage, said. "We would not want to do anything that jeopardizes the wild stock commercial fishery. We want to create jobs, not replace jobs."

Advocates of mariculture say the legislature needs to act next session if smaller Alaska businesses are to get involved. By waiting longer, competition

will shut out more small operators. Even today a salmon farm doesn't come cheaply, averaging between \$250,000 and \$1 million for capital and initial operating expenses.

If Alaska waits years to get involved, "it may be that only operations with real deep pockets can survive," Painter said. Part of Painter's goal is to tap into the "diversity of opportunity" and develop "smaller scale salmon farms and not just international corporations conducting mega-farms."

And the industry is international. Anton Meyer, Norwegian vice consul in Anchorage, said Norwegian firms alone had invested \$50 million in mariculture projects in British Colum-

See Mariculture, page G-2

Mariculture: 'Worst case' could cost fisheries \$36 million

Continued from page G-1

bia. The firms also would be interested in investing in Alaska, he said.

However, Meyer sees some disadvantages in Alaska.

"Alaska does not have a good track record of building infrastructure for any kind of industry. It's somewhat disorganized for any newcomer," he said.

Legislators will end up at the pivot point, choosing between constituents who fear competition and social impact and an industry promising all the things they campaigned to bring home.

"My mind is still open," Juneau's Duncan said. "The bottom line is what will be our economic benefit and impact on fisheries."

"We want to make sure we're not harming a part of the state economy," Duncan said. "My fishing constituents are not very enthralled with the idea."

"I know who I represent," Sen. Lloyd Jones, R-Ketchikan, said. "Commercial fishermen are not in favor of it; consequently, I have to make sure I don't hurt their cause."

Legislators like Anchorage Rep. Johnny Ellis and Kodiak Sen. Fred Zharoff cite Alaska's geographic advantages and the economic potential to support mariculture development.

The already substantial market share of farmed salmon and the predicted growth buoys the proponents' arguments. A sampler of statistics:

- In 1936, approximately 59,200 metric tons of farmed salmon were produced worldwide. In three years, that's expected to increase to between 107,000 and 140,000 metric tons.

- The 1986 wild salmon harvest was 657,000 metric tons. Fo-

recasts for 1990 predict the world harvest stabilizing at about 677,000 metric tons.

- About 43 percent of world salmon production and 90 percent of U.S. salmon comes from Alaska commercial fishermen. The 1986 harvest in state was 268,000 metric tons.

- Between 1983 and 1985, fresh farmed salmon imports into the United States grew from 4 million pounds to 16 million pounds, with the value growing from \$15 million to \$52 million.

"If this state does allow salmon farming, it appears that even a very modest development will result in thousands of jobs, and over \$100 million in sales when both direct and indirect effects are considered," according

"It doesn't matter if Alaska is involved, the impact is there . . . Farmed salmon is not going away."

— Rick Harris
Sealaska vice president

to a report prepared by Robert Logan, a University of Alaska-Fairbanks professor, and by John Weddleton, an Anchorage consultant.

A study conducted by Sealaska Corp., the regional native corporation for Southeast Alaska, found mariculture could be profitable in urban, rural and remote sites.

"It doesn't matter if Alaska is involved, the impact is there," Rick Harris, vice president of resource planning and administration for Sealaska, said.

"Thirteen countries are producing farmed salmon. The market shows no inclination to stop growing," Harris said. "Farmed salmon is not going away."

The growing farm production is expected to cause a \$5 million

to \$36 million loss in revenue to the Alaska fishing industry by 1990, according to the House Research Agency.

"In relative terms, prices for Alaska salmon are expected to fall by about 9 percent as a result of world farmed salmon production, and an additional 1 percent if Alaska were to develop a 20,000 metric ton industry," the agency reports.

The market for fish, both fresh and frozen, has grown tremendously.

How long the expansion can continue is uncertain, however: Commercial fishermen see a glut of salmon in about four years, while mariculture proponents see new markets opening when fresh salmon is available

do not really benefit our seafood industry but are primarily benefiting foreign producers."

In Logan and Weddleton's report, a 20,000 metric ton Alaska industry was predicted to provide direct farm employment of 1,200 jobs. Depending on the value of sales, farm size and location variables, the industry employment predictions ranged from 2,000 to 6,300 jobs.

The "worst case" effect on the traditional fishery was estimated at \$36 million in losses from farmed salmon.

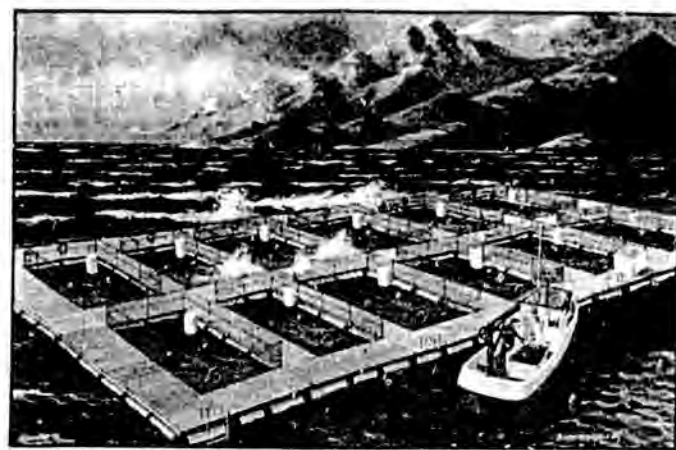
"An incremental Alaskan production of 20,000 metric tons causes an additional \$4 million in losses," they wrote. "This compares to a 'best case' scenario of \$5 million in losses from world salmon farming, but in absence of Alaskan salmon farming."

"Recall that the positive impact of a 20,000 metric ton salmon farming industry was in excess of \$100 million in terms of direct sales," Logan and Weddleton wrote.

"It would be difficult to argue that salmon farming is unjustified in Alaska on purely economic grounds. It would have to be on the grounds of social concerns such as environmental hazards," they wrote.

Krygier said the latter concern should be no small matter to Alaskans who have the world's best wild stock fishery.

He said the farms must be kept well stocked with food for the growing salmon. The nutrient-rich water also is a boon to disease-causing organisms. Net pens would be attractive too to



An artist's rendering shows a salmon farming facility.

other salmon, kings and cohos that winter in Southeast rather than in the North Pacific. That would expose wild stocks to disease, and could allow stocks to mix, Krygier said.

"We fish our wild populations," Krygier said. "That's not like Norway, which had no natural populations to damage."

"The value of our natural stocks are so great we can't risk bringing in a potential disease-creating situation like this," he said.

Such risks must not be overlooked but should not necessarily rule out mariculture in Alaska, according to Painter.

"Certainly the environment needs to be protected, and wild fishery resources are vital to the state economy," Painter said. "They can be protected with a good regulatory approach."

"Or it can go way overboard so that nothing will happen. It's always difficult to find the balance," he said.

Disease and genetic research has been going on for several years in Norway, and federal agencies have test programs in Alaska and Washington.

Sen. Arliss Sturgulewski suggested there was "a major role for the University of Alaska to play" in determining what would make a quality operation.

Marine research has been underfunded and spread over the university system with little cohesion, Sturgulewski charged.

What the state should not become, she said, is a banker.

Painter said the association was not lobbying for loan programs or financial backing. There is private financing available, he said.

"Foreign capital coming into the state is not a bad idea," Sealaska's Harris said. "We need to ensure that Alaskans are part of the industry, so we don't see people in Kake sitting on the beach while the Norwegians fish."

Gunderson's

Fish farmer diversifies, sees sales multiply

By John Quinley
Times Writer

When Dan Swecker and his wife began salmon farming in 1974, he had to work another job to make ends meet.

Today he describes himself as more of a bureaucrat than a farmer as he supervises an operation that likely will pass \$3 million in sales this year, double his 1986 business. In the first five years of business, his gross sales rarely passed \$100,000 per year.

Swecker Salmon Farms is about 20 miles outside Olympia, Wash. With 10 full-time employees in production work and up to 20 part-time workers in the processing end of the business, Swecker is riding the rising wave of interest in mariculture products.

"We started raising coho salmon smolts for saltwater net pen growers in Puget Sound," he said. Their customers were industrial giants like Weyerhaeuser, which soon began its own smolt operations. "In the late 1970s we decided that we should diversify from fingerlings."

Swecker's operation turned to pan-sized coho salmon that were held in fresh water and not released in saltwater. They were raised to about one pound and custom processed.

"That was very successful," Swecker said. "We also did the custom processing for us and two or three other growers. The fish were deboned with the heads left on," he said.

The business then moved into Atlantic salmon growing for net pen operators.

"We worked through quite a learning curve; they're more difficult to raise in fresh water, but they stay a year longer in saltwater before reaching sexual maturity, so they can be raised to a larger size. They're easier to raise than coho salmon once they're in saltwater," Swecker said.

This year the company opened a processing plant in Olympia to process fish from growers in Idaho, Oregon, Washington and British Columbia. He also is looking at plants in Oregon and soon will close a deal to process fish imported from New Zealand.

Swecker's success also has attracted investors. Sealaska Corp., the regional native corporation for Southeast Alaska, bought 49 percent of the operation.

"We wanted to get a better understanding of mariculture, the risks, the opportunities. We're depending on Dan's expertise and knowledge," said Rick Harris, Sealaska vice president.

Swecker, who is president of the Washington Fish Grower Association, predicted the market for farm-grown products would expand and that mariculture producers might gain the upper hand in marketing because of their ability to provide fish all year.

See Salmon, page G-5

Sunday, September 6, 1987, The Anchorage Times

Salmon

Continued from page G-1

That doesn't spell doom for traditional commercial fishermen, he added.

"Some of the areas with the most opportunities are more suitable to commercial fishing, (such as) the vacuum-packed fish in a sauce, a frozen product that can be microwaved. People are getting smart; they are learning that a good frozen product is better than a bad fresh product."

The fresh farmed-salmon market primarily is "white tablecloth" restaurants.

"I think as an industry, aquaculture is going to break out of that routine and work toward the retail side," Swecker said. Among the potential products using farmed salmon are fresh TV dinners, which is a packaged meal with a fresh entree and vegetables that can be cooked in a microwave oven.

The seafood industry needs to look toward "an integrated market strategy . . . and take best advantage of the strong points of each product. The guy who can provide both is at the best advantage."

"We can fight with Europe or produce our own fish here and take over our market. I want to push them off the block."

By JOHN F. BURNS
THE NEW YORK TIMES

HARDY ISLAND, B.C. — As the sun disappeared behind the mountains that line this spectacular coastline, John Spence palmed a handful of herring meal and tossed it onto the gray waters of the Pacific. In an instant, hundreds of sleek silver salmon broke the surface in a graceful arc.

"Hungry fellows, coho," said Spence, whose company, Hardy Sea Farms Inc., feeds a million coho and chinook salmon that it has corralled in nets off this rocky outpost.

Next month, if all goes well, some of those salmon will begin a journey that will end in homes and restaurants as far away as New York, and one more step will have been taken in a process that is changing the way that gourmets get one of their favorite foods.

Hardy Island, named by Britain's Royal Navy for the captain of Nelson's flagship at Trafalgar, is one of the newest sites of the fast-growing industry of salmon farming.

Instead of sending men to sea in the smacks and seine boats that have traditionally brought salmon to shore, Spence and his operations manager, Michael Mulholland, are raising the fish in offshore pens, fattening them for market just as farmers do cattle and hogs.

The industry of salmon farming migrated here from Norway, where it began 20 years ago. It has also been adopted in Ireland and Scotland, bastions of the old "wild fishery" that catches salmon in oceans and rivers, and is also developing off the Atlantic coast of the United States and Canada, and as far afield as Chile, Japan and New Zealand.

The industry's growth is part of the worldwide burgeoning of the ancient enterprise of aquaculture. Increasingly, demand for fish is outstripping what fishing can supply, and the gap is being filled with farmed fish.

From ponds in the Philippines to the vast lakes of Africa, specialists are using modern versions of techniques pioneered in China more than 2,000 years ago to provide a potentially unlimited source of protein.

At the top end of the aquacultural scale are the salmon farmers, who can earn up to \$50 for a single nine-pound coho, 30 inches long, of the kind produced at Hardy Sea Farms. Last year, the worldwide output of farmed salmon was more than 70,000 metric tons, about 10 percent of the

FISH FARMING

British Columbia joins areas successfully farming salmon

total worldwide catch.

But while the fishing industry is struggling to maintain production because of problems with overfishing and pollution, the salmon farming industry is predicting rapid growth, to more than 150,000 metric tons by 1990.

Yet to continue its growth, salmon farming must overcome the political muscle of commercial fishermen, the concerns of environmentalists, a number of fish diseases, and the attitude of those gourmets who proclaim the flavor of farmed fish inferior to that of those caught in the wild.

If the farming is successful, it could make millionaires of men like Spence, a former McGill University professor who recently resigned as a salmon farming adviser to the British Columbia government to take over as president of Hardy Sea Farms.

The company is being watched closely throughout the industry, largely because it teams Spence, an authority on fish biology, with Thor Mowinckel, the Norwegian businessman who is widely regarded as the founder of the salmon-farming industry in his home country.

Mowinckel's company, Saga Seafood A-S of Bergen, is the majority owner of Hardy Sea Farms, and he has already worked successfully with Spence in a salmon farm in County Donegal, Ireland. Saga Seafood is investing heavily here in the belief that there will be continuing rapid growth in the "white table" demand for salmon — the most profitable end of the industry, which concentrates on supplying fresh fish to restaurants and homes, as opposed to the canneries that take the bulk of the salmon caught by wild fisheries.

The company bases its confidence partly on the reaction of Westerners to medical studies that found lower

rates of heart disease in nations that eat large amounts of fish. Westerners, especially North Americans, are consuming more fish themselves.

Also, the company says, there is a growing demand for a steady supply of fresh salmon year-round, a market that the wild fishery, with its tightly-regulated fishing seasons, finds difficult to supply.

Starting next month, two years after it filled its first pen with smolts, or baby fish, Hardy Sea Farms will begin shipping salmon from here, 50 miles north of Vancouver, then on to customers in Canada and the United States. In its first "harvest," between now and next spring, it expects to market 300 metric tons of salmon, worth about \$1.5 million, figures that it expects to rise to 900 metric tons and \$7 million in 1988-89.

However, the company's success depends on its ability to overcome some major obstacles. Among these is the insistence of some gourmets that fish caught at sea, typically after swimming thousands of miles in ocean currents, have a taste that no farmed fish can match. Beyond this, there is the hostility of commercial salmon fishermen — hostility that has coalesced into a powerful political force in Alaska, where one of the world's largest salmon fishing fleets has so far blocked efforts to establish salmon farms.

Perhaps more serious is the battle to keep the fish free of a bacterial kidney disease that has bankrupted some salmon farms in Scotland and Ireland and decimated the fish stocks of at least one British Columbian venture.

Environmental groups that previously agitated for an end to whaling and to commercial sealing have mounted a public campaign against the farms, contending that the concentration of salmon feces beneath

the pens can cause endemic disease among marine life and that antibiotics used to keep the salmon healthy could invade the food chain.

Spence believes that scientifically qualified managers, schooled in the problems that have caused failures elsewhere, can surmount these obstacles.

But as he waited for a float plane that took visitors on an aerial tour of the rival salmon farms that have established pens in virtually every inlet within 10 miles of Hardy Island, he acknowledged that the industry is still in the "high risk" category. "If you haven't debugged your technology, you're in trouble, no doubt about it," he said.

So far, Hardy Sea Farms has invested nearly \$5 million here. In addition to the floating pods containing the pens, each the size of a football field, the company has built extensive onshore facilities, including fuel storage tanks, a barn for the feed, accommodations for a work force of 30 people and a dock for float planes and freighters.

Eventually, the company expects its investment to exceed \$10 million, with an annual production capacity of as much as 6,000 metric tons.

Nor is Hardy Sea Farms alone. More than 130 salmon farms have sprung up along this coast in the past three years, and at least 900 more lease applications are pending with the provincial government. Already, experts are talking of a potential harvest here of 20,000 metric tons of salmon by 1990, which at present prices would have a market value of more than \$100 million.

The model for the industry is Norway, where experimental ventures begun in 1968 have blossomed into an industry that markets 45,000 metric tons of salmon a year, 1,000 metric tons a month to buyers in Boston and New York. Norway now has its emulators in Maine and New Brunswick, Canada, at farms that have a current output of about 1,500 metric tons, but, as Mowinckel's involvement here suggests, the fastest growth in the industry in North America is in the Pacific Northwest.

Farms along Puget Sound in Washington, many of them Norwegian-owned, have an annual output of 600 metric tons. But pollution of the sound and the limited availability of deep, well-flushed seawater basins, essential to the salmon's health, have restricted growth. If the impasse in Alaska is broken, the industry could prosper rapidly there, but in the meantime most of the development is occurring here.

Alaska can become world leader in fish farming

By SEN. ARLISS STURGULEWSKI
and REP. JOHNNY ELLIS

After months of being buffeted by reports detailing Alaska's deepening economic woes, it might be easy to conclude our best long-term plan is to market the state as one large ghost town. You may have missed among the headlines the many modest signals that our economy is improving and diversification is more than a political buzz word.

Consider the mining industry in which two large-scale projects — Red Dog near Kotzebue and Greens Creek near Juneau — have been given the nod from investors, or the fishing industry, which is enjoying near record prices and demand. Then there's the continued growth in tourism and steady recovery of markets for forest products.

These trends have been covered by the news media and are known to some Alaskans, but they somehow lack the appeal of the booms that have so typified our economy in the past. Let's face it, discovery of a new Prudhoe Bay makes better headlines than development of a couple of mines and steady expansion of tourism and fishing. The real solution to our current economic problems won't be solved by another boom, however.

COMPASS
POINTS OF VIEW FROM OUR COMMUNITY

The answer is solid, steady growth in a number of industries, particularly those offering opportunities for development of many small to medium-sized businesses. One of the best economic development potentials now available to Alaska is mariculture, or fish and shellfish farming. A recent fish-farming seminar in Juneau sponsored by the Trade Commission of Norway underscored some of the reasons mariculture is an attractive option for Alaskans.

Norwegian salmon farming is one of the more amazing success stories in an industry that has achieved remarkable growth throughout the world. Production of Norwegian-farmed salmon has grown from 9.5 million pounds in 1980 to a projected 121 million pounds this year; the annual production growth rate is running at 40 percent.

Norwegian officials say 3,000 people are directly employed in the

industry. Indirect jobs push the total employment to 8,000 to 10,000. Mariculture offers something for both urban and rural Alaska; most of the direct farming jobs would be located in outlying communities while secondary jobs would be in the regional service centers. Increased seafood exports would strengthen Anchorage's bid to become a world seafood trade center.

The long-range outlook for Norwegian fish farmers is very good. This is because of genetic improvements in farming brood stock, aggressive marketing, quality control and a commitment to research. For example, after only a few years of large-scale production, Norwegian salmon farmers have improved food conversion ratios to surpass those of poultry farmers, the most efficient meat growers.

The participants in the Norwegian fish-farming seminar in Juneau also presented a wide variety of technological innovations that suggest continued improvements are in store for salmon farmers. Discussed were concepts that would revolutionize fish-farming techniques throughout the world, such as controlled environment fish-culturing systems and farming in bays sealed off by non-physical barriers.

Other seminar participants described innovations in packaging, air transportation, feed technology and fish-farming equipment that will allow the Norwegians to remain world leaders in mariculture. The Norwegians also appear to be close to large-scale commercial production of halibut, sole and cod. It is not in our interest to allow their penetration of American markets to go unchallenged.

One thing seems clear to many Alaskans who attended the seminar: Alaska has the capability to become a world leader in mariculture. Certainly there are many policy questions that must be answered, such as protection of the environment, control of disease, protection of existing uses of public water, and how to recover state costs of regulating the industry. We have much to lose by not pursuing mariculture development.

As one seminar participant put it, "Alaska has the opportunity to become a hammer or a nail in the sweeping changes aquaculture is bringing to world seafood markets. ... Alaska can protect its dwindling share of global markets by becoming a driving force in aquaculture production, or it can be hammered upon by other regions taking advantage of

increasing consumer demand for fresh seafood."

The long-term health of our economy hinges in the vision and resourcefulness of Alaska entrepreneurs and the ability of government to work with the private sector to take advantage of opportunities such as fish farming. Mariculture development in Alaska is a unique situation; government isn't being asked to change world market conditions, offer subsidies or otherwise interfere in the marketplace.

The legislature is now studying methods of ensuring that development of this promising new industry proceeds in an orderly manner that will assure maximum economic benefits to Alaskans.

The positive signals we're now starting to see — growth in fishing, mining, tourism and timber — are only a beginning to full economic recovery. Mariculture offers us another building block for a healthy and diverse Alaskan economy.

□ Sen. Arliss Sturgelewski, R-Anchorage, is chairman of the Special Committee on Local and Regional Economic Opportunity. Rep. Johnny Ellis, D-Anchorage, is a member of the House Labor and Commerce Committee.

LETTERS

Alaska should avoid problems of mariculture

Dear Editor:

Responding to the Aug. 17 article on salmon farming appearing in the Money section, there are several important points that deserve more complete coverage. For clarification, the farming of Atlantic salmon, *Salmo salar*, is, indeed, trout farming as this species is a close cousin to rainbow and cutthroat trout and not of the same genus as the salmon native to Alaska.

In much of Europe, where net-pen marine "salmon" aquaculture (mariculture) was pioneered, the runs of free-swimming anadromous salmonids were reduced by over-harvest, habitat destruction and pollution. Fisheries management was largely a case of too little too late, where Atlantic salmon were concerned.

Surprisingly, the author of the Aug. 17 article portrayed contemporary Ireland and Scotland as "bastions of the old wild fishery that catches salmon in oceans and rivers." This is not exactly the case. Salmonid enhancement, vis-a-vis

hatchery releases and stocking programs, contribute far more proportionally to the fishery of Ireland and Scotland than does wild spawning. Alaska's wild salmon fishery, by its sheer magnitude, makes the fishery of Ireland and Scotland appear tame by comparison.

The question facing Alaska on the issue of whether to accept or decline net-pen mariculture is largely one of compatibility. Now, on both sides of the Atlantic, net-pen operations are substituted for the foregone alternative of wild fishery production. That is, if the two can be compared at all.

Norway, a leader in net-pen mariculture, has its share of problems. The author of the fish farming article, a Mr. Burns, only briefly covered a few. The net-pen system, like raceway trout culture, is a biologically intensive form of crop production. Fish are extremely crowded. Demands for dissolved oxygen, waste removal and food are tremendous in the high density enclosures; as a result, fish are physically stressed and high rates of mortality due to disease can be virtually endemic. In his article, Mr. Burns takes care to point out several worst-case scenarios in Scotland, Ireland and British Columbia where disease forced firms into bankruptcy. But in Norway disease problems are being compounded by Atlantic salmon that have escaped confinement, diseases in tow, and pose a new man-made threat to the previous wild stocks

(Fisherman's News, July 1987).

Lastly, Mr. Burns' article shed the faintest glimmer of light on an especially poignant concern in the issue of whether "high risk" net-pen mariculture should be permitted in Alaskan waters. He writes of the need for "scientifically qualified managers, schooled in the problems that have caused failures elsewhere." Yet, in the Pacific Northwest, with the many well-meaning and talented fish culturists employed, disastrous fish kills still do occur and often are only a heartbeat away. With the few vaccines and antibiotics available for preventive and curative fish health-care, the arsenal has never been full.

So let us applaud the state legislature for imposing a one-year moratorium on net-pen mariculture and work to extend that moratorium. Let us support further the proven policy of state wild fish management and enhancement, together with non-profit association aquaculture. Be thankful for what you've got, Alaska.

**Burl Sheldon
Wrangell**

8/26/87
**JUNEAU
EMPIRE**

THE WALL STREET JOURNAL.

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REGIONS

New Fish-Raising Techniques Cause a Ruckus in Northwest

By KEN SLOCUM

Staff Reporter of THE WALL STREET JOURNAL

IVAN WERSTIUK'S new, 2,600-square-foot home looks down at the nearby water at Bell's Beach on Whidbey Island off Seattle, where at the moment a bald eagle walks along the shore. Seagulls often bark at Mr. Werstluk from the beach and seals are a common sight. For the retired contractor, the \$300,000 investment in such a setting was the realization of a lifetime dream.

But after moving in, Mr. Werstluk learned that the cove in front of his house is the proposed site for a commercial fish-raising operation called salmon net-pens, a sort of floating island of about two acres that opponents condemn as "marine versions of cattle feed lots." Fumes Mr. Werstluk, "I wanted a place without garbage and traffic."

For people involved in the cultivation of seafood, Mr. Werstluk is a dreaded Nimby, an acronym for "not-in-my-back-yard," and he and others like him are producing the biggest aquaculture ruckus the Northwest has seen in decades. It seems likely to decide whether these scenic shores are mostly the domain of residents and sportsmen; and it could tilt for decades the U.S. role in a growing world industry.

The whole idea seemed simple enough. Why not take a mere 80 acres of Puget Sound's three million acres to raise premium-quality salmon for winter sale to the white tablecloth restaurant trade. That not only would produce several profitable business ventures and jobs but would lower the federal deficit by completely offsetting the \$80 million in pen-raised salmon the U.S. imported last year.

BUT THE BEST SPOTS for farming seafood are Puget Sound's coves, near-shore spots protected from storms that also happen to be where recreational fishing is best and homeowners have put life savings into coveted shoreline property. The result has been an explosive court, media and legislative confrontation from the San Juan Islands off Canada to the Washington state capital in Olympia.

Most aquaculture did fine as long as it stuck to nature's way and raised oysters or other seafood beneath the water's surface and mostly out of sight. But in recent years, some entrepreneurs innovated. They increased production by turning to new techniques involving racks that protrude from the water at low tide or sea cages that ride the waves and are visible even at night.

Several types of aquaculture are involved, but the storm centers on salmon net-pens, common in Norway, fast-growing in Canada and, until recently, catching on in the U.S. Each pen is about 40 feet square, stands some five feet above the water and has nets forming a fish cage some 15 feet below the surface. Clustered along floating walkways and anchored to the bottom, the cages form a floating island, usually up to two acres.

SALMON NET-PENS are an emotional lightning rod on Whidbey Island and elsewhere. When a reporter recently made an appointment with an island resident to discuss them, he was met by a contingent of 33 people.

Their complaints track environmental lines. Stating that a five-acre net-pen operation produces the excrement of a town of 4,000, they contend the sea cages present a possible health hazard to humans, choke out sea life below the cages and may spread disease to wild fish. They point to the unknowns, such as the effects on wild life of antibiotics used in aquaculture.

While not professional environmentalists, they're wise to the "system." Charles R. Caldwell is a retired finance official for the Los Angeles school system; L. Joe Miller was city manager of Bellevue, Wash., and Rochester, N.Y., and Harold Logan is a retired vice president of Seafirst Corp.

In addition to hiring an attorney, local folks have made sure they're heard in the state capital. "We're determined not to sacrifice our environmental concerns for a few jobs," says the state representative for the area, Mary Margaret Haugen.

THE SHORE RESIDENTS, who are often joined by sport and commercial fishermen, are having an impact. Washington state has seven commercial salmon net-pen operations, all but one built within the past five years. But Island County, which takes in Whidbey Island, and some other counties have put a one-year moratorium on new salmon net-pen applications. Sea Farm of Norway Inc., which operates net-pens off Port Angeles and Port Townsend, dropped plans for a salmon-raising operation near the San Juan Islands after objections from local residents, and the county ordered an environmental impact statement that the company said would cost it upwards of \$100,000.

Noting that "we're a clean-water industry, and we'd be the first to suffer if we polluted," John Forster, general manager of Sea Farm of Norway, says, "Part of our job is to show we're good neighbors and will deliver jobs. But the air has been poisoned by people who use exaggerated arguments and hysterical attitudes."

Some aquatic experts worry that the state and the nation may suffer in the long run if salmon raising flees to another country. Observing that salmon net-pens do involve legitimate environmental concerns but that they can be overcome with proper siting, John Pitts, aquaculture coordinator for the state Department of Agriculture, says that only three states, Maine, Washington and Alaska, have ideal environmental conditions for farming salmon.

He ponders: "It seems to me that since we import 65% of our seafood and with the ocean catch static and U.S. consumption rising, it makes sense that we should turn to aquatic culture as other countries have to make up that shortfall."



*This appeared in the
Journal while you were
in Norway.
Peggy Haskett*

Norwegian farm salmon threaten wild stocks

The Norwegian Directorate for Nature Management is establishing a salmon genes bank to help "return to nature and draw on hereditary properties that have more or less been lost during the process of changing salmon into farm animals," according to a Norwegian Information Service bulletin.

Farm-bred salmon that have escaped from their confines can threaten reserves of wild salmon, says nature management researcher Lars Petter Hansen.

"It has been established that up to one in 10 salmon in the (Norwegian) wild have either escaped from



breeding plants or originate from smolt that has been put out in Norwegian rivers," Hansen said, adding that it has also been proven that these renegades become homeless and when moving up river to spawn choose more or less by chance which river to enter.

The growing number of salmon farms is expected to result in a corresponding increase in escaped salmon and both Norwegian and foreign scientists in the international ocean research council are concerned about the influence of farm-bred salmon on natural reserves, Hansen stated.

He added that the Directorate is preparing a model for use in distinguishing farm salmon from the wild variety, in an effort to prevent farm salmon from concealing a possible drop in the reserves of wild salmon, "a development which can put obstacles in the way of managing the already heavily depleted reserves of wild salmon."

Fisherman's News
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Farm Salmon Threat to Natural Stocks? According to the June 1987 issue of Fish Farming International, farm salmon that escape from their cages could be a threat to Norway's stock of wild salmon. The article "Farm Salmon Stock Fears in Ireland and Norway" (p.32) reports that "up to ten percent of Norwegian wild salmon have either escaped from farms or originate from smolts introduced into the rivers. These fish are said to be 'homeless' and choose their spawning rivers more or less by chance."

Lars Petter Hansen of the Norwegian Directorate of Nature Management has voiced alarm over what the farm salmon may be doing to wild stocks. "With the steady expansion of the salmon farming industry (production last year amounted to 45,000 tons), the number of escaped fish is expected to increase," said the article. "Norwegian and foreign scientists are concerned about the influence of these fish on natural stocks."

See attached

FAO sees key role for women in aquaculture

THIRTY women, assisted by a handful of men from FAO, recently completed four days of talks on the role of Women in Aquaculture, and the potential for a significant growth in their future participation.

The occasion was a workshop held in Rome and sponsored by FAO's Aquaculture Development and Coordination programme (ADCP) and the Norwegian International Agency for Development (Norad).

The 30 participants were invited because of their present active work in aquaculture. Among representatives from administration and technical research, there were owners and managers of fish farms, hatchery managers, extension agents, marketing specialists, credit and bank managers. And they came from many parts of the world.

The workshop was structured by ADCP in such a way that attention was focussed on every level of aquatic farming, beginning with the consumer and pro-

ducer, and continuing through to management of the national industry and inter-regional affairs.

These levels, noted Dr. Colin E. Nash, Programme Leader of the ADCP and organiser of the workshop, were the principal components of the sector and helped the participants concentrate on the main issues of development.

As a result, the workshop made a number of recommendations which should benefit the participation of women in many areas.

The meeting was informed by eight working papers which had been prepared by specialists.

There were four papers on women as producers in West

Africa (Bernadette Trotter), Asia (Elvira Baluyut), Latin America (Margarita Lizarro) and the island communities (Ruth Busch). There were also four papers on other activities such as handling, processing and marketing (Petra Splenhoff), institutions and credit (Aida Librero), extension and training (Carole Engle) and in the professions (Carol Brown).

All the working papers and the summary of discussions of the six working groups will be produced by

ADCP and NORAD.

Summing up, Dr. Nash noted that the records show that women are very active participants in aquaculture, such as extensive production in rural areas, hatchery production, extension, research and even administration. There are still many constraints which must be overcome, but there is no question that the growth of aquaculture world-wide and the opportunities for the advancement of women are mutually beneficial.



Research worker in a Russian laboratory investigating the breeding and ranching of salmon. The key role of women in aquaculture now extends to every aspect of the world-wide industry.

Farm salmon stock fears in Ireland...

HAVING enjoyed its honeymoon with the press, in which aquaculture was hailed as Ireland's new "sunrise industry" in terms of job creation and export revenue, fish farming now seems to be coming in for a great deal of criticism, much of which is unfounded.

Writing in a recent issue of *Aquaculture Ireland*, Gerry Ross says that unfortunately most of the ammunition for this criticism seems to have been provided by the Central Fisheries Board (CFB) in its document *Inland Fisheries: Strategies for Management and Development* (FFI, March 1987).

However well intentioned this document was, it has given rise to a rash of articles which have caused concern among farmers planning to set up smolt hatcheries in freshwater, says Mr. Ross.

The CFB says it is particularly anxious about the environmental effects of cage rearing.

It is also concerned about the escape of farm strains into the wild or their release by owners or lessees of such systems, for enhancement purposes, which it is said, could affect the genetic integrity of the salmon stock.

Gerry Ross points out that perhaps it is time that somebody made public the fact that fish farmers are equally worried about the environmental effects of cage rearing, not only from a concern for the natural resources, but from the cold hard fact that their livelihoods depend on high water quality and the survival of their fish.

He says that none of the newspaper reports he has read has mentioned that the main worry on smolt production units is not disease getting out (although this comes high up the list) but about disease getting in — from wild stocks.

.. and Norway

FARM salmon which escape from their cages could be a threat to Norway's stock of wild salmon, says researcher Lars Petter Hansen of the Directorate for Nature Management.

It is estimated that up to ten per cent of Norwegian wild salmon have either escaped from farms or originate from smolts introduced into the rivers. These fish are said to be "homeless" and choose their spawning rivers more or less by chance.

With the steady expansion of the salmon farming industry production last year amounted to 45,000 tons.

the number of escaped fish is expected to increase. Norwegian and foreign scientists are concerned about the influence of these fish on natural stocks, said Mr. Hansen.

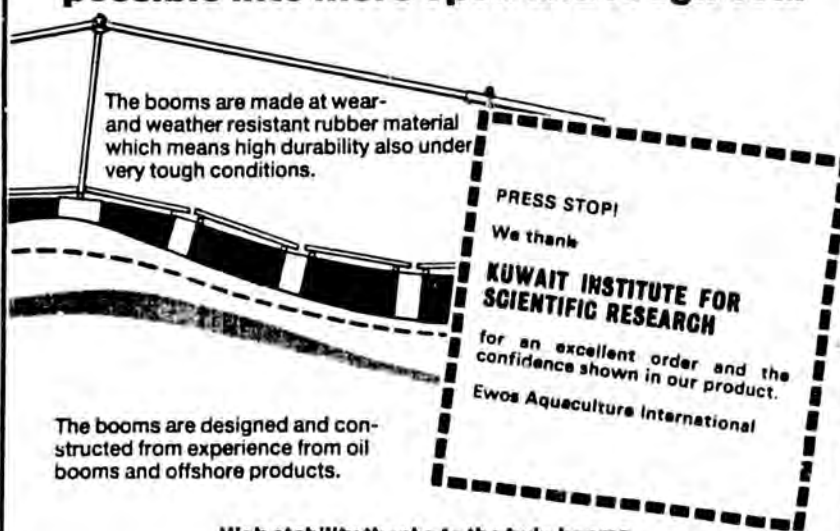
His organisation is preparing a model for use in distinguishing farm salmon from the wild fish.

In an attempt to preserve the wild salmon, the Directorate for Nature Management is setting up a gene bank. It points out that even salmon breeders can benefit from returning to nature to draw on hereditary features that have more or less been lost in the process of changing Atlantic salmon into farm animals.

EWOS NEWS



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Faiks said.

While Alaska is just studying fish farming, the Norwegian government is already into genetic research, producing 200-300-pound halibut and 25-pound lobsters.

"They are two years away from fish-farming halibut for sale, and the lobster farm we toured grows 30,000 lobster a year," she said.

Norway boasts 700 fish farms and produces 50,000 tons of fresh fish a year.

The biggest problem the Norwegians have encountered is disease among the farmed fish. To help control that glitch, the government tests the fish daily and requires the farmers to meet strict regulations, she said.

The fish farms themselves are also closely monitored. Each is 8,000 cubic meters. The permits to operate a fish farm are handed out by the local government to private individuals. Each farm costs about \$1 million to set up and employs about three people, who earn approximately \$70,000 a year. Owners estimate it takes two to four years before they receive a return on their investment, Faiks said.

By Debbie Reinwand
Times Writer

A group of Alaska legislators has just returned from a trip to Norway and a tour of that country's mariculture facilities — and for those who missed the trip, there will be film at 11.

During their voyage, the nine legislators contacted a video company and for the price of \$1,000, had the group film the Alaskan leaders and their Norwegian hosts in action.

The film footage is now in San Francisco being dubbed onto

tapes, which will be forwarded to Senate President Jan Faiks' press assistant Penny Pearson for production, the senator said.

"What we'd like to have is a documentary of the trip that we could present to the legislature and offer to public television," Faiks said.

The film of Alaska's leaders will be spliced together with some generic shots of Norwegian fish farms, she said. "They had a really good tape that we also purchased from them."

Accompanying Faiks on the

trip were Sens. Jim Duncan, D-Juneau; Fred Zharoff, D-Kodiak; Don Bennett, R-Fairbanks; Dick Eliason, R-Sitka; Rick Uehling, R-Anchorage. Also on the tour were Reps. Johnny Ellis, D-Anchorage, and Steve Reiger, R-Anchorage. Ellis and Zharoff sponsored bills last session to establish a mariculture regulatory system.

During the recent trip, the legislators visited three major research stations, both government-owned and private, as well as numerous fish farms, to learn

more about mariculture.

The legislature has debated for several years the possibility of opening Alaska to the mariculture industry, but that idea has been met with resistance by many commercial fishermen.

Faiks said Alaska may first open up some experimental farms before diving full force into the industry. "It will be up to the legislature to decide whether this is a viable new industry and whether we want to augment our already very successful commercial industry with a fish

farming industry," she said.

In Norway, mariculture began to boom 15 years ago, primarily because the commercial and wild stocks were overfished and most of the lakes, shorelines and streams were privately owned.

"If we do get into this, we have to realize that it's for very different reasons than the Norwegians had. We already have a thriving commercial industry, but there's a whole new market out there we could capture and that's the fresh fish market,"

See Film, page A-8

Thursday, August 20, 1987, The Anchorage Times

Lawmakers filmed mariculture trip to Norway

The Alaska Economic Report

April 11, 1987
No. 7/87

Usibelli Coal Test Good For All Alaska Coals:

Taiwan Tests Alaska Coal ?

Usibelli coal representatives are in Taiwan this week working on agreements for two shipments of Alaska coal to that country next summer for extensive testing purposes. If current negotiations are successful, as well as boiler and storage tests next summer, then long-term shipments of coal between Alaska and Taiwan could become a reality. However, coal industry people in Alaska say the real benefit is that Alaska coals will be tested in Taiwan, and that the Taiwanese coal industry will become knowledgeable on the technical values of Alaska coals in their own boilers. The testing program, leading to a Taiwanese market for Usibelli, could also hold promise for other Alaska coal projects, such as the Diamond Shamrock development in the Beluga Coal Field on Cook Inlet.

Taiwan Market Factors

A number of different factors are now influencing the Taiwanese coal market. First, the Taiwanese are having problems with plant emissions at a number of plants. Second, Taiwan is under enormous pressure to increase purchases from the U.S., lessening the trade imbalance. One way they can respond to this pressure is increase their purchase of U.S. western sub-bituminous coals.

Third, the decline in value of the dollar, and related shifts in currency values among competitor nations (Australia/Canada), is now beginning to benefit Alaska coal values.

Usibelli Taiwan Coal Deal

Alaska's low-sulfur coals are becoming more attractive in Taiwan due to environmental emission problems. Indications are that the Usibelli tests are driven by one particular plant where Taiwanese power officials both do not want to add capital plant, and also where, due to site problems, they cannot practically add de-sulphurization equipment to reduce emissions. (Continued On Page 7).

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Permanent Fund: The "40-30-30" Plan

Rising oil prices have dimmed the chances that the Legislature will take hard-nosed revenue actions, such as adopting an income tax, or doing away with the oil severance tax 'ELF' factor. But these same forces appear to be pushing lawmakers towards using Alaska Permanent Fund income.

One such plan surfaced by Senate leaders is being called the 40-30-30 plan, representing a proportionate split between dividends, budget use, and fund inflation-proofing.

The method could have the effect of putting a ceiling on dividends, but without fixing that lid by a dollar 'cap.' The program is being linked to a budget reserve plan, a budget growth 'limit' and a limit on budget reduction. Reductions would be offset by withdrawals from the budget reserve. It is too early to assess such a plan in its detail, but conceptually some lawmakers are worried about such measures being inserted in the Alaska State Constitution.

Petroleum:

Standard Boosts Prudhoe Oil Price

Standard Oil has increased its sales price for North Slope oil by \$1.50/barrel, to a new price of \$17.75 on the Gulf Coast and \$16.75 on the West Coast. Standard produces just under half of Alaska's total oil output and is the only major producer to post its prices in public. The price move is an important indicator of improving conditions in oil markets, and it's good news for the State of Alaska, since state budgets are highly dependent on oil revenues. Improving prices were anticipated in the recent March oil forecasts, but the size of Standard's increase wasn't expected. If an expected sharp summer slump in oil prices doesn't develop and Standard's new price holds steady, the state could have some \$200 million in added revenues next year, analysts say.

Study Confirms Oil Production Fall

A private consulting firm has issued a report that essentially confirms U.S. Department of Energy forecasts of falling U.S. oil production and increasing dependence on foreign oil supplies: Copeland, Wickersham, Wiley & Co., New York-based investment firm, says even with an increase in real oil prices from \$19/barrel this year to \$23 in 1990, U.S. production will drop 23%, from 8.54 million b/d to 6.7 million b/d. U.S. reserves will fall from 28.4 billion barrels at the end of 1985 to 18.8 billion barrels, a 34% decrease. With increasing oil demand, imports will account for 52% of U.S. oil supply by 1990 and 66% by 1995, the firm says.

Attack On State Camden Sale

Environmental groups are urging the state to postpone its Camden Bay offshore sale, involving 32 tracts of 122,745 acres, because of its immediate proximity to the Arctic National Wildlife Refuge. The sale is now set for early summer. If the state goes ahead with the sale, it could tip Congress toward a vote to open the 1.5 million acre coastal plain to exploration, they argue. The acreage is rated moderate to high by the state, but its proximity to ANWR has increased industry interest.

Drilling Down 45.7%

Oil drilling in the U.S. was reported down by 45.7% in the first quarter of 1987, compared with the same period in 1986. Figures indicate 4,088 wells were drilled in the first quarter this year, while 7,525 were drilled during the quarter in 1986. Oil companies remain cautious and are watching prices.

Living With "The ELF"

The Alaska oil industry may have to live with the possibility of the passage of the ELF-bill for two years --that's until the current Legislature goes out of existence. The ELF (Economic Limit Factor) bill, is a bill that would prevent a severance tax decline on Prudhoe Bay production from going into effect this July. The ELF is worth about \$90-million to the industry this year, and a similar amount in ongoing future years. The bill has passed the Alaska State House, but passage in the Senate does not appear likely --at this time. However, *the problem is with the terminology 'at this time.'* The bill will remain alive in the Senate, and observers say that any dislocation in oil prices could change the climate.

Good News, Bad News: For the industry the 'bad news' is that the bill passed the House. The 'good news' is that it likely will be killed in the Senate; but the 'uncertain news' is that they will have to live with the possibility of passage until Jan., 1988.

Possible Special Session: For the state administration, the ELF bill represents a critical piece in the state's effort to balance their budget. The issue not simply a balanced budget, but also the 'liquidity' (ready availability) of funds the legislature uses in balancing and in designating reserves against possible revenue short-fall. An imbalanced budget, or a budget balanced on 'soft' revenues, could result in a 'special session' of the Legislature later this year. It is the pressure and climate of such a special session that worries the oil industry the most.

Watch On "Refinery Bill"

Alaskans are keeping a cautious eye on a new bill introduced in Congress by Rep. Stewart McKinney, D-Michigan, and Rep. Howard Wolpe, D-Michigan. The bill would ban export of refined North Slope oil if more than 30% of a refinery output is to be exported. The bill would likely cripple efforts of Alaska Pacific Corporation to proceed with their Valdez Refinery --a project designed for export markets. The 'existence' of the congressional bill is enough to hurt the project and make Far East customers wary, observers say.

Gas Pipeline Bill: A Bill is active in the Alaska State Senate that would allow the state to grant a 'provisional' right-of-way for pipelines. The bill would permit Yukon-Pacific Corporation to obtain such a right-of-way for their proposed Far East gas export project. The bill reportedly has the backing of the state administration, but 'local hire' amendments may also be attached to the bill.

Looking Into An Uncertain Future:

"Aquatic Farming" in Alaska

Aquatic "farming" in Alaska - the subject of debate in the state legislature this year - may not pose a threat to commercial fisheries markets, but the boom in worldwide pen-raised salmon presents a formidable long-range challenge to the fishing of wild Alaska salmon. These are the conclusions of two separate University of Alaska assessments of salmon farming.

A preliminary assessment by Dr. Robert L. Logan and John Weddleton of the University of Alaska's Economics Department in Fairbanks: "Any feasible short-run developments (in Alaska) are miniscule when compared to world salmon production. Our preliminary results suggest that any increases in the 10 to 30 thousand metric ton range can easily be absorbed by salmon markets without significant effects on market prices or on wild salmon sales," the two write. "... the same, salmon farming in Alaska will produce substantial net increases in employment and income."

The primary short-run displacement, if any, will be in fresh wild salmon market, they said. Given that this comprises only 3% of sales of Alaska Pacific salmon, "we expect minimal displacement in the short run."

However, long-term effects are more disturbing: "Farmed salmon production is rapidly expanding throughout the world, and is expected to more than double by 1990. Thus, there is no guarantee that today's prices will prevail throughout the 1990s and beyond. Indeed, preliminary results from this study indicate that if demand for salmon products does not increase between now and then, prices for salmon could fall from 4% to 13%. This would cause a displacement of marginal producers in the traditional fishery, whether Alaska pursues salmon farming or not," the two economists write.

"It would reduce the feasibility of salmon farming, especially in light of feed and labor costs in Alaska. We expect significant increases in demand over this period...but if displacement of the traditional fishery is going to occur, it does not matter whether Alaska pursues salmon farming or not. The only question is who will earn the income - Alaskans or foreigners."

Long-Range Threat

A second study of the market effects of pen-raised salmon, this one by Drs. Ronald V. Rogness and Biing-Hwan Lin of the U of A's School of Man-

agement, and released last September, predicts substantial growth in the imports and number of distributors of Atlantic pen-raised salmon. But because 97% of Alaskan salmon is marketed frozen or canned, growth in salmon farming will immediately affect only the small segment of Alaska fishermen marketing their product fresh. However, "the marketing relationship between Atlantic and Pacific salmon can change, especially when there is a glut in the supply of pen-raised Atlantic salmon."

The Norwegian Fresh Fish Marketing Association predicts their annual exports will reach 60,000 metric tons by 1990, up from 28,650 mt in 1985. At least 20,000 mt (44 million lbs.) of this will be imported into the U.S., if current ratios of Norwegian exports and U.S. fish imports continue; in addition, British Columbia salmon farmers say they will export 22 million lbs. of Atlantic and Pacific salmon to the U.S. by 1990; Chile, Scotland and New Zealand are also targeting increased exports of farm-raised fresh salmon to the U.S.

Alaska's total harvest (729 million lbs. in 1985) dwarfs these imports, but the market most immediately affected are those for troll-caught Alaskan chinook and coho, which totalled 19 million lbs. in 1985. The markets for these are mostly "white tablecloth" restaurants, into which pen-raised Atlantic salmon are now making significant inroads.

Marketing Survey

The U of A's surveys of U.S. fish distributors, however, show that farm-raised salmon have the long-range potential of being substituted for wild fresh or frozen salmon on a much wider scale. Here are some highlights:

- Of 62 distributors handling both pen-raised Atlantic and wild Pacific fresh salmon, 49 said the Atlantic variety could substitute for Pacific salmon. Analysis of questions relating to substitution indicate a consciousness of freshness in pen-raised salmon that is sometimes absent in wild salmon shipped from Alaska.

- Distributors surveyed reported they increased sales of pen-raised Atlantic salmon 14% in 1982-3, 22% in 1983-4, and 30% from 1984-5, indicating the markets for these imports are rapidly expanding.

(Cont'd Page 6)

Alaska News Summaries

AMCHITKA SUPER-RADAR BASE: The Navy is planning to base a \$92 million radar system using the "over the horizon" backscatter technology at Amchitka Island, in the Aleutians. Navy officials also plan making plans to spend \$80 million in construction for the Adak Naval Air Station.

ELMENDORF TO RECEIVE 8 COMMUNICATIONS AIRCRAFT: A recent navy decision to base 8 E-6 communications aircraft at Elmendorf Air Force Base, near Anchorage, will mean half of the Navy's 15 E-6's will be operating out of Alaska by 1990, according to Everett Pyatt, assistant secretary of the Navy. The decision will base an estimated 200 support personnel and crew members at Elmendorf.

FAIRBANKS OPTS FOR SALES TAX: The Fairbanks City Council voted 5-1 to begin a 3 percent sales tax and to leave property tax levels alone. Citizens testified on a proposal to either more than triple the property tax mill rate or to reinstate the sales tax. Fairbanks faces a \$5.2 million deficit by the end of this year if costs aren't cut or revenues raised.

ANCSA BILL SHOULD CLEAR SENATE: A bill amending several provisions of the 1971 Alaska Native Land Claims Settlement Act is headed for congressional approval, according to Alaska Senator Ted Stevens. The legislation will go to a conference committee between the House and Senate for approval, unlike last fall when the bill needed unanimous Senate consent. The proposed amendments would change the way corporations may issue stock and would modify some of the special provisions in the 1971 act. Stevens said there is roughly a three-way split among Alaskans who favor, oppose, or are undecided towards the amendments.

ALASKAN POTATO CHIP SELLS: Alaska Potato Chip, Inc. put its chips on the market recently, selling them to grocery stores in Anchorage, Wasilla and Palmer. A 10-ounce bag retails for \$2.99, about 6 cents less than other brands, says Daniel Bagley, general manager of the corporation. The potato chip factory, located in the Matanuska Valley, will soon operate 20 hours a day and employ a dozen people, according to Bagley. The company is presently importing potatoes from the Pacific Northwest but plans to test local potatoes for usage this summer. Alaskans can buy stock in the company for \$1 a share, Bagley said.

HELICOPTERS DENIED LANDING PERMITS: Helicopter companies seeking summertime landing permits to bring tourists to the Eagle River area of Chugach State Park have been denied because of strong public reaction against the idea, according to Neil Johannsen, state parks director. State park officials said they will consider pursuing bids for a more conditional concession permit.

15,000 MAY BENEFIT IF LEGISLATURE PASSES AHFC PROGRAM: A new home refinance program proposed by the Alaska Housing Finance Corp. could lower mortgage payments for up to 15,000 Alaska homeowners if approved by the state legislature. Passage would mean the AHFC could sell \$1 billion in bonds on New York and European financial markets this year. That sale would be largest run of bond sales in the agency's seven year history. Under the new AHFC refinance program, mortgage interest rates would be lowered to approximately 8.5%, about half of the 16% homeowners paid a few years ago. The proposed program would be available to people in financial difficulties, AHFC officials say. The AHFC is already looking at 2,000 foreclosures.

UNITED BANCORPORATION ALASKA REPORTS \$32.2 MILLION LOSS: The parent company of the United Bank Alaska reports losses of \$32.2 million for last year, a figure which is \$6.4 million more than losses reported previously in an unaudited statement. The increase is attributed to the bank enlarging its reserves in preparation for possible future delinquent loans.

FAIRBANKS HOLDS PROPERTY TAXES, BUDGET: The Fairbanks Borough Administration has proposed a budget that contains no mill rate increase for property taxes; funds schools at current levels and cuts about \$3.4 million from spending. The budget depends on the new 2% sales tax to raise about \$7.2 million in new revenue. The locally funded share of the borough budget will go from 58.2% to 69.6%, making up for lost state and federal funds.

DIVIDEND TO RISE AFTER FUND STOCK SALE: Profits from the February sale of about one-third of the Alaska Permanent Fund Corporation's \$1.8 billion stock portfolio are not the \$290 million board members were hoping for, but are enough to increase 1987 dividends to about \$723, according to corporation spokesman Jim Kelly. The \$221 million profits from the sale also edged the earnings reserve account above \$500 million. By the end of this fiscal year the fund is expected to earn \$1 billion.

MORE CRUISE SHIPS TO VISIT SOUTHCENTRAL ALASKA: The Anchorage Convention & Visitors Bureau expects a 30% increase of cruise ships docking this year in the southcentral cities of Whittier, Seward and Anchorage with three ships - Explorer Starship, the Sea Princess and the Royal Princess - voyaging in the area for the first time. A total of 72 visits are scheduled for the region from May through September. 15% of all visitors to Anchorage are cruise ship passengers, and the significant increase in passengers is good news for hotels and retailers.

ALASKA "FRESH FROZEN" SEAFOOD PROMOTION: Evans-Kraft advertising agency of Seattle has been promoting Alaska "fresh frozen" seafood since last year throughout the United States for the Alaska Seafood Marketing Institute. The facts that Americans are now consuming 14.6 pounds of seafood a year, up from 12.5 pounds three years ago, and that fish contain the widely publicized "omega-3" fatty acids which are believed to reduce cholesterol levels in the blood are strong points in the sales pitch. The greatest problem now encountered in the sales of Alaska frozen salmon is the competition from fresh pen-raised Norwegian salmon which is being sold throughout the United States with a particularly strong market on the east coast. Evans-Kraft marketers have the task of convincing retailers and consumers that "fresh frozen" - if frozen properly - is as good as any fresh fish.

MORE SALMON FOR BRISTOL BAY THAN FIRST FORECASTED: Alaska Dept. of Fish and Game has added 700,000 salmon to its original bleak forecast of a 43% declined Bristol Bay salmon run. Still, the harvest will only be fair at an estimated 9.3 million fish catch, but with current prices at least as strong as last year's at \$1.50 to \$1.65 per pound, the Bristol Bay fishery could top an \$86 million value. Naknek river, opened to fishing last year for the first time, may be opened even earlier this year to setnetters and driftnetters.

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Fisheries:

ASMI: Domestic Success

Alaska Seafood Marketing Institute's campaign to promote sales of Alaska pollock in three Midwestern target cities scored some notable success and proved the point that frozen Alaska whitefish sales have considerable potential for expansion. ASMI did the project under a federal fisheries grant, unfortunately not continued this year.

Denver, Chicago and Minneapolis were selected as test targets because ASMI had experience and market demographics from salmon promotions in those cities. Newspaper ads and in-store promotions were used. All of Denver's supermarkets participated, as well as 72.5% of Chicago's and 97% of Minneapolis stores. ASMI knows that at least 326,455 lbs. of pollock fillets moved in those markets during the promotions, but the actual volume is far higher because distributors and food stores keep such data confidential.

One Alaska company, Arctic Alaska Seafoods, reports it sold \$1.5 million in pollock due to the promotion, and expects sales of \$2.5 million to those markets this year, a residual effect of the project.

Probably of more importance is that several major food retailers are now stocking frozen Alaska pollock year-around, which will lay the base for long-term demand growth. Also, valuable data for future marketing strategy was gained in the project. Whitefish sales can successfully be targeted to lower-income families with a stress on price and taste, for example.

ASMI Seeks USDA Money

ASMI wants a \$3.5 million loan from the United States Department of Agriculture to promote Alaska seafood overseas. After the 1982 botulism scare, Alaska has lost more than 50% of its fish market in Europe. \$2.5 million would be dedicated to the promotion of Alaska frozen salmon in France, Belgium and the United Kingdom; and \$1 million would promote Alaska herring and pollock in Japan. Reclaiming the European market won't be easy with the prevalence of Norwegian and Scottish salmon. Europeans have already grown accustomed to the light-colored Atlantic salmon and have voiced suspicion over the dark red Pacific salmon meat. The federal government should lend a sympathetic ear to ASMI's request; The Department of Commerce has recognized the U.S.' \$5 million seafood deficit and has employed marketing experts in both Belgium and Tokyo to promote U.S. seafood.

Pacific Salmon Fishing Quota

The Pacific Salmon Commission has recommended to the U.S. and Canadian governments that the 1987 fishing quotas be about the same as 1986, with the addition of hatchery kings in Alaska waters. The governments will set the actual seasons under advice of detailed recommendations of the salmon commission, which will be worked out in a meeting next June. The addition of Alaska hatchery salmon could mean up to 22,050 chinook for Alaska fishermen.

Domestic Processing Zone

On April 13, North Pacific Fisheries Management Council (NPFMC) will release a study of the proposed domestic processing priority zone around Unalaska and Dutch Harbor for public review. The proposed zone would exclude foreign processing vessels from 100 miles off the coast in an effort to increase domestic processing. Most fishermen deliver to floating foreign processors rather than make the trip back to shore. Public comment and testimony will be accepted at the next NPFMC meeting in May. NPFMC will then vote on the proposition, and pass it on to National Oceanic and Atmospheric Administration for approval. The proposal is highly favored, and in keeping with the targeted phase out of foreign vessels from U.S. waters by 1991. Many other areas will undoubtedly propose local domestic zones, if this proves successful.

More Black Cod Fishing

More fishermen than ever are fishing for black cod, because of especially strong prices. At the beginning of the season, April 7, processors were paying up to \$1.38 per pound, \$.13 per pound more than last year's best price. The North Pacific Management Council expects the season to be shorter than last because of the increase of effort.

Aquatic Farming (Cont'd from Pg. 3)

- Twenty five distributors in the survey purchased Atlantic salmon independent of the availability of wild Pacific salmon, and 18 purchased it when Pacific salmon were out of season. Five purchased no Pacific salmon, and five for only certain markets.
- Distributors reported they liked pen-raised Atlantic salmon because of its year-around availability, freshness, consistency and more uniform size. Pacific salmon were preferred at times because of price and color, firmness and less fat.

Timber:

Sitka Workers Decertify Union

By a 238 to 130 vote on-strike and replacement pulp mill workers in Sitka have voted to decertify Local 962 United Paperworkers International Union as their bargaining agent. If the vote stands it will be the first time since 1959 that workers at the mill have not had union affiliation. Sitka mill workers went on strike last July, with the company later hiring replacement workers. Approximately 70-ballots were cast by non-union workers. Even if challenged the numbers of these votes would not alter the election.

Admiralty Island Timber Suit

Admiralty Island logging is back in court, but this time the litigation is between Sealaska Corporation and the Sitka based Shee Atika Corporation. The Shee Atika Corporation, for years, had to battle environmentalists and the Admiralty Island Village of Angoon over rights to land selection on the island. The current dispute, however, involves a \$6 million loan provided Shee Atika by Sealaska in 1980, with Cube Cove timberlands owned by Shee Atika to serve as collateral. Sealaska claims Shee Atika is now violating the terms of the loan by logging Cube Cove lands. Sealaska was granted a restraining order in late March by a Juneau Superior Court.

Going For Kenai 'Oil'

UNOCAL will begin drilling a well later this spring within the Kenai city limits. The well will be over the Cannery Loop gas field, but UNOCAL says it is going deeper than the gas structure looking for oil. If the well is not a discovery well, they say, they will plug the well and use it as a gas well. They also plan a second well in the same area. UNOCAL recently bought out the interests of Pacific Gas Lighting in the project, and now hold a 60% interest.

Prevailing Wage "Coming Down"

State Commissioner of Labor Jim Sampson says that he will soon implement a 20% reduction in the prevailing wage set for state construction projects. The rollback reflects reductions agreed to by key Alaska construction unions last fall, he says. Alaska rural legislators have also been pressing for a reduction in the prevailing wage, hoping to spread state construction dollars further on rural projects and also facilitate 'local hiring' in rural areas. Rural legislators have also been pressing for the Department of Labor to set more than one 'rate' in Alaska, such as an urban construction rate and one reflecting rates in rural areas of the state.

Mining:

Coal 'Backs Up' In Seward

Coal has been reported 'backed' up at the Seward coal terminal, requiring a slow-down of work at the Usibelli Healy Coal mine, and in the shipment of coal from Healy to Seward. The pile-up of coal at Seward has been caused by no trans-pacific shipment to Korea last December, reportedly due to some 'refitting' at Korean utility plants. Then there was another missed sailing in February. The 'contract' minimum calls for 10-ships a year, a schedule which requires about three coal trains a week between Healy and Seward. The coal pile-up has reportedly caused some dialogue between Alaska and Korean coal interests concerning a period 'of notice' when monthly shipments will be deferred, allowing the railroad and Usibelli to 'gear-down' for the period.

Fairbanks Mining Suite: Two Fairbanks placer miners have filed suit against the U.S. Environmental Protection Agency (EPA). The miners allege denial of procedural 'due process' as a result of a case filed by EPA against the miners in early 1986 over water quality issues. The case against EPA was filed by Stan and Rose Rybachek, of Fairbanks.

Amselco & Helca In Greens Creek

Some clarification is needed in regard to the relationship of Greens Creek Mine majority partner Amselco and Helca Mining Company, which recently bought into that Southeast Alaska mining project. Amselco, a mining subsidiary of British Petroleum, originally bought out the majority interests of Noranda and Anaconda in the Greens Creek project. Helca Mining then bought a 28% interest in the venture from majority partner Amselco, with Amselco retaining more than a 51% interest. As part of the arrangement Helca will be responsible for coming up with an estimated \$45-million share in developing the underground mine. The mine is located on Admiralty Island 18-miles west of Juneau.

Park Mining Rule: The National Park Service has proposed a regulation that says miners in park lands in Alaska must have their operations approved even if the claim is patented and the miner doesn't cross federal land to reach it. A recent U.S. District Court ruling upheld agency procedure, but questioned whether the rules 'were clear.' The new regulation is an outgrowth of the litigation, and intended to clarify established procedure already used by the Park Service.

Alaska News Summary (from page 6)

NEW DOWNTOWN ANCHORAGE MALL 40-50% OCCUPIED ON OPENING: Anchorage's new downtown mall will be 40%-50% occupied when it opens August 1, developers say. A listing of retail establishments that have signed up for space will be available soon, they said. The new facility, now under construction, will be connected to the J.C. Penny Company store on three floors, and a sky bridge will connect it across Sixth Avenue to two floors at Nordstroms. A second sky bridge will cross Fifth Avenue to a parking garage. Developers of the mall hope to bring retail firms to Alaska that are not now in the state, but many Anchorage businessmen are concerned that the facility will just draw consumers in from existing business establishments downtown, or from suburban malls in outlying parts of Anchorage. Original plans for the mall included a third department store and a major downtown hotel, but these have been delayed.

GET LAND NOW. CONSULTANT ADVISES ON ANCHORAGE WATERFRONT PROJECT: Roma Design Group, contracted by the Anchorage Municipality on its proposed waterfront commercial development project, suggests the city go ahead and acquire acreage before a June 7 expiration of the city's option, then work on a commercial development plan. The city now has \$2.2 million in state grant money that can be used to acquire the acreage. The land is owned by the Alaska Railroad, but the current leaseowner, Anchorage Dredge and Dock, says a \$2.2 million appraisal on acquiring the leases is too low.

KLM DROPS 2 FLIGHTS THROUGH ANCHORAGE: Another airline is cutting its international flights through Alaska because of new nonstop Japan-Europe routes: KLM Royal Dutch Airlines has cut its flights through Anchorage from ten weekly to eight, a result of new agreements between Dutch and Soviet authorities allowing for non-stop flights between Tokyo and Amsterdam over the USSR with KLM's Boeing 747-300s. British Airways also recently announced cutbacks in flights through Alaska.

CONSTRUCTION STILL IN DOLDRUMS - DOWN 32%: New construction contracts for Alaska were down 32% in January and February compared to the same period in 1986, F.W. Dodge, a McGraw-Hill Information Systems Division, says. Contracts totalled \$56.9 million for the first two months of the year compared to \$84 million last year and \$134 million two years ago. Housing contracts totalled \$10.3 million; nonresidential building work totalled \$19.6 million; roads, airport and utility systems totalled \$27.1 million for the period. Anchorage construction totalled \$12.3 million.

ALASKA-JAPAN FIBEROPTIC LINE CAUGHT UP IN TRADE DISPUTE: The U.S. Senate has approved a resolution calling for multinational participation in the planned \$500 million undersea fiber optics telecommunications line that will stretch between the U.S. and Japan via Alaska. The action came after Japan's communications ministry said it would restrict any foreign participation in the project, reserving it to Kokusai Denshin Denwa (KDD), Japan's monopoly international telecommunication company. Two consortiums are bidding for the project, one all-Japanese and the other a joint venture of Japanese, U.S. and British firms. Meanwhile, Pacific Telecom, parent of Alascom, is part of a group of U.S. companies that has applied for FCC permission to build the U.S. portion of the project, estimated at \$60-\$70 million.

AIDA COULD BUY BAD BANK LOANS. SMITH SAYS: Commerce and Economic Development Commissioner Tony Smith has advised Gov. Steve Cowper against plans to use state funds to aid ailing banks in the state, but will recommend a plan where the Alaska Industrial Development Authority will buy portions of real estate development loans held jointly with Alaska banks that would be otherwise taken over by Federal Deposit Insurance Corp. if the bank gets into trouble. This would prevent FDIC from dumping the property on the market, further depressing values. AIDA has financed millions of dollars of real estate loans in recent years, using tax-exempt bonds to finance 90% of loans with Alaska banks financing the other 10%. Smith said the buyout plan would cost about \$26 million - the amount of financing provided to AIDA-backed loans by four troubled Alaska banks. Indications are that Alaska banks could have up to \$500-million in problem loans on their hands.

ANCHORAGE PUSHES DEVELOPMENT CORPORATION: Anchorage hopes to gear up a public-private economic development corporation to aggressively market the city, with a \$5-\$7 million budget hopefully drawn from local tax sources, municipal utility profits, private contributions and state money from Anchorage International Airport. The proposal may be before the Anchorage assembly soon. The corporation would advertise in trade journals, organize sales teams and encourage firms to use Anchorage as a base for international joint-venture operations.

Mike

Jack Coghill
P.O. Box V
Juneau, Ak. 99811

Dear Mr. Coghill

Enclosed you will find a copy of an article taken from the Alaska Fishermans Journal and written by the United Fishermen of Alaska. If you are not already familiar with this article I ask you to please take a few minutes to read it and consider what it has to say on the subject of Salmon mariculture or "Fish Farming" in Alaska. This article best expresses my concerns and I urge you to do all you can not to allow the advocates of fishfarming to ramrod their desires in law in Juneau. this session. I am not absolutely against fish farming but I very strongly feel that the State needs to excercise extreme caution before permitting this in Alaska.

Sincerely,
Michael DenBleyker
S.R.- C Box 8374
Palmer, Ak. 99645

UFA NOTEBOOK

'Salmon Can Wait'

Alaska Mariculture

The feverish surge of interest in salmon farming in British Columbia, which has been likened to the Klondike Gold Rush, seems to be spreading to Alaska. Identical bills have been introduced this session in both houses of the Alaska legislature which would permit pen rearing of salmon.

UFA has been interested in mariculture problems since at least 1985. At their annual meeting that year, the Board of Directors noted that pen rearing of salmon was a rapidly growing industry that was already having impact on traditional domestic and export markets for Alaska salmon, with potential for even greater market penetration in the future. They requested the State of Alaska perform a thorough study of the biological, economic and sociological problems and potentials of salmon pen rearing in Alaska. To date no such impartial studies have been done.

The increasing interest in beginning this industry in Alaska was discussed at some length at the annual meeting of the UFA in early February. The Board of Directors

determined that there are many potential problems with pen rearing salmon which must be addressed by state government before the industry is allowed to begin.

UFA's concerns about mariculture were expressed in a resolution issued by the Board at the close of this meeting. They conclude with a request that the State of Alaska take no action on legislation and development of salmon mariculture until such time as specific issues are addressed. The issues of concern cover a wide range.

*State funds and services for DEC, DNR, and FRED division at DF&G, already cut back due to shrinking revenues, will have to be further reallocated to address salmon farming. For example, the farms must be inspected periodically by state officials for maintenance of health and resource protection standards. Many of the salmon farms will be in remote locations, increasing travel costs to the State. It will require staff time to issue and monitor permits for operation. Water quality and disease prevention will have to be main-

tained. Since the industry depends on freshness of its product, transportation needs must be met; the remoteness of the farming sites will require additional transportation routes which must at least be addressed by state government, even if subsidies are not requested. Money and staff time for these activities must be taken from existing programs. As yet no realistic fiscal note has been developed to identify the cost to the state incurred by management of the proposed activities.

*Competition for market with wild salmon will increase. Troll-caught fish are already in direct competition with pen reared salmon. Optimists believe the demand for fish will continue to rise and there will be substantial markets for both farmed and wild salmon. Increasing international participation in salmon farming, however, indicates there may soon be a flood of farmed product on the market. The commer-

cial fishing industry now needs marketing efforts which the state is unable to fund. UFA foresees additional problems if forced to compete with farmed Alaska salmon. UFA, however, is not opposed to mariculture of shellfish or aquatic plants and, indeed, sees these operations as offering great potential for the state's economy.

*Water and land use of traditional fishing, hatchery, rehabilitation, and smolt rearing and release sites may be locked out as permits are granted for establishment of salmon farms. Many of the land use permits that have been granted for oyster farming (shellfish is the only form of mariculture now allowed in Alaska) are not being used, and there is concern that speculators are establishing claim to desirable sites, intending to use them when salmon farming is allowed. The State has done no planning to determine the best locations for these farms, and

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Alaska Fisherman's JOURNAL, March 1987

no controls have been proposed. Alaska has thousands of miles of coastline but there could easily be conflict between homeowners and salmon farmers, as has occurred in Washington. There may also be conflicts with the tourism industry and with sport fishermen, both of which are important activities for Alaska's economy.

*The potential for disease contamination of the wild stock has not been explored at all. In 1985 Norwegian fish farms were forced to destroy 2,900 metric tons of farmed salmon due to contaminated stock, but since Norway doesn't have its own salmon runs, no one knows what the effects might have been on wild fish. This is an area of serious concern to the commercial fishing industry.

*Many proponents of pen rearing salmon are touting the industry as one which can be done by small as well as large operations. They present it as a boost to the economy of Alaska's coastal villages and suggest that "mom and pop" operations can be as successful as those of a large corporation. In fact, current

evidence indicates this is far from the case. Because of the high costs of fish food, brood stock, and establishment of adequate transportation facilities, in addition to the length of time it takes to produce the first saleable product, it will be almost impossible for any small operation to succeed. Weyerhaeuser, Sealaska and some multi-national corporations which have expressed interest in beginning the industry in Alaska may be among the few operations which can actually be viable.

A recent report by the House Research Agency of the Alaska Legislature titled "Aquaculture in Alaska" mentions these and other concerns, but does not discuss them in any detail and presents few or no solutions to these potential problems. There is a feeling around the state that salmon farming is the wave of the future: it can't be stopped so the only choice is to jump on the bandwagon. UFA disagrees with this sentiment and offers a suggestion: if Alaska must become involved in pen rearing salmon then it should take this chance to do it right the first time. We have excellent international examples of successes and problems before us and we would be wise to emulate the

good and avoid the bad. This can be accomplished only through careful study and planning.

The House Research Agency report states that there is only a narrow window of time for Alaska to join the pen reared salmon industry, after which it will not be economically feasible to begin. UFA disagrees with this position: it feels there will always be room in the marketplace for a competitive product. In the meantime it is essential that studies be done and safeguards be developed to ensure that Alaska's already healthy commercial fishing industry is protected. □





Wrangell 'farm': Growing oysters part of new field of mariculture.

Mariculture: Promise for the future?

Editor's Note: Following is the final part of a series on developments in the Alaska economy.

By KIRK McALLISTER
THE JUNEAU EMPIRE

Robin Larsson came to Alaska to be a farmer. It has the best climate, the best pasture and the best potential for what he wanted to raise — oysters.

After studying marine biology at the University of California-Berkeley, Larsson settled in Wrangell and in 1972 began pursuing a permit to begin oyster farming. It took until 1978 to get it.

"They really didn't know what to do with me," Larsson said of the state agencies at the time. "I think they thought I wanted to claim some of the waters for myself like a homestead or something. There's been a lot of progress since then. The state is aware and excited about the prospects. Alaska should be the mariculture center of the world."

Larsson has made a lot of progress too and is selling oysters, which aren't indigenous to Alaska, to the local half-shell market. Some 20 oyster permits have now been issued to people around the state, there is a shellfish growers association and a mariculture movement that is picking up momentum.

Mariculture, or ocean farming, is the controlled growing of marine animals and plants including fish, shellfish and sea vegetables. It is a subgroup of aquaculture or ocean ranching, which uses the sea "pasture" for the growth of the animal. The state and private non-profit hatchery system is the major component of aquaculture in Alaska.

As people investigate ways to develop Alaska's economy, create new jobs and find markets for new products or new markets for existing products, the potential for developing mariculture is getting a long, hard look.

Proponents say mariculture would open new opportunities in the seafood industry while opponents say that one particular segment of mariculture, raising salmon in net pens, is a threat to the existing commercial salmon industry.

Mariculture is big business worldwide. Currently, 15 countries produce pen-reared salmon. Worldwide production of farmed

ECONOMIC DEVELOPMENT

Where do we go from here?

FINAL PART

salmon increased from 27 million pounds in 1981 to 97 million pounds in 1985 and is expected to reach 314 million pounds by 1990.

Seafood consumption around the world is increasing, especially in the United States, so enormous potential exists for mariculture to satisfy the increasing demand.

In Alaska, mariculture is still in its infancy. In addition to the handful of oyster farmers in Southeast and Prince William Sound, mussels are being successfully cultured in Kachemak Bay near Homer.

In addition, the state and the Japanese Overseas Fishery Cooperation Foundation, a quasi-governmental fishery development group, are testing to determine if scallops can be grown commercially on Kodiak Island and giant kelp near Sitka.

Wrangell oyster farmer Larsson, who was the first shellfish farmer in Alaska since early experiments around the turn of the century, said several things are holding back development of mariculture in the 49th State.

First of all, the current permit system requires him, as an oyster farmer, to reapply every year. With such year-to-year uncertainty it is difficult to find financing to build an oyster hatchery that's needed to really make the industry grow.

In addition there is only one laboratory in the state (in Palmer) that tests for shellfish poisoning prior to putting the product on the market. Getting the lab results can take several days and reduces the shelf life of the oyster batch, which has to be taken out of the water. The oysters can only live for about a week out of the water.

Larsson said that because of these factors, his oyster production is minimal. Nevertheless, he said the potential of the operation is very promising. A family-run operation could produce and sell 100,000 to 200,000 oysters annually (worth about 35 cents each) and make about \$50,000.

Rodger Painter, executive di-

rector of the Alaska Mariculture Association, a 130-member group formed last year that represents 130 companies, individuals, municipalities and Native organizations, said that the group is backing a bill in the legislature to help the industry get off the ground.

The bill would simplify the permit process, get the state to commit for the first time to an overall state policy on aquatic farming and make other statutory changes that would help the industry, such as allowing salmon farmers to purchase eggs from existing hatcheries.

The bill calls for about \$500,000 a year in state spending (increasing to \$600,000-\$700,000 after the first few years) to administer permits and provide industry support. Mariculture products would be subject to the state fisheries business tax, which would more than cover administrative costs, Painter said.

"Alaska is in an ideal situation to become a major player in mariculture," Painter said. "The water is unpolluted, there's lots of undeveloped coastline, the climate is good for cold water species and there are existing processing plants that are underutilized in the off-season months."

Worldwide mariculture is going to continue to grow and the impacts will be felt on Alaska's salmon industry even if mariculture isn't developed in the state, Painter said. It could provide year-round employment and diversify the state's seafood industry.

While there doesn't appear to be any opposition to shellfish and sea vegetable mariculture development in Alaska, some commercial fishermen worry that development of salmon farming could make their way of life obsolete. It's almost a range war between the farmers and the hunters.

Geron Bruce, executive director of the United Southeast Alaska Gillnetters Association, said that he doesn't buy the arguments of mariculture proponents who say that farmed salmon is for the

fresh market and so won't affect the frozen and canned markets where most of Alaska's catch currently goes.

"All these markets are related," Bruce said. "If there is more fresh salmon available there is less demand for frozen product. I think most of us aren't opposed to mariculture in general; we just have a problem with pen-reared salmon."

Greg Fisk of the Alaska Trollers Association was even more emphatically against the idea of the state authorizing pen rearing of salmon. He said farmed salmon directly compete with troll-caught fish and that state money spent on management of mariculture would mean existing programs would suffer.

"I think the potentials of fish farming are really being oversold," Fisk said. "There's no assurance that these will be mom and pop operations; in fact, they're likely to be foreign investments that will export profits along with the fish. We're already world leaders in wild salmon production. Farmed salmon will directly compete with our markets and services — who needs it."

The controversy about salmon farming in Alaska is likely to continue for some time, but one thing that has been proved so far is it can be done. In a project begun in June 1984, fisheries biologists at the National Marine Fisheries Service at the request of the state, have raised Alaska king (chinook) salmon in pens near the southern end of Baranof Island near the NMFS hatchery at Little Port Walter.

NMFS biologist Bill Heard said that after one year in fresh water and two to three years in salt-water pens, king salmon in the three-to-nine-pound range have been successfully raised. Some of the fish have even reached 20 pounds.

"We're only interested in the biological aspects of this," Heard said. "We're confident that chinook can be grown in our waters. We haven't looked at the economic and political questions surrounding this issue. That's for others to decide."

Sealaska Corp., meanwhile, has done an economic feasibility study of salmon farming. To establish a small (110,000 pounds annually) farm, initial costs would be about \$243,000 while a larger one (440,000 pounds annually) would cost about \$896,000.

fish farming INTERNATIONAL

JAN 8 1987

TURN TO PAGE 24
FOR MORE DETAILS



MONTHLY £1.50

DECEMBER 1986, VOLUME 13 No. 12

SURPLUS SALMON WARNING

A NEW estimate of farmed Atlantic salmon production and demand comes from the Irish Sea Fisheries Board (BIM).

In a research study of international production and market trends, it finds that the market is expected to grow to 153,000 metric tons by 1990 — with Norway providing 100,000 tons, Scotland 25,000 tons and Ireland 10,000 tons.

For Ireland alone, this could mean farm earnings of IRE32 million, exports of IRE44 million and 1200 jobs. According to the report of this study, Europe's technical maximum of farmed salmon production is around 250,000 to 300,000 tons. Norway, says the report, can produce 200,000 tons a year, Scotland up to 30,000 tons and Ireland up to 15,000 tons.

The market will determine the limits to output. But other constraints will include lack of suitable sites for sea cages.

Ireland is already facing this problem, notes BIM. But Bridgestone cages have been used in exposed sea conditions with encouraging results.

Production may exceed demand by 23,000 tons

Atlantic salmon farming has also been greatly assisted by recent major developments in feed compounding, and stock improvement programmes have been underway for some time.

But, with the prospect of rapidly increasing supplies, there will be a need for increasing emphasis on marketing with effective performance making the difference between success and failure.

With the growth in production, falling real price trends for fish and frozen salmon are already evident in most European and North American countries. If continued, they should induce greater consumption. And growing awareness of salmon's health value will add to its marketability.

However, total world demand for Atlantic salmon by 1990, after considering present trends in individual markets, "is likely to be only 130,000 tons, which is 23,000 tons less than forecast production".

BIM's conclusion from this is that the imbalance of projected supply and

demand by 1990 could cause reductions in prices and margins greater than farmers and traders presently envisage.

Lower margins will force the least efficient producers out of the industry and will deter potential small-scale new entrants.

The emphasis on greater efficiency will stimulate high standards of technology and training, and a larger minimum-volume production unit.

Salmon farms based on integrated smolt and sea cage production are unlikely to be less than 500 tons a year capacity, notes the BIM report.

Investment needed for such a project would be around UKE22 million and would be capable of earning 18 per cent internal rate of return.

But the investment is risky. A drop of ten per cent in real revenues through low prices would halve the rate of return. A stock loss say every five years (through disease or unusual weather con-

FROM THE CLEAR ATLANTIC WATERS
OF IRELAND



A NEW colour brochure in English, French and German says that the salmon's natural habitat has proved an ideal location for developing Irish salmon farming. Published by the Irish Sea Fisheries Board (BIM), the brochure notes that the first crop of farmed salmon in Ireland was harvested in 1977. Production is projected to reach 10,000 tons in 1990.

Bridgestone "Hi-Seas" Fish Cage



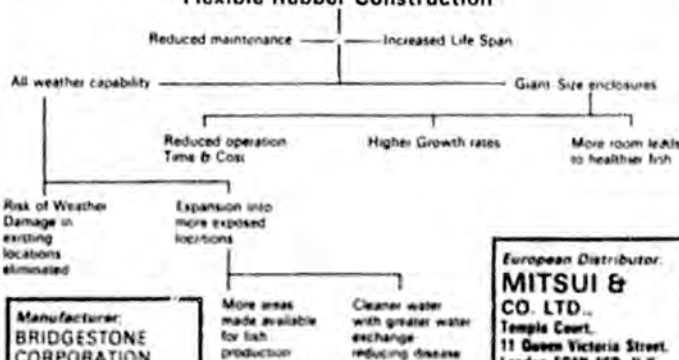
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THE LEADING INTERNATIONAL SPECIALISTS



by Dr. Ronald J. Roberts,
Director, Institute of Aquaculture,
University of Stirling, Scotland.

THIS has been the year of the environmental cataclysm. Chernobyl frightened the world.

Now, on top of this we have the major chemical spillage in the Rhine, allegedly Europe's biggest sewer as well as its largest river.

Waterborne mega pollution has two very important characteristics — it kills large numbers of fish, which is usually obvious, but it also destroys all of the much smaller animals that create the food web within which the fishes live and upon which they depend for their food.

Secondly, it is often trans-national in its effects, since the sea, or larger rivers, generally link a number of countries.

But those acute, severe, obvious catastrophes are possibly less disastrous in the long term than the insidious creeping problems posed by acid rain, or low level industrial pollution, which kill waters by degrees and over a long timescale.

Fish farmers are involved in the pollution business in many ways. Firstly, as users of water they are in the frontline as far as suffering the effects are concerned.

Secondly, they are vital as obvious observant and usually outspoken whistle blowers, who will certainly take steps to seek a remedy or compensation, in the event of such losses.

But thirdly, and this is very important — fish farms may now, or in the near future, be just about the only source from which some species may be grown in any numbers to replenish the wild stocks.

Already, in the case of the African tilapia there is great concern about the long-term security of the primary germ plasm. In

this case, the problem is generally massive dam construction, or fish movements, which result in habitat destruction, cannibalism or hybridisation, but there are now moves afoot to establish tilapia gene banks in South America, and in Africa, based on the genetic analytical work of scientists concerned about the future of such species.

Costa Rica has already offered to host the South American location, and an FAO survey of its feasibility is underway.

Gene bank development and also broodstock progeny evaluation in species which only spawn once, such as the salmonids, has recently had a tremendous boost by the work of McAndrew and his colleagues on cryopreservation.

For long, the large animal veterinarian has been able to freeze cattle or sheep ova and semen for future use. They even taught the human medical people how to do it, and the result was an even greater capacity to over-populate the world, but fish have never had the effort devoted to their gamete preservation of the others.

Now we can certainly preserve the male gametes, which seem to donate most of the influence on growth and conversion in the offspring, for any length of time, in the liquid nitrogen flask.

Sperms are also much safer, in disease control terms, for international distribution, than fertilised eggs or young fish.

Fish ova are a much bigger problem, since they are generally much larger than those of the higher animals, which can now be frozen down with a fair degree of confidence. But we may manage it yet — and, just like the brine shrimp, we will be able to start a culture of our favourite strain or species whenever we wish. If, that is, we have any clean waters left to grow them in.

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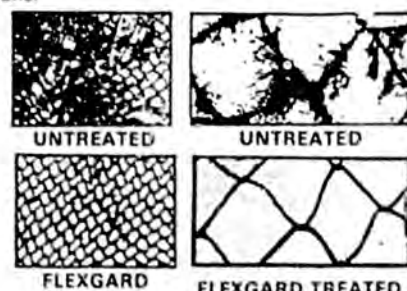
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Farm halt in BC

BRITISH Columbia's Premier Lill Vander Zalm has stopped the issuing of fish farming licences until a study is made to determine the effect of the booming aquaculture industry on commercial fishing.

The decision was made after Bill Procopation, an official of the United Fishermen & Allied Workers' Union, complained that too many licences were being issued indiscriminately.

Geoff Meggs, a UFAWU researcher alleges that fish farm licences are "simply rubber stamped with no public question at all."

And Mr. Procopation argues that "fish farming is just something that's running rampant."

Earlier he had said that the farms were extending into waters traditionally used by fishing boats. "There is room for both," he conceded. "But they are interfering with us."

So far 144 fish farm sites have been licensed with 80 of them in operation. Two years ago there were only ten.

Mr. Meggs commented that the market is not infinitely large and that every fish produced on a fish farm "will add to our competition."

However, Syd Heal, president of the Sunshine Coast Aquaculture Association, countered that "farms produce only two per cent of the amount caught by commercial fishermen. It is a drop in the bucket."

EGGS AND FISH FROM FINLAND

AFTER several years successfully selling high-quality sea grown trout from Finland to gourmets in North America, Per O. Heggelund of Seattle is expanding his operation to fish farmers.

He is now the international marketing agent for salmonid eyed eggs, fry and smolts produced from trout and salmon broodstock in the pen culture facility of the Baltic Salmon Company in Merimasku, Southern Finland.

This novel aquaculture operation was described in *ENR* in December 1982. It was started by Pentti-Oskari Kangas, a former school teacher, pop musician and coffee trader, who was attracted by the prospect of fish farming and invested in a hatchery and cage on-growing of trout in the Baltic.

One of the unusual features of the Baltic Salmon farms is that the growers leave their fish in cages through the autumn and winter and harvest them for the spring market.

One of the strong reasons for handling Baltic Salmon's eggs and young fish, Per Heggelund told *ENR*, is that Finland has an exemplary disease record. This results from a stringent fish health control programme, limited imports and selected stocks of salmonid strains.

The State Fish Health Control Programme of the National Veterinary Institute requires regular inspections and sampling of all domesticated salmonids. At least twice a year pathological tests are conducted on the fish reared at more than 130



Finnish farms and hatcheries. These tests include standard assays for all significant salmonid diseases induced by viruses, bacteria and parasites.

Both Sweden and Norway now approve imports of Finnish salmonid food fish, live fish and eyed eggs. Food fish and eyed eggs from Baltic Salmon can be imported into Washington State, USA, and approval is pending for other states.

Baltic Salmon is also able to export live fish to the USSR.

Further information from Per Heggelund, 3304 N.E. 80th Street, Seattle, Washington 98115, USA. Telex 753332 Hegson sea.



Above: Baltic Salmon's cage farmers hold their fish through the winter to sell them in the strong spring markets.

Left: Per Heggelund came from the north of Norway to study fisheries in the USA and stayed on to set up in business in Seattle, first dealing in fish for food markets and now also in eggs, fry and smolts.

Fish Farming international

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Canadian catchers will pay for stocks

CANADA'S Fisheries and Oceans Minister Tom Siddon said last month that he intends to increase salmon fishing licence fees as part of a major strategy for enhancing Pacific salmon stocks.

Addressing the Salmonid Enhancement Task Group, a group of community advisors on enhancement, Mr. Siddon said the increase in licence fees would bring in revenues of roughly \$4 million a year.

The increases will effectively double the price of a commercial salmon fishing licence and bring the price of a saltwater sportfishing licence up to par with provincial fees.

Ponting out that the commercial licence fee increases area about one cent on every dollar of a salmon fisherman's projected gross earning between 1987 and 1991, he

said the fees were "reasonable in view of larger catches and higher earnings."

Higher sport fishing fees reflect increased fishing opportunities that flow from salmon enhancement.

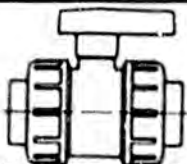
Mr. Siddon said he was throwing the support of his Department behind the creation of a Pacific Salmon Foundation which would channel donations from the private sector into enhancement and other development projects.

Enhancement measures will, he claimed, increase Pacific Salmon production by close to 31,000 metric tons a year.

He added that 1985 was "the best year ever for commercial salmon fishermen."

The landed value of the catch was \$246 million and much of this came from enhancement efforts.

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On the shellfish scene

With Dr. Eric Edwards, Director of the Shellfish Association of Great Britain

OUR shellfish industry welcomes the recent government announcement that stronger measures controlling the use of yacht antifouling paints, which contain organo-tin (TBT) compounds are planned for 1987.

At a recent meeting organised by the Department of the Environment in London further evidence was presented to prove that organo-tin yacht paints were causing considerable problems to both commercial and non-commercial marine species.

In an effort to control this pollution, the government introduced measures last January under The Control of Pollution (Anti-Fouling Paints) Regulations 1985 which stopped the sale of the most dangerous types of organo-tin yacht paints and limited the TBT concentration in copolymer paints to 7.5 per cent (by dry weight).

Even so, despite these controls, a seawater monitoring survey by the fisheries ministry in nine selected estuaries this summer has shown that the "safe" water target concentration for TBT is not being met. That is why the Department of the Environment is further limiting the amount of organo-tin to 5.5 per cent from January 1987.

Make no mistake about it, the effects of tributyl tin compounds on fisheries and the ecology of an estuary can be devastating. Our Minister for the Environment has himself stated that "tributyl tin is one of the most toxic chemicals ever deliberately introduced by man into the environment."

Concern over the effects of TBT compounds used in anti-fouling paints first emerged in France, where severe problems were encountered in commercial

oyster fisheries in estuaries where there was intense boating activity and relatively poor water exchange.

France's big oyster fishery became alarmed when recruitment of young stock fell away from 1978 onwards, and Pacific oysters developed thickened and deformed shells.

The prosperous oyster fishery in Archachon was virtually wiped out. The fact that the onset of these problems coincided with the increasing use of TBT compounds, as the active biocidal agents in anti-fouling paints, and the discovery that the affected oysters had high concentrations of tin, led in 1982 to the French government banning the use of organo-tin on most boats under 25 metres.

Similar problems were recognised soon afterwards in oyster fisheries in the UK and credit must go to government scientists at the Fisheries Laboratory at Burnham-on-Crouch in Essex whose research first established the need to control the use of this type of anti-fouling paint.

By 1986, the work of other scientists throughout the world has proved conclusively that even minute traces of tributyl tin in marine or freshwater can cause high mortality to many larvae and plankton and affect the growth and reproduction in the adult stages of some fish and shellfish.

Most of this pollution problem has been blamed on yachtsmen but a case is also growing that those fish farmers who dip their nets in TBT to prevent fouling are

also causing problems to the environment.

For example, in Mulroy Bay in Ireland, TBT treated netting was used on salmon cages and spatfalls of scallops and other bivalves have been seriously affected.

In Loch Sween, Scotland, Knapdale Sea Farms — producing oyster seed have been similarly hit by the TBT-based preparations used at an adjacent fish farm.

Perhaps more important to the seafood trade is evidence that fish and shellfish themselves can become contaminated with these toxic tin compounds. This is alleged by the Pacific Coast Federation of Fishermen's Associations, in the USA where it is said that salmon reared in sea pens treated with TBT are entering American seafood markets with their flesh impregnated with organo-tins. The report of TBT-laced pen-reared salmon is not the first indicated tainting of these farmed fish.

There are also suggestions that farmed salmon from Norway and Scotland may also be accumulating organo-tins in muscle tissue.

A recent statement from the Scottish Salmon Grower Association stresses that their members are ceasing to use TBT anti-foulant on their cages which cause this problem.

I hope this is correct because we need to control TBT pollution from all sources if our campaign to control this toxic compound is to be completely successful.

Hatchery boost

INDIAN carp seed supply increased substantially in 1985 with the production of 6531 million fry. This exceeded the official target of 6420 million, and was assisted by the government's programme of hatchery construction.

From only five in 1984/85, the number of commercial-size government carp hatcheries increased to 13 in the year 1985/86.

By the end of the seventh plan the number is expected to rise to 45.

ATLANTIC SALMON IN B.C.

IN OCTOBER, a meeting was held at the Pacific Biological Station in Nanaimo, British Columbia, of all those who had grown Atlantic salmon from eggs imported in March 1985.

The eggs came from our Alt Mor Hatchery in Scotland and they were brought in by three participants in the experimental culture of Atlantics on the West Coast of Canada.

Twelve thousand eggs were hatched and reared by the Pacific Biological Station under the guidance of Craig Clarke. These eggs were held in a very controlled unit under strict quarantine.

Biodiet

Incubation was at six deg. C and first feeding at 12 deg. C. Hatchlings were given a special first feeding diet and, once on feed, the fry were put into Biodiet. Summer growing temperature was 18 deg. C with a temperature extension from October to December of 15 deg. C, and extended photo period of a 16-hour day.

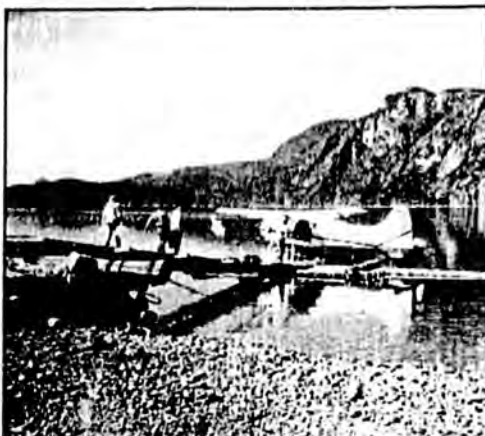
From December onwards, a more normal temperature of six deg. C was held with March temperature onwards doing a usual climb to ten deg. C before smolting in May.

In March, all pre-smolts were vaccinated with vibrio and furunculosis vaccines. Grading gave a two-thirds breakdown with a top 50 per cent having a batch average of 85 grams, and the next 50 per cent a 45-gram average. Potential \$25 went to Roswell Creek Hatchery, the fish being out of quarantine.

The two groups in the sea acclimatised without trouble. The large 85 gram batch grew on well, going into the sea in May and growing to 290 grams by the beginning of October.

The other batch went to sea in June and had a markedly slower growth and

Hugh Horrex reports on progress of the first eggs



Atlantic salmon smolts are loaded into a float plane to be flown north to a site at Hardwick Island.

many disease problems. It is thought that these could well be false smolts, only going to sea because of size and not because of growth inclination.

Tidal Rush Marine Farms imported 10,000 eggs in March 1985 and reared them in their new hatchery at Hotham Sound. Conditions of rearing were not always ideal because of the newness of the site and the quarantine restrictions.

Four thousand smolts were produced, although this was making use of every possible potential smolt.

Hatchery

Some 1500 of these smolts were flown by Beaver float plane to a Sea Farms Canada site 120 miles north of Hotham Sound. This mixed size batch are growing well and have no disease problems but their seawater temperature is lower than that at Nanaimo or

Hotham. The Hotham smolts now have a batch average of 300 (in early October).

The final other groups of Atlantic smolts now in salt water are at the sea site of Ibec, a sister company of McConnell Salmon.

These smolts went to salt water at a batch average of 60 grams with quite a large size variation. The sea site is the most northerly of all the present Atlantic sites and the fish are now doing well, having a batch average of 320 in early October.

From this experience, it appears that Atlantics will do well in Pacific waters, but seawater temperatures at grow-out sites are an important factor as well as a good grading before sea acclimatisation.

The grilse rate has yet to be seen and market weights established. No immediate advantage of Atlantics over Pacifics is yet apparent.

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Channel Islands seed for abalone tests

AMATEUR fishermen are being asked to help with an abalone restocking programme in the Channel Islands.

Warmed by the Gulf Stream, the waters around this group of islands between England and France provide good conditions

for the mollusc which is known locally as the ormer.

This word is an island version of the French "oreille de mer", or ear of the sea. A local delicacy, the mollusc was also sought for its attractive mother-of-pearl shell to make ornaments.

But, since World War II, for reasons that are still unclear, it has been declining in numbers on the rocks around the island shores, from where it was harvested both by inshore commercial fishermen and by large numbers of amateur gatherers.

In the 1960s, gathering the

abalone was banned and only recently has limited harvesting been permitted at specified spring tides.

The success of this conservation policy has encouraged the government of the island of Guernsey to set up a breeding project to research the possibil-

ity of farming the abalone from seed.

After three years, the research workers find themselves with more seed stock than they need and they are offering batches to keen fishermen and shore gatherers to carry out their own trials.

Venezuela farms a fruit eater

ONE OF the most interesting success stories told to FFI during the Verona fish farming exhibition in October concerns an Israeli aquaculture consultant, a Venezuelan fruit-eating river fish, and a wedding.

A Venezuelan government minister became friendly with a family in Israel and came over for a wedding.

The minister was connected with a farm estate at Puerto Cabello near Boca de Arga in Venezuela. Although concentrating on

poultry and other land stock, the estate also had a pond area suitable for development.

When, in Israel, the minister saw some of the country's many fish farms. He was so impressed that he asked if an expert from

Israel could travel to Venezuela to investigate what might be done on the estate.

Ofer Berzak, who is associated with Farm Technology of Israel, was invited to go over.

In Venezuela, he learnt that one of the choice fish is the herbivore called chacama (Colosoma). It inhabits the rivers and its food includes fruit. The fish can grow to 15 kilos and is much sought after in the markets.

Experiments in its culture had indicated that it might be farmed.

Mr. Berzak and his helpers on the estate prepared four large ponds covering 25 hectares. These are around 2.5 metres deep.

Initially fish for on-growing were obtained from wild-caught parents. But, with the ponds built in 1982, a small hatchery was constructed. This was ready in August 1982.



Ofer Berzak has developed a new farm fish in Venezuela.

According to Mr. Berzak, production is 300 to 400 tons of fish a year. And there is no problem selling the fish. The chacama is so popular that much of the harvest is sold to merchants who call at the farm to collect it.

Mr. Berzak said that the farm is now developing polyculture using tilapia (mussels) and possibly prawns. Conditions, he added, are

ideal for aquaculture. There is abundant clean water at optimum temperature, suitable areas for ponds, and a good market. Venezuela will not allow the importation of exotic species for farming. But the success so far with the chacama shows that local species are there to develop.

Further information from Ofer Berzak, Kibbutz Geva, 18915 Israel.



Harvesting one of the four ponds.

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Further information from Ofer Berzak, Kibbutz Geva, 18915 Israel.

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LETTERS

FAO has already cut Asian farm figures

ICLARM hits at headline

Dear Sir,

ALTHOUGH I do not belong to those infected with corresponditis and do not feel myself obliged to defend the virtues of my organisation either, the respect I have felt so far for your *Fish Farming International* prompts me to write.

I am referring here to an article published in your September 1986 issue "FAO gets it wrong..."

This seems to be a digest of Dr. Chua Thia-Eng's article published in the April 1986 issue of NAGA, the ICLARM Newsletter. I must begin by saying that basically Dr. Chua is right when speaking about an earlier overestimation of the aquaculture production in China and India. My problem is with your headline and with the dressing of Dr. Chua's data.

Please, note that FAO has never regularly collected statistical data on aquaculture production prior to 1984. There were no annual returns consequently no such data were published up to now in the *FAO Yearbooks of Fishery Statistics*.

Unfortunately Dr. Chua

has forgotten to quote the source of FAO data used in his article, but obviously these correspond with data estimated by the Aquaculture Development Coordination Programme of FAO (ADCP) for 1975, 1980 and 1983. In a production (FAO Fisheries Technical Paper 248) which is based on these data, the foreword emphasises:

"The basic data utilised have been derived from data submitted by various governments in response to a questionnaire sent out by the ADCP, and from data obtained from various other published and unpublished sources. The resulting base of data is very incomplete and in some cases rather subjective as, at this level of the study, it was desirable to use the best estimates of the group rather than 'official' data where these were in conflict.

"It remains a major conclusion of the study that the available aquaculture data in most countries are as yet inadequate for planning and policy decisions related to aquaculture development and that improvement of

these data should be a priority activity of FAO and its member governments."

Considering that anywhere FAO used these data, their unconfirmed nature was clearly stated, it was not fair to run a headline in your paper "FAO gets it wrong..." and use wordings like "China was reported by FAO to produce..." the more so as with minimal efforts you might have been able to discover that FAO has already revised these earlier estimates.

As a result of a survey conducted in 1985 by our Regional Office, I myself have reduced the estimated 1983 production of the Asia-Pacific region to 6.2 million tons, consequently the global production to eight million tons in a resource paper presented at the Symposium on Fishing Industry organised by the Asian Productivity Organisation in Tokyo, 12-18 November 1985.

After getting some more data, we estimated the 1984 output of the region as seven million tons in a paper prepared for the 18th FAO Regional Conference held in Rome, 8-17 July 1986. So

when your headline appeared in September 1986, FAO had already got it better long since.

Moreover, when collecting his data in 1985 (based on which he compiled his paper) Dr. Chua himself was an FAO staff member, travelling to China and India on official FAO assignments including among others a task to improve our database on aquaculture production.

The major difference between our more recent data and those of Dr. Chua is in regard to the Indian production.

Referring to a 1984 report of an Indian working group on fisheries, in his original article, Dr. Chua presents a 131,000 ton finfish production total for India in 1983. The confirmed official Indian figure for the same year is 732,048 ton, less than the previous ADCP estimate but much more than the figure quoted by Dr. Chua, which seriously underestimates the production of culture-based reservoir fisheries in India.

Of course, it is not the task of your paper to go

into details of such disputes but I think you should avoid joining the new chic of bashing the UN agencies, especially when there is no good reason for doing it.

I. Csavas, Regional Aquaculture Office, FAO Regional Office for Asia and the Pacific, Bangkok, Thailand.

OUR headline in the September 1986 issue should perhaps have been in the form of a question: Has FAO got it wrong?

We are glad to learn from the FAO Asia Regional Office that adjustments have already been made. Perhaps if ICLARM should one day manage to get its Newsletter out on the publication date, we and others in the industry will be able to keep pace with production figures and their interpretation.

We are not about to join the "bashers" of FAO or any other UN agency. But we would like to see a compilation and presentation of aquaculture production figures like those prepared by FAO on global fishing catches.

Editor

Dear Sir,

WE have just received the September issue of *Fish Farming International*, and must strongly protest the inflammatory and unnecessarily critical headline attached to the article on Page 10.

The work of Dr. Chua Thia Eng of ICLARM, as reported in the April 1986 issue of NAGA, the ICLARM quarterly, was a responsible and constructive effort drawing attention to the need for review and improvement of aquaculture statistics.

Must rely

Everyone, especially the editor of *FFI*, should know that FAO must rely primarily upon aquaculture statistics provided to it by national authorities.

Your sensationalist headline makes more difficult our attempts to be constructive in an admittedly difficult statistics environment.

Ian R. Smith, Director General, ICLARM, Manila, Philippines.

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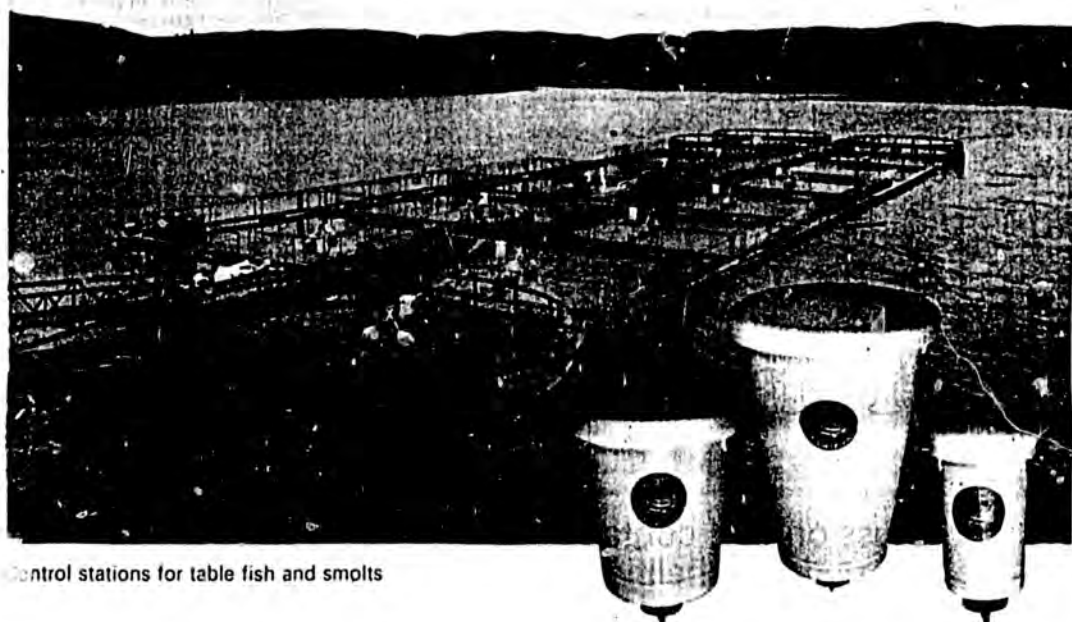
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MEETINGS AND EXHIBITIONS

Norwegians discuss BC farms

INVESTMENT in aquaculture in British Columbia was the subject of a two-day symposium held in the SAS Hotel in Oslo last month.

Organised by the Christian Bank og Kreditkasse and Akvafarm A/S, the symposium took place on November 25 to 26.

It opened with a review of the status of fish farming in BC today by aquaculture Coordinator George Hunter. His talk was followed by a discussion of legal problems in setting up farms and selling fish in BC by Russel

Crum, who also outlined company laws in the Canadian province.

Arne Nore of the Christian Bank looked at Norwegian financing of the Canadian fish farming industry. Other topics covered on the first day included evaluation of sites in BC, the market situation for farmed salmon and insurance in BC.

On the second day, a number of technical aspects were considered, including biology in BC fish farming, smolt supply, and equipment and feed supply.

Big show planned for Amsterdam

THE imposing RAI Centre in Amsterdam will be the venue for the Aquaculture Europe '87 exhibition and conference organised by the European Aquaculture Society.

This event will include conferences, seminars, workshops and an exhibition. The exhibition is being prepared by the firm Expoconsult.

Headed by N.de Pauw of Belgium and A.Drinkward of the Netherlands, the programme committee has among its members Alan Jones of the Sea Farm Project Ferme Marine de Douhet in France, John

Joyce of Ireland, Bjorn Myreseth of Sea Farm in Norway, H Rosenthal of West Germany and P. Secretan of the UK.

Papers for the conference and seminars will cover such topics as water quality, sea ranching, fisheries and production enhancement, feeding and nutrition prevention and treatment of diseases, and economics and marketing.

It is also planned to hold panel sessions with topics including stress-inducing factors in farm species, ecology constraints in aquaculture, legal and political con-

straints and live versus inert feeds for rearing larvae.

English will be the language of the conference and seminars, with simultaneous translation facilities available for the plenary sessions.

Aquaculture Europe '87 will take place from June 2 to 5 and the conference will be held over the first three days.

On June 5, there are plans

to run excursions to aquaculture sites in Holland.

Further information about the exhibition from Expoconsult, P O Box 22, NL 3600 AE Maarsse, The Netherlands.

Information about the conference can be obtained from the European Aquaculture Society, Prinses Elisabethlaan 69, B-8401 Bredene, Belgium.

Crayfish growers' Swiss venue

THE Seventh International Symposium of Astacology will be held next year in Lausanne, Switzerland, from August 3 to 5. The venue is the Museum of Zoology.

Main topics of the Symposium will be interspecific interactions between crayfish, between crayfish and fish, and between crayfish and aquatic plants; restoration of European crayfish populations; and defence mechanisms in pathology.

There will be a closing conference on the Conservation of Invertebrates given by Dr. J. P. Ribaut, who is Chief of the Division for Environment and Natural Resources in the Council of Europe.

Further information can be obtained from Professor Pierre Goeldin, Musée Zoologique, Palais de Rumine, Place de la Riponne 6, CH-1000 Lausanne 17, Switzerland.

EVENTS DIARY

World Aquaculture Society, 1987 meeting, Simon Bolivar Convention Center, Guayaquil, Ecuador, January 18 to 23.

World Aquaculture Society, 341 Pleasant Hall, Baton Rouge, Louisiana 70803, USA.

Scottish Fish Farming Conference, Conference and exhibition in the Eden Court Theatre and grounds, Inverness, Scotland, February 24 to 26, 1987. Dr. Peter Landless, 45 Ashcroft Road, Cirencester, Glos. GL7 1QZ, England.

Vattenbruk 87, Fish farming exhibition and conferences, Malmö, Sweden, February 26 to 28. Malmö Exhibition Centre, Box 19015, S-20073 Malmö, Sweden. Telex 32256.

Aqua Fisch, International exhibition and meetings covering the aquaculture industry, professional and sport fishing, and ornamental fish. Friedrichshafen, West Germany, from March 19 to 22, 1987. Int. Bodensee-Messe Friedrichshafen GmbH, Messgelände, D-7990 Friedrichshafen, West Germany. Telex 734315.

Aquaculture Europe '87, Conference and exhibition in the RAI centre, Amsterdam, from June 2 to 5, 1987.

European Aquaculture Society, Prinses Elisabethlaan 69, B-8401 Bredene, Belgium (for the conference); and Expoconsult, P.O. Box 200, NL-3600 AE Maarsse, The Netherlands (for the exhibition).

Seventh International Symposium of Astacology, Meeting on freshwater crayfish, Museum of Zoology, Lausanne, Switzerland, August 3 to 5, 1987. Professor Pierre Goeldin, Musée Zoologique, Palais de Rumine, Place de la Riponne 6, CH-1000 Lausanne 17, Switzerland.

Aqua-Nor '87, International aquaculture exhibition and seminars, Trondheim, Norway, 13-18 August, 1987. Fiskeoppdretternes Selskap, Postboks 851, 7001 Trondheim, Norway. Telex 55573 Aqua N.

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92

Salt pond Artemia for Vietnam shrimp

By Ir. Arjo Rothuis, Institute of Agricultural Engineering (IMAG),

SHRIMP and prawns are among the most valuable exports of Vietnam. Production is estimated to be around 7000 metric tons a year and this is expected to increase to 10,000 tons by 1990.

But until now this has depended on the natural productivity of the coastal region.

In extensive culture systems, the yield varies between 200 and 600 kg per hectare a year.

The culture of shrimp is concentrated in the Plain of Ca Mau in Southern Vietnam, where climatic and biological conditions are very suitable. However, further maricultural expansion in this region is constrained by a scarcity of wild-caught post-larvae, foods and insufficient knowledge of modern aquaculture methods.

Since *Artemia* is regarded as the basic food organism for many fish and crustacean larvae, the availability of sufficient amounts of cysts and biomass is crucial. Although the production of *Artemia* cysts increased to 200 metric tons in 1985, prices of high quality cysts still vary between US\$30-60 a kilo.

But Vietnam — like many other developing countries — has no possibilities for large-scale importation of these cysts. Therefore production in local solar salt-works seems to be the only solution.

Habitat

During the dry season, conditions in the salt evaporation ponds can provide a suitable habitat for *Artemia*. Integration of *Artemia* culture and salt production even results in a better quality (cleaner) salt.

Since 1983, the University of Can Tho under the supervision of Professor Nguyen Kim Quang, has been carrying preliminary introduction experiments in the salt farms of Bac Lieu and Vinh Chau.

The promising results led to a cooperation project between the University of Can Tho and the Dutch

Committee for Science and Technology for Vietnam together with Jaap Brands from the Institute of Agricultural Engineering in Wageningen. He and Gert-Jan de Graaf selected materials worth US\$35,000 to be taken to Vietnam.

In December 1985, the laboratory in Can Tho was equipped with these materials for cyst processing, canning and quality analysis. At the salt farm of Vinh Chau, a simple field laboratory constructed from bamboo and coconut leaves was equipped with materials for cyst hatching and harvest, water quality plankton and *Artemia* analysis. The electricity for this laboratory was provided by a 600 W wind generator. In three *Artemia* ponds, scientific research concentrated on salinity management, fertilisation method and introduction density.

Besides the work on *Artemia*, a *Macrobrachium rosenbergii* laboratory (including recirculation systems for larvae culture) was also built. There, research on optimal use of *Artemia* nauplii, formulation of artificial foods and new husbandry techniques was performed. During eight months, the whole programme was supervised daily by the writer.

At the salt farm of Vinh Chau, from February to July a total of 15 kg dry weight of cysts were produced. The production rate of the best pond was 8.4 kg/ha/month.

With a hatching efficiency (number of nauplii/g cysts) of about 230,000 and an average hatching synchrony (time between ten and ninety per cent hatching) of six hours, the cysts produced were of good quality. Their

Wageningen, The Netherlands.



Collecting cysts of *Artemia salina* in experimental ponds in Vinh Chau.

nutritive value was also excellent.

Analysis at the *Artemia* Reference Centre in Ghent, Belgium, showed a highly polyunsaturated fatty acid content of 14.6 per cent.

Results

Other interesting results are:

- The optimal introduction density with a San Francisco Bay strain (*Artemia* Systems, Ghent, Belgium) is 20-30 nauplii/l.

- Fertilisation of the *Artemia* pond with organic or inorganic fertiliser at high salinities (over 100 ppt) does not induce an algae bloom. The bad food condition will then result in a poor growth rate and a decreasing fecundity (number of eggs/female).

- Besides the quantity of the algae, quality is also of crucial importance. Mass development of filamentous algae causes a poor growth or even mortality of *Artemia* nauplii soon after introduction. This can be prevented by deepening the pond (0.6 m) and fertilisation at low salinities.

- The use of special fertilisation ponds for "flow-through" *Artemia* culture can also prevent these problems. Here plankton-rich water from the low saline fertilisation ponds flows (by gravity or pumping) through moderate and high saline *Artemia* ponds and finally to the salt crystallisation ponds.

- The culture of *Artemia* is not restricted to the dry season. It was observed that even in the rainy season at a low salinity (85 ppt) cysts were produced. Wind and wave action caused a dispersion of *Artemia* over the nearby salt and evaporation ponds, resulting in a biomass production of about 2.5 tons.

The biomass was used in nursery ponds stocked with a mixed population of wild-caught shrimp post-larvae.

Another part of the *Artemia* biomass was processed

and incorporated in a pelleted food for *Macrobrachium rosenbergii*.

The produced cysts were also used in the *Macrobrachium* hatchery. Introduction of the clear water larval rearing technique indicates a

production potential of about 30 post-larvae/l. And this was without the use of any chemicals for disinfection and/or disease treatment.

Results of the work are very encouraging. Also,

With its long coastline Vietnam offers substantial growth prospects for the development of shrimp and marine fish culture. The work described here is being carried out in the far south of the country.

through the cooperation of the University of Can Tho and the provincial authorities of Hau Giang, costs have been kept low.

Vietnam — with a coastline of 3000 km — has about 150,000 ha of land available for coastal aquaculture. It is believed that in the near future the results of our project can contribute to an increase in the production of farmed fish and shrimp in this country.

The Dutch Committee for Science and Technology and the University of Can Tho have, therefore, agreed on a close cooperation in the coming years, which will be coordinated by Jaap Brands.

● Further information on the project can be obtained from Mr Brands at IMAG, P.O. Box 43, 6700 AA Wageningen, The Netherlands.

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Introducing *Macrobrachium* culture on a laboratory scale at the University of Can Tho.

World-wide service from Norway



Dr. Ole Vahl, Noraqua's director of science and technology.

WITH its now considerable experience in aquaculture, Norway is marketing much more than high-quality salmon and trout. Norwegian manufacturers of farm hardware are finding world-wide outlets for their products. And, increasingly, Norwegian experience and expertise is being sought and used in projects that range from a shrimp farm in West Africa to a land based salmon farm in Iceland.

The latter project is one of a number now being undertaken by the Oslo-based company Noraqua as a joint venture partner, finding capital for development, providing technical back-up and drawing in many other ways on its experience in aquaculture.

Noraqua is in one of the three divisions of the large Selmer-Sande group. Two of these divisions engage in general construction contracting and offshore work.

The third is involved in aquaculture, fisheries and biotechnology. In addition to Noraqua, firms in this division include Norfco, which is engaged in the management of international fishery projects; Norbio, in biotechnological research; and the research firm Biotech, whose work includes biotechnical processing, feed processing and disease control.

Another associate company more immediately linked with Noraqua in fish farming is Kvalos A/S on the island of Maloy which lies between Bergen and Alesund on the Norwegian west coast.

Founded in 1924, Kvalos was an exporter of Norwegian salmon long before this was a farm product. It processes and markets other popular food fish species, and it is now also a farming company. With its own harvest plus the production of other farm, Kvalos exports about 2000 metric tons of salmon a year.

This integrated operation also serves as a training centre for people employed in projects which Noraqua is carrying out itself or is

assisting in one or more stages.

The company is organised to participate in an aquaculture venture at any level from initial project evaluation through to the construction of the farm and opening up markets for its fish.

Looking at evaluation, Noraqua says that this and other services can be provided on a consultancy basis for projects in which the company is not involved as an owner or a partner.

Increasingly, however, it is participating in the projects, helping to design them and finding technical solutions where these are needed. It is also experienced in setting up companies and in finding capital to start and operate worthwhile ventures.

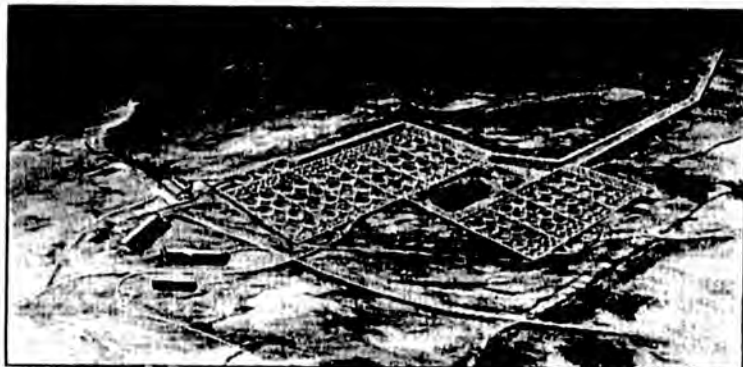
Through its research-based associate companies, it is able to find the most suitable stock, to develop protection against disease and to investigate and

obtain the best feeds for growth.

Opened by Prime Minister Steingrimur Hermannsson in July, the new Islandsfax salmon farm on the Reykjanes Peninsula in south-west Iceland near Keflavik airport is one of the largest of Noraqua's joint venture projects.

This is a hatchery making use of the warmed water from thermal springs in the area and then on-growing the fish in tanks ashore where they are protected

Noraqua helps develop farm projects from Iceland to Tasmania



This drawing shows how the big land-based salmon farm of Islandsfax will look when it is completed.



The hatchery building at Islandsfax.

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Trial harvest of rainbow trout in Tasmania.

Above: Noraqua floating hatchery on a hydroelectric dam in north-eastern Portugal. The first on-growing cages can be seen on the right.

Left: Trial harvest of rainbow trout in Tasmania.

Right: Experience gained by Noraqua on the Kvaløys farms on Maløy on the west coast of Norway is applied to the company's project around the world.



against the cold temperatures of the Icelandic winter. Described briefly by features editor Tom Wray in *FFI* in July, the Islandsfax farm was started by the Samband cooperative organisation and Noraqua and was set up with financial help from the Nordic Investment Bank.

Hatchery

Although eventual production could rise as high as 5000 tons a year, the initial scheme is more modest. The hatchery unit is designed to produce about 750,000 smolts a year. From the incubators, the young fish are raised through fingerling to smolt stage in freshwater tanks. From these, they will be transferred to the large on-growing tanks which are made of reinforced concrete.

Noraqua designed and engineered this farm which should be harvesting about 750 tons of salmon in 1988.

Speaking to *FFI* recently, Dr. Ola Vahl, director of science and technology in Noraqua, described some of the company's other substantial projects in Portugal, Australia, Chile and the United States.

A graduate in science from the University of Bergen, Dr. Vahl joined the company in 1985, having spent some 18 years in various research and development projects. These included work in the development of scallop farming and processing.

"Our operating company in Portugal," he told *FFI*, "is setting up a hatchery and cage project to raise large rainbow trout in the freshwater of a hydro-electric dam."

This farm is sited in the north-east of the country and the design had to allow for the dam's changes in

water level. The solution for the Quinta do Salmao farm was a hatchery building that floats with the cage system.

Noraqua has been working on the project since 1985. It is expected to attain a production of 300 tons in 1988; the company will also supply and service other trout farms in the area.

When Noraqua became involved in a salmonid venture in Tasmania, one of the problems faced by the company was the Australian prohibition on the importation of eggs or live fish. But there is a stock of landlocked salmon in New South Wales and the eggs from these fish are being used.

Salmon Enterprises of Tasmania (Saltas) is a joint venture company with the government of Tasmania holding 51 per cent. Local interests in the state hold 30 per cent and Noraqua has a 19 per cent share.

"This is a smolt producing and research company," said Dr. Vahl, adding that Noraqua would be providing technical support. Under the agreement setting up the operation, it has an option, for the first ten years, to buy 40 per cent of the smolt output.

Million smolts

Hatchery production was expected to begin with 160,000 smolts in November, rising to one million smolts by 1989.

A salmon on-growing company, has been formed by Noraqua. Through an associate company called Norlax, it also has a 50 per cent share in Nortas, which plans to grow about 350 tons of rainbow trout a year in seawater. The other 50 per cent of Nortas is held by local investors.

Another Noraqua operation in the Southern Hemisphere is in Chile. There

Norlax Chile is importing Atlantic salmon eggs from Norway through Noraqua's own quarantine depot set up for the export of trout as well as salmon eggs.

Chilean Salmon (Chisal) is working south of Puerto Montt where a hatchery should be producing about one million smolts a year by 1990.

"The hatchery site is in a remote area in the south," said Dr. Vahl. "It was selected because it is alongside a very good and rather unique river."

Volcano

The hatchery is at the foot of a volcano. The river flows from a lake along the side of this volcano and the water is not only clean but is warmed to a steady year-round temperature of 8-9 deg.C.

"This presents exciting opportunities for fish farming," said Dr. Vahl.

Another Noraqua joint venture project has taken the company away from salmonids, to the dorado or dolphin fish of warm sea waters. Laboratory and hatchery work on this fish began in Bermuda. A hatchery is being set up in Florida, USA, and there are also plans to develop farming in Hawaii where the dolphin fish is a popular delicacy known as mahi mahi.

"We have been looking for a suitable site in Hawaii," said Dr. Vahl.

One way of farming the fish would be to use floating raceway technology developed at the Kvaløys farms in Norway. But another technical possibility for Hawaii could be a land based seawater system.

Further information about Noraqua and its activities and services can be obtained from Noraqua A/S, Box 5101, Majorstua, N-0301 Oslo 3, Norway.

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ABOVE: Even with the help of a net, harvesting the large active fish can be dangerous. Watch your ears!

RIGHT: Another view of the pond farming operation in Iran. Farm workers bring in a net load of carps. The shore of the Caspian Sea is one area where the pond culture of various carps is now well developed.



LAKE FARM CAGES WILL BOOST

IRAN'S FISH SUPPLY

IRAN, like other Middle East countries, has no tradition of fish farming. There are some large ponds on the shore of the Caspian Sea, where common, silver and grass carps — as well as sturgeon — are bred and raised to stocking size. There are also some trout farms near the capital Teheran, and in Shiraz in the south of the country.

Fish is very popular in Iran, and at the Iranian New Year in March no family would do without a fish on the table.

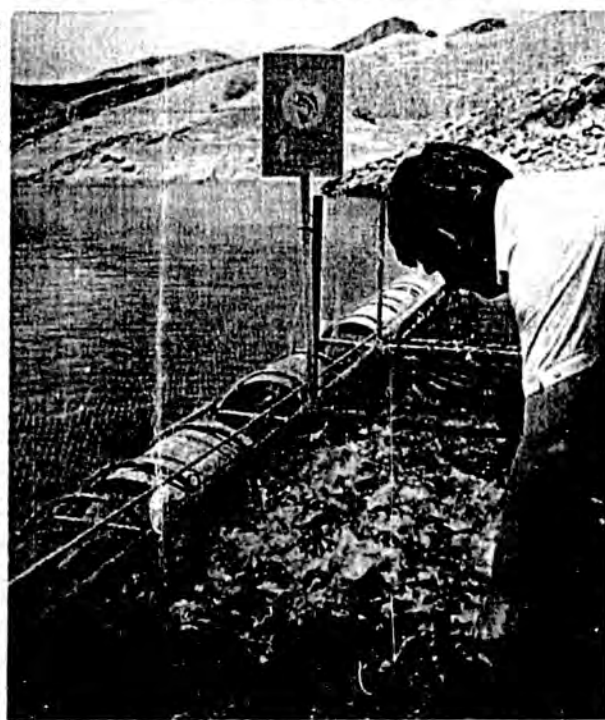
Ten years ago the Agriculture Department of the University of Ahwaz in the province of Khuzestan, north of the Persian Gulf, installed its first fish pond. Positive results led to the erection of a modern breeding station which nowadays has a water area of 500 hectares.

The two to ten hectare ponds permit intensive production. Some ponds are reserved for holding broodstock and young fish.

Pond water supply is taken from a channel of the Karun irrigation system, and each pond can be drained. Last year a modern warm water hatchery was erected for the controlled breeding of carp and other herbivores. Yearly production capacity of the plant is now 1000 tons.

Dr. Esmail Heydarpur of Ahwaz University is the "father of fish breeding" in southern Iran. Dr. Heydarpur studied agriculture in West Germany with special instruction in fish breeding. He wants to accelerate the development of fish farming in Iran to provide the population with protein through the consumption of economically-priced fish such as the carp.

Dr. Heydarpur therefore started a new project financed by Karun Agro Industries. Earlier pilot tests with small, self-constructed net-cages in



Dr. Heydarpur with the first harvest from the pilot net cage installation in Iran's Lake Dez.

**Report
by:
Gerhard
Moller**

the Dez storage lake near the town of Dezful in western Iran proved that the lake offered ideal conditions for growing common carp (*Cyprinus carpio*).

The lake has a water area of about 5000 hectares and a depth of 150 metres. Surface water temperature from June

until September is 30 deg. C, while from October to May it is over 10 deg. C.

In 1984, the West German consultant Dr. Christian Proske of the Inter-Fish company was entrusted with the delivery and construction of a large net cage plant in the

lake. Work was completed early in the summer of 1986.

For the project, a huge cage complex with a net capacity of 11,000 cubic metres was chosen. The net depth of eight metres makes it possible at high temperatures for the fish to seek the cooler waters at the bottom of the cage.

Some nine cages with a diameter of 42 metres each are anchored over water 100 metres deep. Impairment of the water quality by intensive stocking of fish in the cages is said to be out of the question. A strong water flow through the lake — on average 200 cubic metres a second — would, it is claimed, allow the yearly production of 5000 tons of fish without damaging the environment.

The Inter-Fish net cage plant has a capacity of 700 to 1000 tons of carp a year. These figures will increase when local personnel become familiar with the operation of the farm. Fingerlings of 30-50 grams are delivered from the pond hatchery station.

Besides the large net cage installation, a huge amount of equipment had to be bought for the efficient functioning of the Lake Dez cage farm.

For the project, Inter-Fish delivered, among other things, a 60-ton catamaran-type work raft powered by two 35 hp outboard engines. The raft has a large working surface for setting out and harvesting the fish. A one-ton crane powered by a generator set is also fitted, and the raft is able to carry a truck.

Inter-Fish also delivered three outboard-powered workboats and a raft capable of transporting three tons of feed per load. Other equipment included a Mercedes-Benz cool truck, a fingerling transporter and trailer and a Unimog work truck.

Each of the net cages supplied by Inter-Fish consists of 16 parts and has a circumference of 144 metres. Six anchors weighting five tons each and fabricated in Iran each secure three cages. The water surface level of Lake Dez can vary up to 40 metres, and during storms waves two metres high can be generated.

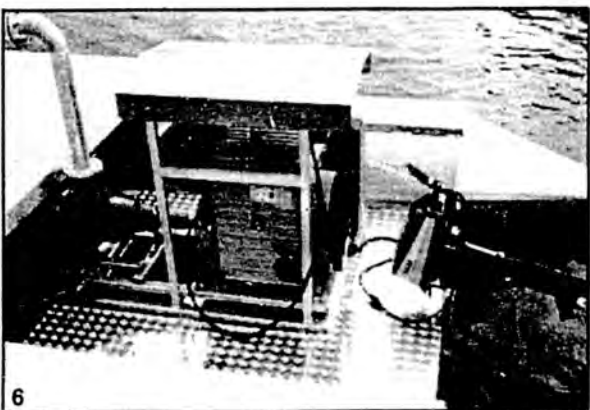
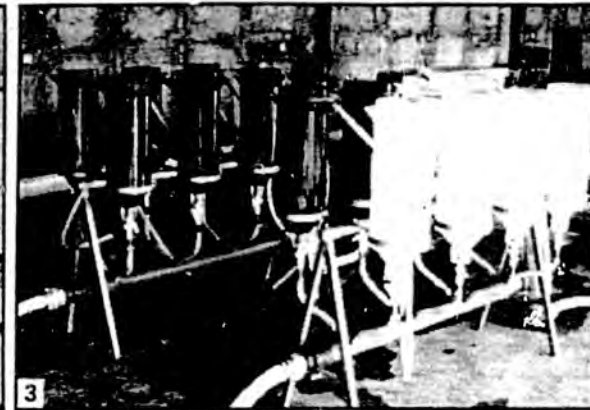
For harvesting, the content of a cage a separate net is spread into the cage, hauled in and the fish is put into boxes aboard the raft. Each 500 kg batch of boxes is loaded by crane onto the truck standing on the raft.

After landing of the raft ashore, the fish is trucked to cold store. Next morning the cool trucks transport it on ice the 1000 km or so to Teheran. Nearly all fish from the lake will be marketed in this way, and will be with the consumer no later than three days after harvesting.

Lake Dez fish farm has 30 employees. Fish feed is presently brought from Teheran, but a feed mill as well as a cold storage depot and large ice machine are planned for the farm site.

Karun Agro Industries is also owner of the net cage farm, and has so far invested about five million Deutschmarks. It is said that investors will see a return on their money within two or three years, and the excellent quality and eating qualities of Lake Dez carp will ensure a strong demand well into the future.

1. The huge net cages were assembled by three German specialists assisted by Iranian college students. 2. Mounting the nets to the new cages. 3. A group of Zuger glasses in the firm's own hatchery. 4. The nine net cages floating in Lake Dez. 5. This Mercedes truck is used to transport the carp fingerlings. 6. One of the three smaller work rafts. 7. The famous 'Dez carp' is very popular and not only in the Dez region of Iran. 8. The one-ton crane being erected on the large work raft.





ALLIGATORS COME BACK

THE AMERICAN alligator was once classified as an endangered species in its native haunts in the southern USA.

Now, however, it is once again thriving in states such as Louisiana where there is an abundance of natural swamp and marsh habitat.

This did not happen by accident. Conservation and restoration programmes organised and directed by the Louisiana Department of Wildlife and Fisheries (LDWF) did two things.

First, they generated enough wild alligators for the state to initiate a 30-day trapping season each year in September-October. Since 1972, 150,000 alligators have been harvested statewide. Last year, in addition to hides, 136 metric tons of meat was sold.

Second, they gave rise to an aquaculture industry in Louisiana which is expected to grow enormously from its present nucleus of 13 licensed farms over the next decade.

Vital part

The LDWF considers cultured alligators to be a vital part of its conservation and restoration programmes.

It has sponsored research since 1964 at its coastal Rockefeller Wildlife Refuge, led by biologists Ted Joanen and Larry McNease, which has perfected farming techniques employed throughout the South. It has also provided hatching year alligators from state-owned lands to qualifying farmers until they can generate broodstock capable of making each farm self-sustaining.

According to Mr. Joanen, the 13 licensed farms will soon become independent of the programme and LDWF

Louisiana perfects culture, reports Dr. Jay V. Huner



A four-metre long alligator waits for its food, while a handler at the farm talks to visitors.

will start supplying stock to 20 or more qualifying applicants who wish to start their own operations.

Larger

Broodstock, wild or domestic, is not available but some prospective farmers are buying larger domestic animals to grow-on for broodstock.

LDWF biologists have developed techniques which use environmental culture

Initial stocking rates for 15 cm hatchlings is five per sq. m which is reduced to two at the end of the first growing year.

Food of choice is ground (first year) or chopped (second to third years) carcasses of nutria (*Myocaster coypus*) with a vitamin/mineral supplement.

Nutria is readily available during the winter trapping season at \$0.18-0.22 per kg and is stored for year-round use. A less satisfactory food is ground trawl by-catch (fish) from the state's marine shrimp fishery.

Growth

At the end of the third growing season, alligators average 1.5 m (1.2-1.6 m range) and weigh 21 kg (15-30 kg range). This growth requires about 105 kg of food with 64 kg being consumed between the second and third years.

This is considered an economically viable proportion as hides average about \$66 per kg and the flesh averages about \$4 per kg. Rising temperatures to 31 deg. C can shorten the growing period to 12-18 months. But, it is still not clear if it is economical to raise alligators at such elevated temperatures.

Under current economic conditions, cultivated alligators need to be harvested after three years because third year food conversion rates decline greatly and stocking densities decrease beyond any cost benefit ratio. Prospective brood-

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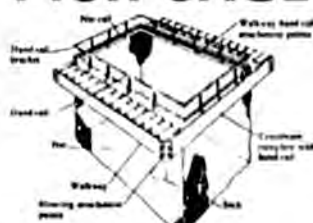
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Broodstock on a Louisiana farm.

stock is cultivated in open systems at ambient temperatures and there is essentially no growth from October through early March.

Cultured alligators first mature at an age of six years compared to 9-10 years for wild animals (2+ m for both) but do not become successful spawners until they reach nine (cultured) or 13 (wild) years of age.

Relatively large pens (0.8 ha) are needed to simulate natural habitat and permit stocking of 17.5-22.5 adults per ha (sex ratio one male to 2-4 females).

Fertility

Females make mound-like nests of natural vegetation and lay an average of 40 eggs that are 85 per cent fertile with a 70-75 per cent hatch rate.

Broodstock must be fed nutria carcasses or some equivalent food if it is to produce viable offspring consistently.

Eggs are removed from nests before day eight and incubated in nests made with natural nesting materials in environmental chambers. Best temperature is 31-31.7 deg. C. Nesting material must have a high moisture content to facilitate microbial breakdown of the egg shell so that young can hatch successfully. Moisture

levels must be about 90 per cent during the incubation period of four to five weeks.

Currently, it appears that annual farm production of 200-1000 alligators is required for partial or sole source income levels. Some farmers also open their farms to the public at a nominal charge to supplement their incomes.

Louisiana farmers are now producing 3000 skins and 18 tons of meat a year. This will, according to LDWF biologist Joanen, increase dramatically in five to ten years as more farms begin production.

He notes that current production of farmed and wild-harvested alligators, mostly from Louisiana and Florida, provides less than ten per cent of the international demand for alligator products. He sees little competition from more temperate areas because of the costs of maintaining heated systems and generating broodstock at ambient temperatures. Food is cheaper too.

Advantages

Wild harvest of alligators is not expected to fluctuate much. Farmers have several advantages in competition with producers of wild animals. First, hides are superior; second, the cultured animals have larger hides per unit of length; and



Young alligators wait for their frozen food to thaw.



Yearling alligators inside a holding chamber which is heated during cool weather.

third, cultured animals may be slaughtered at any time.

Thus, aquaculturists in Louisiana are confident that alligator aquaculture will be a major industry within a short time.

● Further information about alligator aquaculture and availability of alligator products may be obtained from Ted Joanen, Louisiana Department of Wildlife and Fisheries, Rockefeller Wildlife Refuge, Grand Chenier, Louisiana 70643, USA.



In addition to the farm production, about 15,000 wild alligators are taken each year in Louisiana.



Considerable skill is required to make sure that the alligator hide (worth about \$46 a metre) is not damaged during skinning.

Hatchery sell-off for Canadians

CANADA'S federal government is planning to sell off ten salmon hatchery operations in the Maritime provinces.

It is prepared to sell to provincial governments or private enterprise.

But the plan has already run into opposition in the provinces. New Brunswick's Fisheries Minister Jim Tucker criticised his federal counterpart Tom Siddon, saying that provincial governments do not have the money to buy the hatcheries.

"The hatcheries should continue to have federal involvement," said Mr. Tucker. He suggested a joint agreement involving both levels of government, saying that federal officials were needed because of their expertise in salmon enhancement.

Meanwhile the private fish farmers, of which around 20 are based in New Brunswick, have greeted the plan with much more enthusiasm. The market for salmon is currently buoyant and they see the sale as an opportunity to take advantage of this.

Scottish feeds mill opened

NEARLY 200 fish farms throughout the Scottish Highlands and Islands stand to benefit from the opening of BP Nutrition's specialist production mill for feeds at Invergordon.

The ceremony was performed on November 24 by John MacKay, Minister for Education, Agriculture and Fisheries at the Scottish Office.

The £34 million project comprises a modern fish feed mill which will supply expanded and pelleted salmon feeds throughout Scotland, Northern England and Ireland.

BP's two other fish feed plants are in Lancashire, where the emphasis is on fry

feed and pelleted trout food, and Witham in Essex, which supplies expanded trout feed to the farms of Southern England.

The new mill at Invergordon is fully computerised and automated.

Intentionally sited on a green field location at the Inverbreakie Industrial Estate, the most modern purpose-built fish feed mill in Europe will benefit both wheat farmers and fish meal producers.

Crops are used in the production of salmon feed and 60 per cent of the raw material is fish meal from wild caught fish, much of which is landed by the Scottish fleet.

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Meeting looks at oyster quality

MUSSEL fisherman and oyster growers from the Teign Estuary in South Devon, England, met officials recently to discuss shellfish production and better quality.

The gathering at Forde House, headquarters of the Teignbridge Council, was attended by representatives of the Ministry of Agriculture, Fisheries & Food, DHSS, District Council Environmental Health Officers, the Shellfish Association of Great Britain and South West Water.

Bernard Young, Teignbridge Chief Environmental Health Officer, said the main purpose of the meeting with local fishermen was to look at ways of improving the quality of oysters.

The Teign Estuary is one of the most important Pacific oyster growing areas in the country and production is steadily increasing as demand for this type of oyster expands.

But about five years ago — because of sewage pollution — Teignbridge Council made an order that all shellfish grown in the Teign must be purified and also relaid in a cleaner part of the estuary for four weeks before sale.

This practice has substantially reduced the number of public health outbreaks and at the recent meeting Devon fishermen and shellfish merchants agreed to continue to relay oysters in cleaner waters during the winter period.

After years of research on catfish ... Dutch team turns to eel culture

A DUTCH university's fish culture and inland fisheries teaching and research team set up in 1975 has gone on to win an international reputation for the quality of its work.

And it has recently begun to act as an important catalyst in the development of intensive fish culture in the Netherlands.

The team works within Wageningen Agricultural University's Department of Fish Culture and Inland Fisheries. Starting with a part-time staff member of just one — Professor E. A. Huismans — the Department now has a full-time team of about 20 scientists and other specialists.

It is staffed by experts in a number of aquaculture and fisheries fields. These include fish reproduction physiology; fish nutrition, feeds and feeding; fish health care and fish diseases; fish husbandry technology; and fisheries biology and management.

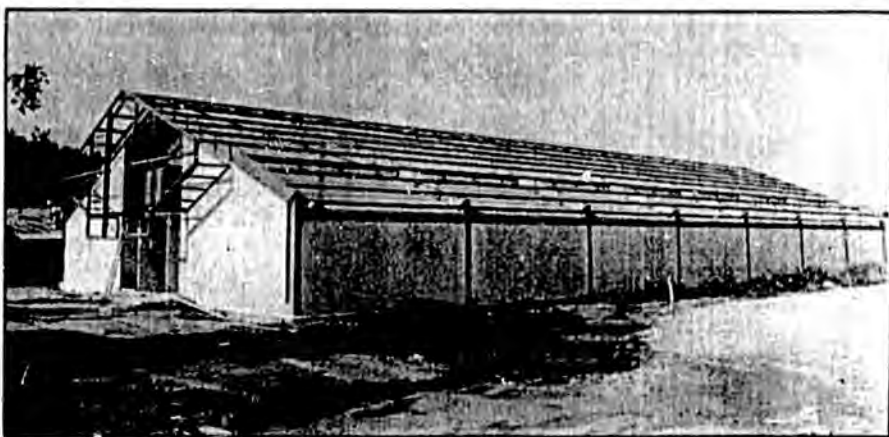
Since it was founded, the Department has produced many MSc. and PhD. graduates, and has been involved in several fish culture and fisheries projects in tropical countries.

The Wageningen team is probably internationally best known for its work on the African catfish (*Clarias gariepinus*). The team's years of dedication and research on this spectacular looking fish have played a major part in bringing its culture to commercial fruition both in Africa and, surprisingly, in Holland itself.

The African catfish is now cultured in ponds in a number of countries such as the Ivory Coast, Cameroon and the Central African Republic.

In the Netherlands this fish is grown in recirculation systems at high densities.

The Department started its applied research work on the African catfish in 1977. With the National Fish Culture Station in Bangui in the Central African Republic, FAO, the University of



This new three million guilders laboratory at Wageningen will be used to carry out research on a number of fish species including eels. It features an advanced recirculated water system.



Ing. E. H. Eding, one of several of the Department's researchers working on African catfish.

Utrecht and Israel's Kinneret Limnological Laboratory, it developed a new culture technology applicable in developing countries.

Results of this research, ultimately aimed at improving the nutritional status and

income-generating capacity of developing countries, have recently been published in the *Practical Manual for the Culture of the African Catfish* (reviewed in *FFI* in September).

Steroids

Hormonal control of reproduction in African catfish has been an important research area investigated by the Wageningen team. Researchers are currently looking into the role of steroid conjugates in stimulating reproduction to further enhance the culture of this fish.

This project is concentrating on the formation of gonadal steroid conjugates and the role of these water-soluble steroids in the regulation of egg maturation,

ovulation and spawning. The results may lead to the production of pharmaceutical products for fish culture.

Other research has shown that cold shocking of eggs is a successful method to introduce triploidy in African catfish. The exact time at which the cold shock should be applied is: two to four minutes post-fertilisation.

Much of the interest for induced triploidy in fish culture is based on the assumption that triploids would be sterile and may show better growth than diploids at least after the time of sexual maturation of diploids.

Experiments at Wageningen have shown that, after gutting, more product remained in triploids than in diploids. The researchers recommend that decisions in favour of triploid culture of the African catfish should

therefore be based more on expected advantages concerning body composition and gutted weight than on an expected increase in growth rate. Growth rate was not significantly affected by triploidy.

Fish health

Research in fish health and fish diseases by the Department of Fish Culture and Inland Fisheries at the Agricultural University of Wageningen is assuming greater importance as the number of fish farms in the Netherlands increases. Production systems used are very intensive and run high risks of sudden outbreaks of diseases.

It is therefore very important to be able to assess the level of fish health. Such

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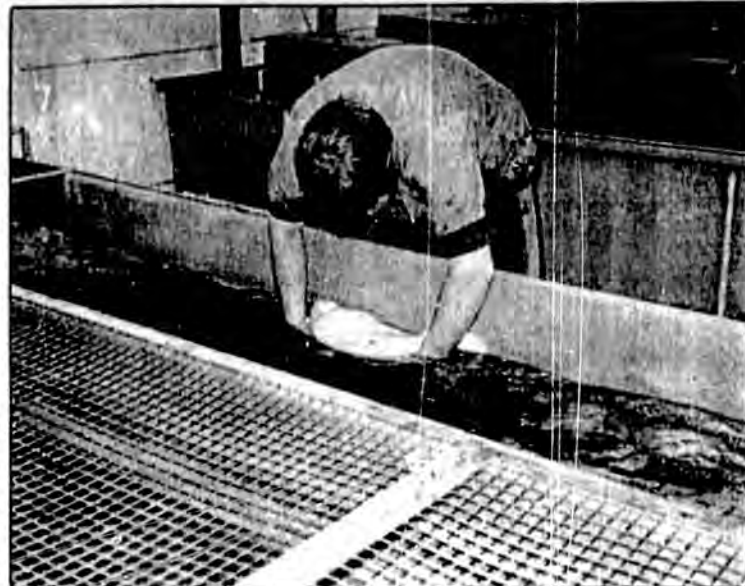
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One of the African catfish broodfish at the Wageningen research laboratory.



Inspecting a carp in the broodfish unit.



PhD. student Hans Kome leads an experiment on inbred lines of carp.



Ir. M.A.M. Machiels is developing a computer model to calculate fish growth from biochemical information.

assessment could enable supplementary management measures to be applied in time to prevent disease-induced economic losses.

Present research in this area focuses on checking out the validity of certain haematological parameters (leucocytes, plasma proteins) as a useful feature of fish health. This is being carried out on a number of species-specific diseases including the nervous syndrome of carp, the ruptured intestine syndrome of catfish and the summer mortality of marine cultured rainbow trout.

Until recently, the bulk of Wageningen's research work has centred on the African catfish and carp. But with the imminent opening of the Department's impressive new three million guilders laboratory, Dutch investigations into the culture of the European eel are set to move into top gear.

Interest

There is now tremendous interest in the intensive culture of eels in northern Europe, and the Wageningen team is eager to probe the

secrets of this poorly understood fish, which has still to reproduce and ongrow fully in captivity.

Two of the things the Dutch researchers will be looking into are how to influence sex differentiation in eels, and how to artificially induce ovulation in the reproduction cycle.

In the Department's new 740 square metre laboratory on the Wageningen campus, research will be carried out not only on eels but also on the African catfish, Indonesian catfish and carp.

A recirculation system will provide gas-heated water at the various temperatures required to a series of 1000 litre capacity rectangular tanks and smaller aquaria. There are no windows in the laboratory, the artificial lighting intensity in each room being individually controlled to provide the photoperiod required.

Wageningen University offers various opportunities for training foreign workers in aspects of aquaculture. These opportunities have largely arisen from the needs of development co-operation and from the long-standing association between experts

and institutes in the Netherlands and certain tropical and sub-tropical areas.

As courses are given in English, participants are required to have a good command of this language. A certificate of proficiency may be stipulated.

The Wageningen Agricultural University in October 1986 started a Master of Science course in animal production and aquaculture, designed for graduates from developing countries. Applicants are selected on the basis of their academic record and on the results of an entrance examination. The course lasts two years.

The MSc. programme includes a series of basic modules covering design and analysis of experiments, data

processing, nutritional physiology, farm economics, microbiology, principles of animal production, animal physiology immunology, and endocrinology and reproduction.

Then, those students specialising in aquaculture rather than animal production, will go on to study the principles of fish production, fish health control and fish technology, fish feeds, aquacultural engineering, problem solving and so on. Students must submit and successfully defend a thesis.

An important aspect of the University's training for Dutch students is that they have to spend a total of five to six months on practical work. This is more often than not given abroad.

The Department of Fish Culture and Inland Fisheries itself is also involved in projects abroad. As well as its work with the African catfish in the Central African Republic, it has been engaged in a grass carp project in Egypt, is now helping to upgrade fishery education in Indonesia, and has accepted a research upgrading assignment in Costa Rica.

● Further information from The Agricultural University, Department of Fish Culture and Inland Fisheries, Zodiac Building, Marijkeweg 40, POB 338, 6700 AH Wageningen, The Netherlands.

Over: Holland looks to intensive fish culture

Indian prawn hatchery

AS PART of its overall strategy for developing brackish water prawn farming, India's Marine Products Export Development Authority (MPEDA) has entered into a technical cooperation agreement with the firm France Aquaculture.

The firm is setting up a hatchery for the supply of tiger prawn (*Penaeus monodon*).

This hatchery will be based at Godalpur in Orissa on the east coast. It will have a production capacity of 25 million larvae a year and is expected to boost prawn farming in the state, which is seen to have great potential.

The hatchery is scheduled to be commissioned by the end of 1987.

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Pakistan shrimp

WORK is nearing completion on the construction of a pilot shrimp culture project at Bhora Bari Taluka, in Pakistan's Thatta district. Building began in 1982, and the cost should come to 28 million rupees.

The station will consist of 12 experimental ponds of 3.2 acres each, eight demonstration/commercial ponds of 12.5 acres, four nursery ponds, a field laboratory, facilities for shrimp processing and feed storage, offices and staff accommodation.

The first crop will be raised from March to June next year, with plans for another from July to December. The production target is 40 kg an acre, totalling 40 tons a year.

Also in the Thatta district, an aquaculture training institute has been set up near Chilya. This will run three month courses for up to 40 trainees at a time.

Holland looks to intensive fish culture



Johan Verreth, chairman of the Netherlands Society for Aquaculture.

UNTIL a few years ago, the main fish species cultivated in the Netherlands were the roach, pike-perch, carp, pike and rainbow trout.

Only the rainbow was grown for the table market, the other species being cultured for restocking Holland's extensive network of ponds, lakes, streams and canals.

In 1985, about 100 tons of rainbow trout was produced by Dutch farmers. Most of the fish is grown in traditional ponds, and one or two people have also recently started to grow them in net cages at the edge of the sea.

But according to Johan Verreth, chairman of the Netherlands Society for

Aquaculture and a researcher with Wageningen University's Department of Fish Culture and Inland Fisheries, climatic conditions in Holland are not really favourable for growing trout.

"Our summers are too warm and our winters too cold," he explained. That is why the seawater cage culture of trout in the Netherlands is facing a number of disease problems. The pond farms are also facing problems with water quality.

The rapidly growing interest in the Netherlands in the intensive warm water culture in recirculated systems of the African catfish (*Clarias gariepinus*) and the European eel stems largely from the pioneering work done by Wageningen University's Department of Fish Culture and Inland Fisheries.

Because the catfish can tolerate low oxygen levels in the water, it has been found very suitable for culture not only in African ponds but also in intensive recirculation systems in Holland.

Stocking densities used by Dutch farmers are said to range from 350 to 400 kg of fish per cubic metre, and at Wageningen University African catfish have even been grown at 500 kg per cu. m.

The Dutch catfish farming industry seems to be dividing itself into a few specialist producers of fingerlings and a larger number of ongrowers. Many of the latter are pig or poultry farmers seeking diversification because of EEC and national restrictions on their traditional farming activities.

KNOWN more for the cultivation of mussels and cockles than for fin fish farming, the Netherlands nevertheless has a small but growing fish farming industry producing for the table market chiefly rainbow trout, African catfish and eels. To find out more

about these developments, FFI features editor Tom Wray went recently to Holland to talk to JOHAN VERRETH, chairman of the Netherlands Society for Aquaculture, and WOUT DEKKER, a member of the R&D group of Trouw & Co. BV International.



A rainbow trout cage farm in Geedereede harbour south-west of Rotterdam.

Trouw's Wout Dekker estimates the Netherlands' total production of African catfish in 1985 to be somewhere between 60 and 80 tons. This year production could jump to 150 tons, and for 1987 a figure of 400 tons has been forecast.

Challenge

But though it had been proved that the African catfish can be grown very easily in Northern Europe, it is a completely new species to most Europeans and presents a tough marketing challenge.

No beauty in the round, the African catfish is however said to yield excellent filets and makes very good eating when smoked. The smoked product has a flavour somewhere between that of mackerel and eel.

But production of African catfish in Holland is increas-

ing too fast and the market is currently oversupplied, said Johan Verreth.

According to a report from the Dutch Agricultural Economics Institute, farms already constructed by 1985 were capable of producing 500 tons a year, and with new investments made this year annual production capacity could have jumped to 1500 tons.

Starting out with small fish of 2.3 mg, Dutch growers can rear African catfish to a market size of 6-700 g in seven to eight months. Feed conversion is said to be close to 1:1, and the production of 50 tons of fish requires about two to three hours of work a day.

According to Wout Dekker, it is not possible to discuss a realistic cost price for the fish because it depends on the size of the farm and the fine tuning of the production system. But in only

three years the African catfish has become a luxury item sold mostly to the restaurant trade, though some fish has been sold through the Paris wholesale market.

"We estimate that prices should be between 9 and 12 guilders a kilo," said Mr Dekker, who is also on the board of the Netherlands Society for Aquaculture. "But after a couple of years it could drop to 6-7 guilders as systems are fine-tuned."

Question

The Dutch success in growing African catfish in warm water recirculated systems posed the question of whether or not that success could be translated to other, more difficult, species such as eels, for which there is a huge unsatisfied market.

That some people think so can be seen from the flurry



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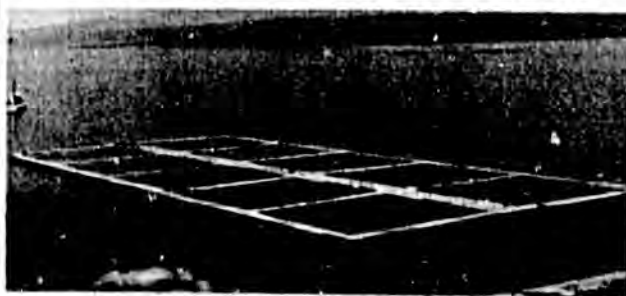
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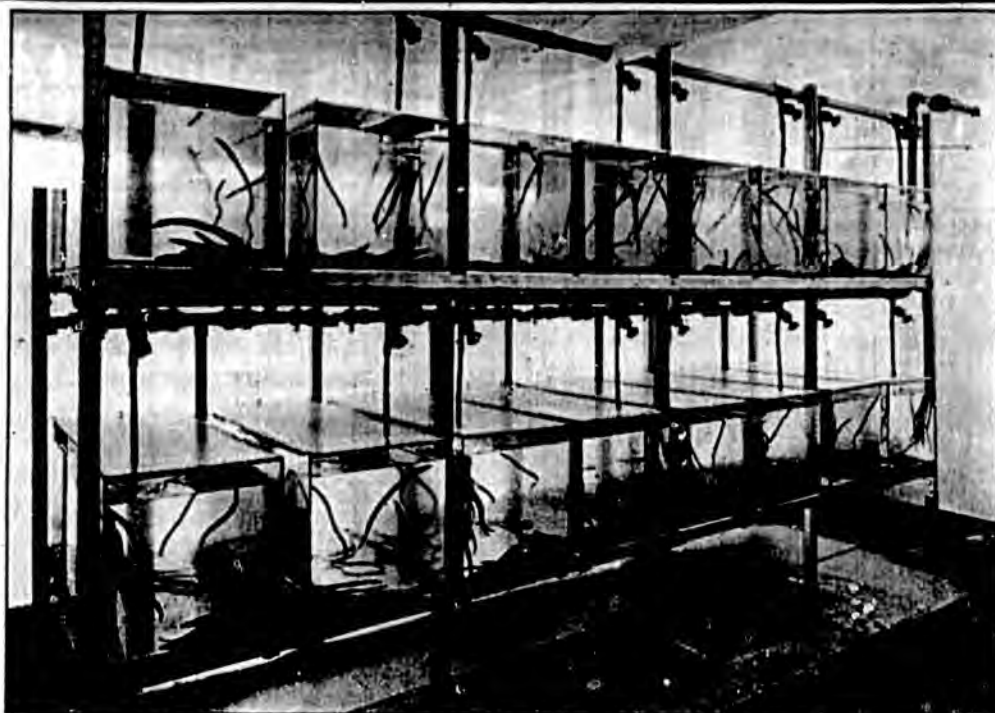


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Eels at Trouw International's rebuilt test farm near Putten east of Amsterdam.

of activity now taking place in Holland. Johan Verreth told *FFI* that a number of huge eel farm projects are in the planning and construction stages with annual production capacities of up to 800 tons.

Biggest Dutch eel farm to be established so far is Texvis BV, a 6000 sq. m operation based on 84 rectangular basins in which it is aimed to produce some 300 tons of eels a year by 1988.

Located on the island of Texel, the most southerly of the West Frisian islands opposite the town of Den Helder, the Texvis plant was set up in January of this year by Dr. E. W. Liewes, a former employee of Trouw International. The eels are being grown in recirculated seawater.

According to Johan Verreth, it is unclear whether or not the eel farms based on recirculation systems are going to be commercially viable in the long run. There is no marketing problem but the rearing technology in recirculation has not "crystallised" and there are some technical problems to solve.

Supply

The major problem for eel growers over the next few years will be the supply of glass eels or elvers. That is why Wageningen University's Department of Fish Culture and Inland Fisheries has started work to try and reproduce eels in captivity. The day that hatchery-reared juveniles can be produced

for growing-on in holding facilities will signal a major step forward in eel culture.

A key feature of Holland's aquaculture is its close relationship with education, research and development. The "know-why" of the research institutes, most of which are in Wageningen, is transformed into "know-how" by experimental stations and development centres all over the country and transferred to the farmer through the extension services.

Johan Verreth and his colleagues hope such a system can be developed for Holland's emerging fish farming industry. Wageningen University's Department of Fish Culture and Inland Fisheries has clearly got

much to contribute, as also has Trouw which has over 25 years experience in aquaculture.

Trouw has recently rebuilt its test farm where feeding trials are carried out on various coldwater and warmwater fish.

At a more practical level, a number of Dutch agricultural colleges and high schools are beginning to offer courses in fish culture. Initiatives are also being taken to provide an efficient fish health care service and to develop a quality control programme.



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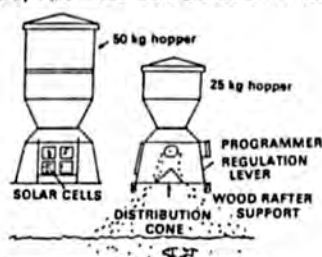
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Sri Lanka link to Stirling

BRITAIN'S Overseas Development Administration (ODA) has set up a six-year formal link for research and training between the Institute of Aquaculture at the University of Stirling in Scotland and the Faculty of Science of Ruhuna University in Sri Lanka.

The link will fund training of staff from Ruhuna in fisheries and aquaculture, collaborative research programmes, and curriculum development for the new fisheries and aquaculture courses being established at Ruhuna.

The Institute of Aquacul-

ture at Stirling is an international institute with students from 22 countries. It undertakes research projects in Africa, South-east Asia and South America, as well as Britain and Europe.

It has had training and research involvement with

Sri Lanka for ten years. Staff from Stirling have also run specialist training programmes and regional training courses in Colombo in conjunction with the British Council on several occasions.

The Institute already maintains a formal link programme with the Agricultural University in Kuala Lumpur and with Songkhla Fisheries Training College in Thailand.

NFU Committee gets a new secretary

ONE of the newcomers to the annual Two Lakes Conference at the Hampshire College of Agriculture in September was Judy Rockcliffe, who has been appointed secretary of the Fish Farming Committee of the National Farmers' Union.

"My mother, being a Londoner, brought me up to favour fish, and lamented the lack of supply through the 1960s and early 1970s," Judy told *FFI*. "So the growth of the fish farming industry, and the greatly increased interest in fish as a food, has been greeted with great pleasure by my family."

Judy has an MA degree in English literature from the University of Manchester.

She first became involved in agricultural politics in 1982 when she joined the NFU to work for the late Peter Jones, then director of the Intensive Livestock Division.

"That was in the days of the whirling disease and preparation for the Diseases of Fish Act," she recalled. "It was also when abstraction licensing, an issue which is still very much with us, was first raising its ugly head."

From Peter, I learnt that, however indirect the link may be, politics affects producer prices, whether it is something which increases costs of production or whether it is an influx of imported fish.

"But, as I see it, the NFU's job is not only to fight against proposals which may damage fish farmers' interests, but also to initiate action which will be of positive benefit to the sector."

"It is important, I believe, for producers to have an input into R&D programmes, for example. Only they know, from a practical on-the-farm basis, what information is really required."

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Asks Michael Ingram

TROUT farming is considered to be a rural activity, forgetting for a moment those enthusiasts who utilise front-line technology with specialised recirculating systems.

In its guise as a peaceful occupation — one with nature itself — fish farming used to be a business which tacitly accepted the occasional loss of stock to the local poacher. Indeed, only a few years ago in my local pub I was regularly taunted by my neighbours with their aside comments such as "one of your fish leapt into my frying pan last night!"

Situated as we are in a quiet out of the way glen, adjacent to the sea, Clearwater Trout Farm used to be protected by a few ancient strands of rusty barbed wire. In fact, this defence used to take such a toll on waders that it was eroded as quickly as possible in most major areas of access to the ponds.

The word "security" rarely entered our vocabulary except as regards the float alarm on the main broodstock pond. Even this was attached to an audible alarm that was so quiet, passing herons used to perch on it before partaking of their daily breakfast.

In time, however, as the farm expanded with the development of the higher technology disease tested all-female and triploid ova, the necessary value of the broodstock requires that more serious thought should be given to both major aspects of security — the control of the

stock and its defence from predators.

The control of the stock (i.e. the use of measures to maintain the *status quo*) was relatively simple to set up.

Originally, a one third home-made float alarm (with the inaudible bleeper) was the sole defence against disaster. In fact, a few days before the purchase of the farm a blockage in the inlet raceway had been the cause of a fish kill which effectively halved the value of the stock (but doubled the expected time sale to achieve commercial viability). The silent alarm can therefore be considered as a totally useless security aid.

Broodstock farming is a specialised business in many ways but its major weakness, with regard to the damage caused by loss of stock, is the time lag to replace such losses. Even more important is the effect on customers who may never receive their eggs.

These eggs are often pre-sold many months in advance, the numbers available determined by the broodstock on the farm. Both the gradual reduction

of stock due to intermittent stealing and the larger losses which can be caused by other, more controllable factors, can result in a damaging shortage of fish at the crucial spawning time.

Easy target

Broodstock are best left alone for much of the year to avoid unnecessary stress. Unlike an on-growing farm, sorting and grading is minimal and opportunities to count the stock are very rare.

By the third year of commercial operation at Clearwater, it was clear that the farm was an easy target for the local thieves (poacher is not a word to use on those people who steal other people's livelihoods) and the

security had to be drastically reduced.

The audible float alarms which had been installed at two or three critical points (in place of the silent tweeter) were the cause of ill-feeling with the only non-farmer whose house overlooked the site. It was apparent that some of the fish took great delight in wellying the float in the dead of night at very unsocial hours!

Purchase of a telephone alarm system removed the nuisance to some extent although the effectiveness was often tempered by an infuriating habit of ringing one up at three in the morning, only to be told that "all systems are normal!"

The computer HAL in the film 2001 has nothing on the

telephone alarms in the Clearwater hatcheries! The only real problem with this form of security alarm is that it is totally dependent on the telephone being replaced on the receiver at the end of the day, and there being no fault on the line.

For example, one of our local residents was being woken at all hours of the night, completely unbeknown to ourselves, by the telephone alarm apparently making its own secret assignments.

But, even at a cost of between £400 - £1000 and coupled with the use of radio-pagers at £35 a quarter, the system still proves its worth time and again; linked as it is to the oxygen electrodes, mains



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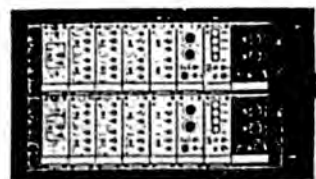


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electricity relays, float alarms and intruder alarms.

With regard to intruders, Clearwater has suffered more than its fair share of unwanted visitors. On the broodstock farm where each fish is valued somewhere between £30 and £100, the removal of any stock is a serious offence as far as we are concerned.

Due to the technological use of powerful lights over the ponds for the photoperiod regime, it was considered that these would be a considerable deterrent — along with a six foot chain-link boundary fence, topped with barbed wire. Unfortunately, modern-day education obviously includes A-levels in fence climbing and after chasing innumerable youngsters across and over the fence it was obvious that even more defence was required.

At an ever spiralling cost, each pond was surrounded

with chicken wire and netting strung across the top. While this netting did not prove a major obstacle in itself, it at least showed if a forcible entry had been made. This is vitally important as the removal of small amounts of fish on a frequent basis can often be more damaging than a 'major removal.'

The chicken wire had the added advantage of making it more difficult for the herons and cormorants to satiate their appetites as they wished. I say "more difficult" because, since the enclosure of the ponds, herons have been observed working their way under the netting (lifting out the staples) and also diving straight down through the overhead netting (six to nine inches square) — and flying straight up again.

Pubs may be open all day on the Isle of Man but such visions have assuredly been



Pond completely netted with artificial light overhead.

noted! Whoever designed a system of two strings around a pond to protect it from herons was either a secret ornithologist subscriber to the Save the Heron Fund or was working with sub-normal, paraplegic birds!

Anyway, apart from such predatory attacks through the netting itself it was considered that, by the summer of 1985, the farm was reasonably well guarded against all but the most determined of thieves. At some point an economic decision has to be made in a business such as fish farming as to how much stock can afford to be "lost" to unknown causes. With a capital investment of some £4000 in fencing, a 24-hour alarm system and variable lights over the ponds, Clearwater was considered to have reached the limit of sensible expenditure on stock protection.

Then, in one night in Sep-

tember 1985, our illusions were rudely shattered. Thieves cut through the chainlink boundary fence, slashed the netting away from one of the ponds and removed about half-a-ton of prime brood fish — one month prior to spawning time!

Prompt announcements over the local radio, contact with all restaurants and hotels and a reward offer of £1000 succeeded in preventing the sale of the fish. But the loss was irreplaceable. A potential one million eggs at a value of £10,000 (as triploids) had been removed from our pre-sold stock.

The solution was clear. High-value stock has to be protected efficiently and effectively and professional methods have to be employed.

On advice from the police (who along with ourselves knew who the perpetrators of the deed had been but



Spawning pond completely netted over. Floats hold airtight for back-up air supply.

were unable to prosecute) and from various security firms, two highly trained guard dogs were purchased — to provide a 24-hour cover.

Similarly, a second chain-link fence topped with an angled barbed wire was erected six feet inside the existing boundary fence around the whole of the farm. Warning signs were placed on all sides of the farm and entry restricted to farm personnel only.

The end product? To the best of our knowledge, no fish have since been stolen from the farm.

One thing is certain. If you have stock of any value, somebody will try and remove it — free of charge. Nobody should consider themselves exempt from this risk and proper provision must be made in budgets for both capital and on-going expenditure on security. The recovery time in fish farming

can be longer than one anticipates.

Today, the fish at Clearwater are safer, but much of the pleasure has been removed from the farming. Even after one had ventured through the double gate at the farm entrance, dipped feet in the disinfectant, and walked gingerly past the baleful glare of the guard dogs (there are now four due to the farm manager discovering a latent love for man-eating hounds), one is still trapped between the confines of chainlink and barbed wire.

As the setting sun silhouettes the barbed wire, red above the sinister black, wolf-like shapes of the guard dogs as they patrol the outer fence, I often dream of owning a quiet rural trout farm in some secluded corner of the countryside, ideally beside the sea — maybe on an island somewhere — where it is safe...? *

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Prawn larvae are born into a hectic world. In the first few days of life the larvae must moult 15 times. A time of great tension.

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In tests in hatcheries around the world, FRIPPAK diets have substantially out-performed all alternatives. They have proved outstanding value for money to hatchery operators by improving larval survival rates, and

enabling optimum growth rates to be achieved. By enabling hatcheries to be a more reliable source of post-larval prawns, FRIPPAK diets are a big marketing plus.

Building on this success, FRIPPAK is now developing new maturation feeds for prawns. In addition, diets are being developed for other sectors of the aquaculture industry including bivalves and fish and considerable success has already been achieved.

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UK firm offers valves and pipes

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A BOOST in profitability is being offered to aquaculture users of imperial PVC fittings and pipe by British PVC specialist Elspa Ltd.

"On offer is the very highest quality metric product range rated 16/20 bar, which gives savings of an average of 50 per cent against established manufacturers," says Elspa.

According to the company, the fittings are used extensively in the European market already — especially in Norway where there is now a heavy demand for this type of product.

Although Elspa's experience is still in its infancy in the aquaculture business, it says it has become increasingly aware of how its range of PVC

valves, pipe and fittings complements the needs of developing fish farmers.

The firm's PVC ball valves are available in both single and double union from 20 mm to 110 mm (1/2 to 4 inches) BSP or plain inch.

Pipes are available in a comprehensive range and are offered at "extremely competitive prices".

Elspa's PVC material consists of closely knit mixtures of quality compounds. With an experienced mixture of these additives, the polymer is converted into sound, durable extrusions and injected mouldings to the highest standard required.

The resulting pipe and fittings have an exceptionally smooth bore and finish, with a high input strength, says the company.

Fittings perhaps constitute the most complete area of Elspa's programme. Not only does it offer the metric and imperial 16 bar, but also a metric 10 bar and "quite uniquely", a 'non-pressure' range (up to 5 bar) with either glue or push fitting joints.

"The economy of this system makes a lot of sense in aquaculture for it gives more than enough quality for a fraction of the cost of a 16 bar fitting," says Elspa.

Information pack from Elspa Ltd., Badsey Fields Lane, Badsey, Evesham, Worcs. WR11 5EX, United Kingdom.

Solar power for Sunfeedy

AS REPORTED briefly in FFI last month, French-made Sunfeedy machines for dispensing dry pellets in fish farms were shown for the first time in an international show at Acquacultura 86 in Verona.

These solar-powered feeders are able to work independently of any other power source. And FNI was told in Verona that they work well even in the cold and cloudy weather of winter.

At present the machines are made only in France and the firm Zigfa International is introducing them to farms around the world. These include farms in Japan where the importing company takes the machines in parts and assembles them locally.

Trout farm

According to Zigfa, the first Sunfeedy machines were tried out in a trout farm in the northern Champagne area in France.

The standard Sunfeedy weighs only eight kg. It works directly from solar energy.

Specially designed for farm ponds and pools, it is said to be easy to install and can be easily moved. From ponds, its use has extended to cages. One recent application is feeding red sea bass in a cage farm in Corsica.

The Teretilex transparent plastic hopper of the standard model holds 25 kg of feed. The small motor is powered by four solar cells.

It can dispense a variety of pellet sizes at feed rates from a few kilos a day to 20 kilos an hour. The machine can be stopped at any time.

The machines can be supplied with larger hoppers of 50 kg capacity.

They are also available in more sophisticated versions fitted with a timing system for programmed feeding.

Further information from Zigfa International, Arcier, 25220 Roche-Lez-Beupre, France. Telex 361597.

Norway firm sets up in BC

T. SKRETTE A/S of Norway has set up a subsidiary company in Vancouver, British Columbia.

Called Aquatess (Canada) Inc., the new company will market the full range of technical equipment supplied by Skretting.

At present, the general manager Alan Osmond, an engineer with wide experience in marketing, is supported by product manager Hermann Hummer-voll from the Skretting organisation.

Sales people are presently being recruited and trained.

It is expected that the organisation will have seven to ten people working within

a year. Staff will include project engineers covering hatcheries and sea cages.

"The aim of Aquatess is to provide high-quality products and a first-class service," says Skretting.

"Based on our wide experience in the fish farming industry and backed by the Skretting organisation, Aquatess should have a flying start."

Aquatess (Canada) has its offices at 890 West Pender Street, Suite 730, Vancouver, British Columbia, Canada V6C 1K5.

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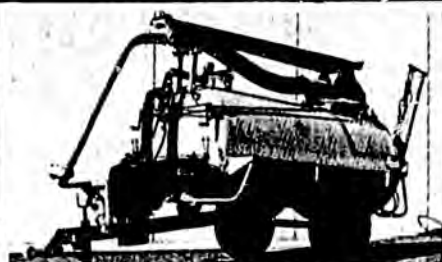
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Shetland farmers dispute rent claim

SALMON farmers in Britain's Shetland Isles say they are determined not to submit to the Crown Estate Commissioners' demand that they pay £50 a ton of fish produced. And, according to Dr. Alistair Goodlad, chief executive of the Shetland Salmon Farmers' Association, there is every possibility that the Commissioners have no right to make the charge anyway.

At the heart of the problem is the question of who owns the seabed around the Shetland and Orkney Isles, where the old Norse system of Udal Law has never been repealed. Under Udal Law, the Crown has no claim to the foreshore, which belongs to the owner of the adjacent land.

"We asked the Crown Estates Commissioners to give us evidence that they are the landlord," Dr. Goodlad told FFI. "They have replied saying that 'The Crown is by prerogative right the owner and, in Scotland, paramount superior of all lands covered by the seas adjoining the coast or by arms of the sea of public navigable rivers and also, with the exception of Shetland and Orkney at least to the extent that the land there has not been feudalised, of the foreshore and land between high and low water mark.'"

The Commissioners claim that there is "a presumption of ownership in favour of the Crown and the burden of proof of title and posses-

sion to the contrary is on a claimant."

They go on to say that the position under Udal Law as affecting foreshore in Shetland and Orkney is well known and understood but there is "no law or practice known to them which suggests that the Commissioners are not entrusted with management on behalf of the Crown of seabed below low water mark around Shetland and Orkney as well as elsewhere in the United Kingdom."

Researching

Some of the best legal brains in Norway are presently researching the status of Udal Law, and this contribution to the argument could be of vital importance not only to Shetland's salmon farmers but to fishermen as well.

Even if it is proved that the Commissioners do have the right to ask for what they call a rent, the amount they are demanding threatens to cripple Shet-

land's emerging salmon farming industry before it can get fully underway, said Dr. Goodlad.

"The way it seems to us is that as long as we were just making a living from the sea that was okay," he said. "But as soon as we start to turn it into a business that can generate profits and help to employ other people on the islands, the Crown wants some of the action."

Nothing

"It's a rip-off. They call it a rent. It's no rent, it's a levy, a tax. A landlord provides a roof over your head

and provides various services. We get absolutely nothing from the Crown Estate Commissioners."

Dr. Goodlad told FFI that the amount Shetland salmon farmers are being asked to pay the Commissioners from January 1987 will jump from £20 a year to £6000-£15,000 a year depending on the amount of fish produced. And with next year's harvest scheduled to reach around 3000 tons this means that some £150,000 a year could be "creamed off" the Shetland salmon farming industry.

"The National Farmers'

Union and the Scottish farmers have largely acquiesced to the Crown Estate Commissioners' demands," he said. "For some of them £50 a ton may not mean very much. But most Shetland salmon farming companies are in the throes of early expansion. They still have heavy debt loads and it will be three or four years before they will have any surplus money with which to do anything."

● FFI features editor Tom Wray visited Shetland recently and his report on fish farming developments there will appear next month.



Alistair Goodlad, salmon farmer and chief executive of the Shetland Salmon Farmers' Association. "The Crown Estate Commissioners want £150,000 a year from us and they are not going to have it," he says.



Salmon harvested from one of the many sea cage farms now established in Britain's Shetland Islands, where the industry is already set to produce some 4500 tons by 1988.

HIDB launches salmon drive

A MAJOR new initiative aimed at maximising the return to the Scottish Highlands and Islands from farmed salmon is being launched by the Highlands and Islands Development Board.

The scheme will link farmers and processors with a range of professional services for salmon product development that could include market research; technical research and development; production development; packaging and design; and marketing. Financial help towards the cost of this professional advice could also be available.

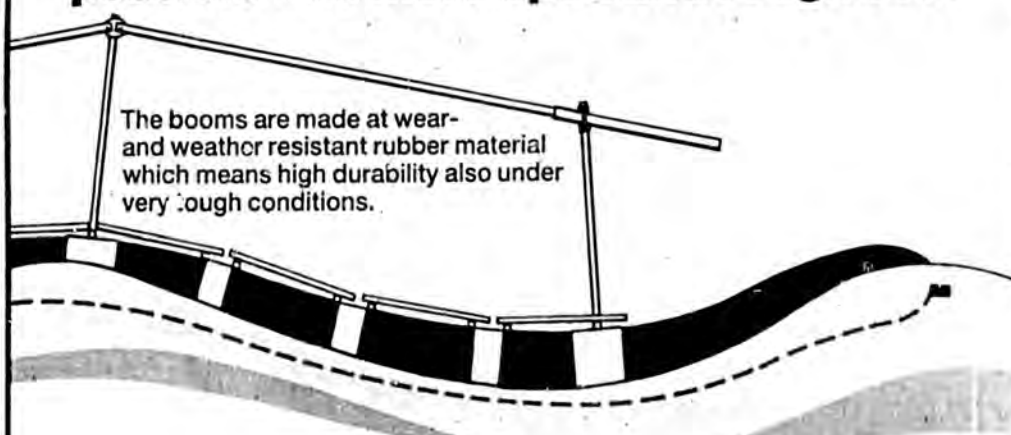
Alastair Alexander, head of product marketing at the HIDB, said: "The salmon industry is one of the fastest growing sectors of the local

economy and it is vital that we ensure that the area derives maximum benefit.

"New product development is one of the keys to the future success of the salmon industry which at present is dominated by fresh and smoked salmon. This scheme, which will act as a 'marriage bureau' between companies and sources of expertise, is designed to encourage the development of new products and ultimately to increase the processing industry in the Highlands and Islands."



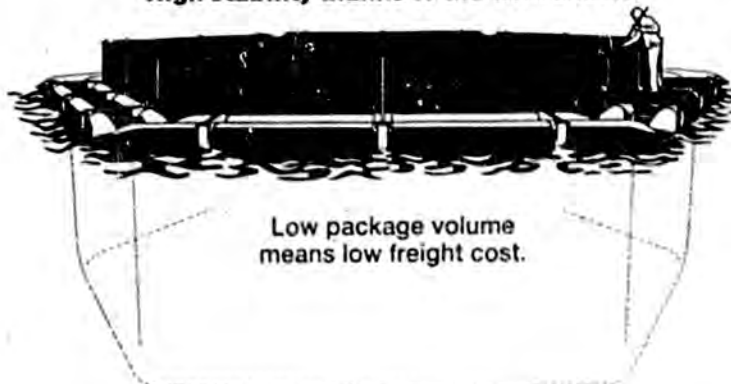
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