

SCOMM

#36:34



Alaska State Legislature
House of Representatives

Special Committee on Fisheries

Pouch V
Juneau, Alaska 99811
(907) 465-4924

CHAIRMAN
ADELHEID HERRMANN
VICE-CHAIRMAN
JACK FULLER
MEMBERS
CHARLIE BUSSELL
BEN GRUBENDORF
PETER GOLL
JACK MCBRIDE
FRED ZHAROFF

MEMORANDUM

TO: Representative Adelheid Herrmann
FROM: Deborah L. Greenberg, Committee Aide
DATE: December 16, 1983
SUBJECT: Analysis of the HISTORY OF HATCHERIES to Determine Support and Opposition for Hatchery Development

You asked me to look into the history of hatcheries so that we could understand the reasons why the financial and the political support hatcheries enjoyed at one time, does not seem to prevail now. I have interviewed several people involved with hatcheries issues as well as many who had first hand experience with their development. This memo also covers my review of the key sources of written information that best portray this history.

GENERAL OUTLINE OF HATCHERY HISTORY

Below I have outlined the most salient events in the history of hatcheries development, and have focused the remainder of my discussion on how that history affects current issues.

1878: Initial large scale harvest of 56,000 salmon for the year.

1878 - 1936: Steady increase in annual harvests. PEAK harvest level in 1936 of 126.4 million salmon.

Hatcheries were MANAGED BY THE FEDERAL GOVERNMENT.

Substantially greater emphasis was placed on SOCKEYES.

1936 - 1951: Most hatcheries had closed Very FEW HATCHERIES were in operation.

1960: The State gains control of fisheries management from the federal government. HATCHERIES IS NOW A STATE ISSUE.

Hatchery History
December 1983
Page two

- 1941: A steady DECLINE BEGINS of many important salmon runs.
- 1960: A FISH FOOD IS DEVELOPED that makes hatchery production significantly easier, and the interest in hatcheries is revived.
- 1960 - Now: The emphasis of hatchery production is on PINKS, not Sockeyes, due to disease control problems.
- 1941 - 1967: Annual harvest levels decline until 1967 when hitting an annual low of LESS THAN 21 MILLION SALMON. 1971: As a result State, the legislature established the FRED DIVISION.
- 1972: In a continued response to the low salmon harvest and other reasons, the Legislature passed the Limited Entry laws establishing the the Commercial Fisheries Entry Commission (CFEC).
- 1972 - 1975: The FOUR LOWEST CONSECUTIVE ANNUAL SALMON HARVESTS OCCUR.
- ? Voters pass BONDS to help finance hatcheries with strong support.
- 1974: PNP HATCHERY program was established.
- 1976: The legislature established REGIONAL AQUACULTURE ASSOCIATIONS.
- 1980 - 1982: Annual harvests for these years AVERAGE HIGHS OVER 110 MILLION salmon. This is thought to be a result of hatcheries, limited entry, and better environmental conditions.

CURRENTLY: Two controversial issues threaten the State hatchery program:

- The issue of whether hatcheries is the best mechanism for strengthening salmon runs, given the biological, economic, and environmental costs.
- The issue of whether hatcheries are better managed by the State, by Private Nonprofit, or by Private profit agencies.

HISTORY OF SUPPORT FOR HATCHERY DEVELOPMENT

As you can see from the history above, fisheries resource managers, have responded to annual declines in salmon harvest levels by using a combination of the following three mechanisms to strengthen runs:

1. Regulation of the harvest, through the Board of Fisheries, Limited Entry, etc.
2. Artificial Aquaculture techniques, such as hatcheries, and
3. Habitat management.

Of these, habitat management has been the least emphasized as a solution to the problem of strengthening salmon runs.

Supporters of hatcheries have had similar motives throughout the history of the State. The most important of these are discussed below.

Hatcheries have been strongly favored when there is a desire to increase the levels of stock dramatically for economic reasons. The initial hatchery program in the State was established by the federal government in response to the demands, and the potential, of what was then a new and developing large-scale industry. In response to the decreasing annual harvests through 1967, and low harvests, thereafter, the FRED division was established as a full scale hatchery program to restore the State's salmon resources, and ensure survival of the State's second largest industry.

As these events demonstrate, one of the most compelling arguments in favor of hatcheries, is the trend in declining salmon runs. If hatcheries are operating successfully, they can provide several advantages to the industry. The numbers of naturally occurring stocks, fluctuate dramatically and somewhat unpredictably, and hatcheries can serve to make the impacts of these fluctuations less burdensome for the fishermen. In addition, the numbers of fish available for harvest can be adjusted to meet the demands of fishermen and the market.

As other nations are rapidly developing their fisheries industries in response to the growing concerns for protein supply and resource development, competition for the resource and access to the market becomes greater. Hatcheries supporters for a long time have speculated that unless Alaska becomes more involved in developing its own fisheries resources now, that State's fishermen will quickly lose a competitive advantage over foreign interests, and even over other states on the Coast. Many other important fishing countries which have developed hatcheries include the Soviet Union, Norway, Japan, and Canada.

HISTORY OF OPPOSITION TO HATCHERIES DEVELOPMENT

Several biological, economic, and as always political concerns have been raised about the value of State support for hatcheries. I will address these questions in regards to hatcheries in general here, and reserve the discussion about the State vs. PNP or other management, for the last paragraphs.

One of the major reasons why the State no longer seems to be actively supporting hatcheries development has to do with the overall change in State policy toward fisheries development as a whole. When oil revenues were anticipated and first received by the State, there was a policy of reserving portions of these funds for the development of the State's renewable resources, especially fisheries. As the years have progressed this no longer seems to be the case. The lack of State commitment to the fisheries development as a whole has resulted in even less funding for hatchery development specifically. And of course, as State oil revenues dwindle, the competition for funding increases sharply. Programs that are not as well established in the State tend to be the first affected.

Among the most major biological questions raised about the wisdom of developing hatcheries as a management tool concerns the disease control problems and the gene pool problems of the future involved with rearing fish. Because a hatchery attempts to mass produce many fish in one location, diseases that would ordinarily only affect a segment of the fish population could threaten large numbers of stock at once, and in turn have a major impact on the industry.

I have reserved the discussion about the genetic implications of hatcheries until I can consult further with Mel.

An additional criticism of hatcheries that has been made by opponents throughout time is that fish weirs impede many important fish runs in the State. Many feel that hatcheries can adversely affect the environment by impeding natural runs, and that better habitat management would have more advantages for fisheries resources and the environment both.

Any hatchery manager is responsible for making important decisions resulting in economic impacts on the fisheries industry. This includes determining what kinds of fish are produced, and for whose benefit. Hatcheries have tended to operate most successfully in recent years, by producing pinks. In many areas of the State, however, other species such as chinooks, or sockeyes, constitute the important runs. This discrepancy raises the question about the economic value of the hatcheries to the State and to the fishermen. If, as a result of hatcheries' pink production, a whole new market for pink salmon is created, then how does this impact fishermen (and to a lesser degree processors) traditionally harvesting other species? If hatchery managers can determine what species to produce and in what quantities, these decisions could well be based on factors such as the willingness of the fishermen to fish, or on the preferences of processors to buy? There are no guarantees that these decisions won't be made solely for the benefit of one user group or one sector of the industry, rather than for the resource as whole for the maximum benefit of all users.

These concerns vary throughout the different fisheries in the State in relation to the species which comprise the critical runs, and the influence of those parties who would like to benefit from hatchery production. Support for hatcheries is often met with resentment by those who feel that State hatcheries in many regions of the State were located for political reasons rather than for sound biological or economic considerations.

THE STATE VS. PRIVATE NONPROFIT VS. OTHER MANAGEMENT OF HATCHERIES

The most current controversy about hatcheries concerns the proposed transfer of hatcheries from the State to the Private Nonprofit aquaculture associations, or other private organizations. While I do not intend to debate the merits of each proposed bill on this topic, I will address the issue in general.

The preference for hatchery transfer from the State to the Private Nonprofits (PNPs) in part stems from the lack of confidence in the State to manage the hatchery program well. Many individuals have felt that for the amount of time and money that has been sunk into FRED that there is relatively little to show in the way of returns, and that therefore it is time to let the the private sector demonstrate its capabilities. For many others there is just a belief that without the transfer, the State is functioning to impede free enterprise. There are also concerns that the State is in no position to be involved in an enterprise that might eventually involve large scale selling of fish, and that the State through hatchery production should not be allowed to have so much potential power in affecting the market.

Many groups have pointed to PNP management as an opportunity for fishermen and other concerns to exercise local control of local resources for local benefit.

The overall problem of PNP operation of hatcheries stems from the notion that fisheries resources need to be managed comprehensively for the State and that PNP control of hatcheries would threaten sensible fisheries management. This concern is particularly highlighted by those who feel that not all PNPs or aquaculture associations are equally capable of accepting the responsibilities that go along with hatchery management. For instance, the problem of disease control and the genetic implications for stocks are problems that are more difficult to handle if hatchery control is segmented and the responsibility of each hatchery to protect the State's resource is questionable and vague.

Many assert that the push for PNP ownership and management of hatcheries in some regions of the State, comes from individuals or small groups eager to exercise self-interest through hatcheries management. Again this seems to vary widely from region to region depending on the circumstances.

The economic issues connected with PNP management are also pointed to as reasons to retain State management of hatcheries. It is not clear whether managers would produce fish on the basis of what is needed in the market place, what is desired by processors or what is being fished by fishermen, or whether this would be done solely for the purposes of trying to supplement declining stocks in important runs. Others fear that if hatcheries encounter financial difficulties their production decisions will be based on economic benefits alone with little regard for the necessity to produce stocks in an effort to ensure sustained yield of resources on the decline.

Many fishermen, also fear that if management is in the hands of private nonprofit organizations that private for-profit hatcheries control would soon follow. Aside from posing economic problems similar to those posed by PNP management, there is the additional reservation that private-for-profit management would not enable the Board of fisheries, State biologists, and resource users to obtain adequate information required for evaluating a whole array of fisheries management questions.

ADDITIONAL INFORMATION

I am including for your review the best materials I have been able to find pertaining to the history of hatcheries. Each has its own slight bent but still provides valuable information. The book by Patricia Roppel on the history through 1959 is also good and we might want to order it. I also could easily compile more information on related topics if you would like. I hope you find this information useful.

1. Alaska Fisherman, "Report: Alaska Aquaculture"
September/October 1982, Vol. 9 #11.
2. Ohls, Carl, Alaska Fisherman, A four part series on Aquaculture Associations,
November 1979, Vol. 7 #3
December 1979, Vol. 7 #4
January 1980, Vol. 7 #5
February 1980, Vol. 7 #6
3. Moberly, S. A. A review of Alaska's Fisheries Rehabilitation, Enhancement and development (FRED) Program 1971-1982 # 3, FRED Reports, October 1983.
4. Roppel, Patricia Alaska's Salmon Hatcheries 1891-1959, National Marine Fisheries Service 1982, 300 pp.



Specialists in marine aluminum fabrication since 1959. Offering a complete line of aluminum products for the commercial fisherman and fish processor.

ALFAB

178 Dayton Avenue West
Edmonds, Washington 98020
Phone: (206) 776-8222



HYDRA-ELECTRIC

Get Your Order In
For This Year Now

- Gillnet Drums & Level Winds
- Halibut Drums
- Herring Shakers
- Automatic Purse Seine Winches
- Double Sheave Deck Winches
- Power Rollers
- Pot Pullers

4894 GUIDE MERIDIAN
BELLINGHAM, WA. 98225
(206) 733-3116 or 398-8855

MARINE VIEW BOAT BUILDING COMPANY

We Beat Seattle Prices

- ★ New Construction ★
- ★ Repairing & outfitting,

EMBRYO



Newly hatched cohos with egg sacs mingle with embryos at an Alaska Department of Fish and game hatchery.

ADF&G photo

Private fish farmers beset by problems

Editor's note: One of the most ambitious economic programs ever attempted by the State of Alaska is its program to rebuild the state's salmon runs to support all-time high harvests of 100 million fish a year. If short-term problems can be overcome, the state's aquaculture program has the potential of eliminating the ups and downs that have plagued Alaska's salmon industry.

So far, the short-term problems have been numerous and the returns from the investment of millions of dollars of tax dollars minimal. The *Alaska Fisherman* is launching a four-part series that will take an in-depth look at where the program is now and what hurdles must be overcome.

The first article focuses on the private aquaculture associations, and subsequent articles will deal with state-run hatcheries, biological uncertainties

modern technology to efficiently harvest a resource grown by them. The evolution of fishermen into cultivators holds the promise of eliminating the hunter's age-old problem of dependence upon the vagaries of Mother Nature.

A key element in this change is giving fishermen the opportunity to farm salmon themselves through the private non-profit regional aquaculture associations. A creation of the 1974 and 1976 state legislatures, the concept is designed to minimize direct state participation and allow fishermen to control, and pay for, the rehabilitation of the fishery.

John Sund, chief aide to Speaker of the House Terry Gardiner, said aquaculture is the "second prong of limited entry. Limited entry gave fishermen an incentive to conserve fish. If you conserve today, you reap

Association (NSRAA), with its diverse number of fisheries and committees, would have a "hell of a job" trying to collect a voluntary assessment on an annual basis.

Sund discounts the Prince William Sound Aquaculture Corporation's (PWSAC) success at supporting itself with a voluntary assessment because PWSAC has had "a hand-to-mouth existence" and uses "an awful lot of volunteers."

PWSAC, in fact, is considering using some sort of mandatory assessment once the legal mess is straightened out.

Armin Koernig, PWSAC general manager and president, said, "My own feeling, as a fisherman, is I'd like it to remain voluntary. That's the best check on the support you have from fishermen. However, to build a 20 year financial commitment it may not work because bankers like to have more security." (See related story on page

★ Conversions ★

★ Drydocking ★

5420 MARINE VIEW DRIVE
TACOMA, WA 98422

(206) 627-1742

Fresh water
from
sea water!

... priced as low as \$2990.

... the Village Marine water system is designed to provide for gallons a day of fresh water. The device is in use on a boat, completely self-contained and easy to install. Just 4 connections. All under \$3000. (See related story on page 12)



Village Marine proven, effective system was designed especially for Marine use. Fresh water for drinking, bathing, cooking and cleaning is instantly available.

Call or Write:

MARLAND ENTERPRISES

4401 23rd W., Seattle, Washington 98199

Phone (206) 284-3906

BY KAT OAK

After going through periods of over-exploitation, neglect and tight regulation, Alaska's commercial salmon fishery has entered an era of replenishment.

This new phase could foreshadow a change in the traditional roles of fishermen as hunters to farmers using

this problem when in 1971 it created the Division of Fisheries Rehabilitation, Enhancement and Development (FRED) in the Alaska Department of Fish and Game. One of FRED's responsibilities is running a statewide hatchery program.

In 1974, legislation passed to open up the hatchery business to qualified private nonprofit corporations. In 1976, the law was rewritten to give fishermen direct responsibility for rebuilding salmon stocks through the vehicle of regional nonprofit corporations.

Still in their formative stages, the corporations have been beset with problems. As a new concept, the corporations don't have much experience to fall back on and have felt their way through all sorts of novel situations.

The main problems seem to be old rivalries between gear groups, a shortage of brood stock, lingering doubts that science is capable of duplicating the quantity and quality of the natural runs, personalities, and questions over how to raise money. The funding problem currently is the biggest roadblock.

Most of the corporations are in a holding pattern right now because of the uncertainty over financing. The mechanism the legislature created for fund-raising — a mandatory assessment on the catches of all fishermen in the region — has been declared unconstitutional by a Superior Court Judge. (See related story on page 12)

The general consensus among corporation managers and political leaders is that a voluntary assessment won't work.

Sund, who helped write the contested assessment law, said the Northern Southeast Regional Aquaculture

Alaska's five private, nonprofit regional aquaculture corporations are in varying stages of development, all are laboring under problems unique to their regions, and all have taken different approaches to running their programs.

The Southern Southeast Regional Aquaculture Association (SSRAA) and its Panhandle counter-part, NSRAA, have much more in common than most in that they share a lot of the same problems. Both are trying to weld together gear groups — gillnetters, seiners and trollers — that have little use for each other because of long, bitter battles over access to the salmon resource.

The gear groups disagree over what kind of facilities to build and what kind of species of salmon to concentrate on. Seiners, in general, are critical of the private nonprofit aquaculture program in Southeast Alaska because of communication problems, a feeling the projects have nothing to offer them, and conflicts over special harvest permits.

A case in point is SSRAA's chum egg take at Disappearance Creek on Prince of Wales Island. Michele Zerbetz, executive director of the Southeast Alaska Seine Boat Owners & Operators, sent a letter to the state Board of Fisheries charging the egg take represented a turn-about from biological management to political management.

The escapement goal was raised to provide for hatchery brood stock creating a conflict with seiners who wanted to fish the area. Board members Jim Beaton said the special harvest permit was granted because, "We felt the board was under

(Continued on next page)

Shelton said. "There's a willingness to see if development is appropriate under some circumstances. The legislative mandate to guarantee the

Anchor
behave
glacier wa
a 65 million

(Continued from previous page)

legislative mandate to guarantee the egg take."

Zerbetz addressed the issue in her letter. "Now that an organization like SSRAA has borrowed millions of dollars from the state and has built a hatchery," she wrote, "the state is in a position of having to insure that their money is returned. Therefore, decisions are being made that result in a political management for our fisheries resources."

The long-range problem Zerbetz sees is a trend will develop to give hatchery stocks priority treatment resulting in the dominance of artificial salmon over natural runs.

The whole question of special harvest permits becomes a thorny one when thrown into the lap of the Board of Fisheries, which has the power to sort out the conflicts and approve the permits.

Beaton said only a couple of permits have come before the board and each involved an insignificant number of fish. But the permits do cause "a lot of emotional problems and headaches for us because a lot of people are against it, as you well know, and they show up at the meetings" to complain.

So far the permits have been granted because the board felt it was in the "broad public interest to allow this to come about," Beaton said the permits have not caused the disruption of any major fishery but that "could be a problem down the road."

SSRAA used the Disappearance Creek brood stock in its new hatchery, the Whitman Lake central incubation facility (CIF) on the Ketchikan road system.

With the CIF, SSRAA is attempting to meet the needs of all the gear groups. "The design is very flexible," said executive director Ron Wendt. "We have the capacity to incubate and rear 26 million eggs. Our plans call for three separate runs, — coho, summer chum and fall chum."

Shelton said. "There's a willingness to see if development is appropriate under some circumstances."

The Salmon Creek/Twin Lakes hatchery will rear cohos, summer chums and pinks, and will feature a visitor's interpretation center. The facility is a joint effort between NSRAA and the Juneau City Borough.

Because of the NSRAA financial situation, Poon said the association stresses projects with "very extensive multiple-agency cooperation."

In the works are an evaluation of over 30 lakes for a lake stocking program, a survey of the Chilkat River for a cooperative habitat improvement project, a sockeye lake fertilization program, and the development of portable hatcheries.

Poon said the projects were put together from a survey sent to all fishermen in the region and from public hearings.

The Cook Inlet Aquaculture Association (CIAA) also is in something of a holding pattern. Though not a party to the lawsuit, CIAA is having all the money collected from its two percent mandatory assessment held in escrow pending the Supreme Court resolution of the case.

In the meantime, a number of projects are underway, according to the executive director Floyd Heimbuch.

A test incubator has been set up at the Eklutna Lake Power Plant near

Anchorage to see how chum eggs behave in different test situations in glacier water. CIAA envisions building a 65 million chum and pink egg capacity facility there.

CIAA is also planning to fertilize the sockeye population in Crescent Lake on the Kenai Peninsula, improve the spawning grounds at Tustumena Lake, and provide engineering data for a fish pass on the Paint River.

The Imarpik (Yupik Eskimo word for "big bay") Regional Aquaculture Corporation in Bristol Bay has not yet fully defined its goals, except to note that, because of strong natural runs and high bush construction costs, hatcheries have a low priority.

Projects Imarpik is looking at include building waterfull by-passes, opening up beaver dams, predator control, stream clearance, lake fertilization, and more research into the region's fishery.

The corporation's informational brochure indicated Imarpik, though still in the organizational stage, also is interested in being an advocate for Bristol Bay fishermen on political issues like resources protection, the area's share of ADF&G's research budget, coastal zone management, D-2 legislation, and outer continental shelf oil development.

Amidst all of the controversy, no one argues with the goals of the

aquaculture program, just over the best method to achieve them. Most of the political and administrative battles fought over the salmon fishery stem from the fact that there just aren't enough fish to go around.

Despite the relative health of the natural salmon stocks right now, there's no assurance they will remain healthy.

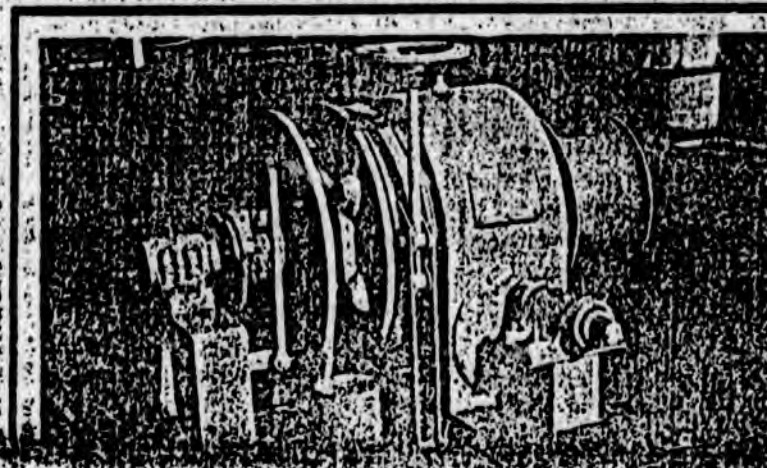
Speaker of the House Terry Gardiner, a Ketchikan fisherman, bristles when asked if expensive rehabilitation programs are really necessary. "Why don't you ask the Cook Inlet gillnetters that question?" he said. "Mother Nature is kinda fickle." Measured against what the runs once were, "the fish have not come back." He added, "They're nowhere near their historic levels."

Even as outspoken a critic of the aquaculture corporations as fisherman Wayne Alex believes in hatchery programs. "You definitely gotta have them," he added.

Alex filed the lawsuit that got mandatory assessments thrown out as unconstitutional.

"What pisses me off is we've wasted so much time," he said, and built resentment against the hatchery programs. The lawsuit "didn't change my attitude toward the hatcheries. We need them now more than we ever did."

(Continued on page 25)



FOR SALE

Single Wildcat Anchor Windlass. Wildcat, designed for 1 3/8" chain. The winch has a jaw clutch, worm gear drive, is rebuilt and ready for hydraulic power.

incubate the eggs at the facility, and deposit the eggs at sites where more fish are needed. "Unlike most hatcheries, it's not tied to a specific site," he said. Theoretically, the corporation has the flexibility to respond to a number of different situations. But biological uncertainties still exist with this approach.

Besides getting the CIR on line, Wendt said other SSRAA priorities on its "bare bones budget" include lak fertilization and the compilation of a complete data file on every single stream system in southern Southeast.

NSRAA incorporated a couple years after SSRAA and tried to learn from some of the SSRAA difficulties.

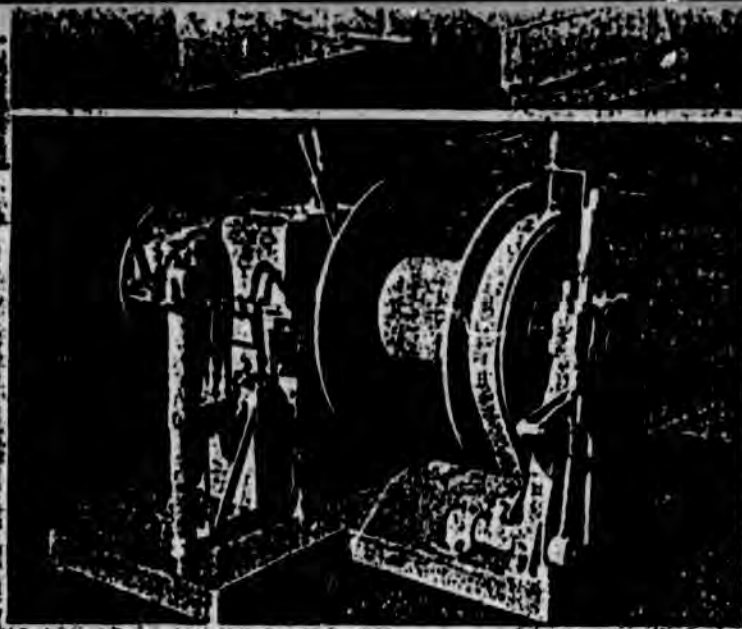
Jev Shelton, a member of the NSRAA board of directors, said two things the northern group appeared to do differently were to see that a "lot of time and care was taken" to make the board as "representative of the region as it could be" and to "not go in with any predetermined idea on how to spend money in order to generate fish. No one started with the idea of definitely building a large-scale hatchery."

How successful the northern Southeast has been at this is a matter of debate among fishermen. Like southern Southeast, the gear groups and communities are split over the worth of the aquaculture corporations.

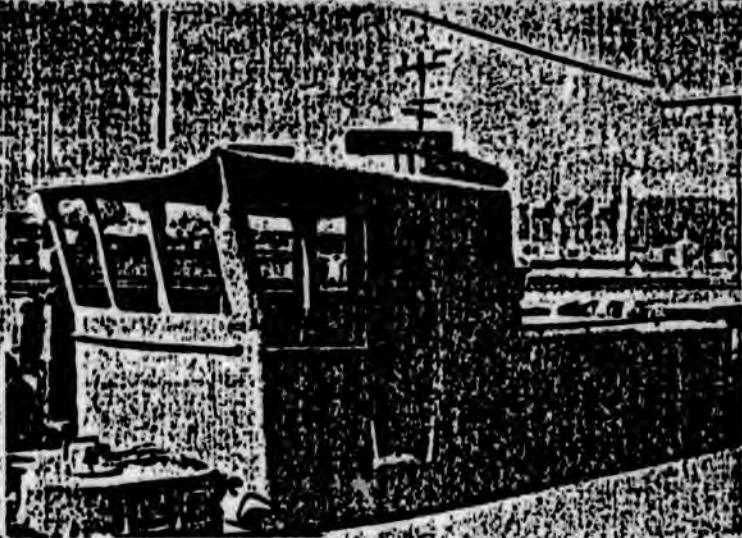
NSRAA general manager Dr. Derek Poon, for example, is careful not to use the word "hatchery" in his public statements.

In an interview, Shelton and United Southeast Alaska Gillnetter President Geron Bruce said "hatcheries" have bad connotations in the minds of many fishermen because of the cost, biological problems and special harvest privileges.

Despite this general feeling, NSRAA is going ahead with plans for the "Salmon Creek facility" in Juneau. "The point needs to be made that there's not a blanket rejection of hatcheries,"



Single drum utility winch with Hesse-Exsted worn gear drive, jaw clutch, compression brake and 15" gypsy. The drum has been modified to accept 800 feet of 5/8" wire and the winch equipped with new hydraulic power. Would make an ideal anchor, mooring or general utility winch.



Tugboat Wheelhouse 21' long, 7' wide and 8' high. Steel construction and never used.



WM. DRURY COMPANY, INC.

2220 E. 11th Street

Tacoma, WA 98421

Phone 206-272-4109

From Seattle 833-1441

Marine & Industrial Equipment

aquaculture

(Continued from page 9)

Alex's lawsuit attacked the aquaculture program on the narrow legal point that the mandatory assessment was an illegal tax. Still, Alex does have strong objections to the whole private non-profit regional corporation concept.

"This approach set back fisheries rehabilitation 10 years. Everything about it is wrong. Even if I hadn't filed suit, it would have floundered around."

Alex said the way the corporations are set up, they are not accountable to anyone. He believes people that don't know what they're doing could end up running them.

Alex sees other problems with the structure. "If you gave the logging industry this much power over their resources, the fishermen would scream." Alex said fishermen could be drawn into a conflict with the general public over an issue like the use of fresh water resources.

"This thing should be run by the state. Then all people would have a sayso, not just the harvesters."

The whole question of what role the state and the corporations should play in the overall rehabilitation program still is being defined.

Bob Roys, FRED division director, said he would like to see the state "spend the bucks to work all the bugs out" of the aquaculture program. Let it "rationally develop, then bring the regional associations in."

The fishermen and the politicians, though, are impatient to get started.

"There's probably more than one group that can work the bugs out," said Jev Shelton. "We have access to all the experience in the world. We have lots of contact with academic programs. We have access to people that can solve practical, technical on-site programs."

the department was pretty close. That's just the way the community is laid out." While avoiding specifics, he noted there have been conflicts with other corporations.

The ingredients for a successful hatchery program include pathology (fish disease prevention and control), genetics, engineering, biology and fish culture, Roys said. It takes time and knowledge and experience to determine whether something's successful.

Roys said some corporations have discovered aquaculture is "not quite as simple as they thought. In certain cases they have not recognized the complexity of projects. Every site has its own vagaries."

As for the popular political notion that whatever the state can do, private corporations could do better and cheaper, Roys said, "I can dig up information to show you the opposite. For the regional corporations' cost of running one hatchery, the state can run four or five for the same amount." The only problem, he added, is the program is too new to tell if the data had much validity.

Many different ideas and concepts about aquaculture are floating around and being tried out with varying degrees of success. "I think all the issues have to get in a pot and boil a bit," he said. "Then we see what flows out." Next Month: A look at FRED.

Alaska Fishermen, November 1981

(cut out and save)

Commercial Fishermen's Directory

Our independent teams of experts are waiting to serve you individually or collectively, depending on your needs.

FIRM	PHONE (206)
A & B Service Distributors	838-5027
Marine Carpentry	244-1347
Harris Electric	282-8080
All your Electrical Needs	
M & M Steel Fabrication	878-4963
All your Welding Needs	824-7627
Seattle Refrigeration	762-7740
Sand Blasting & Painting	839-2555

(cut out and save)

All problems have alternative solutions...
you do have a choice, but only one of these is legal!



MANSFIELD TDX

The flow-thru treatment system that complies with USCG requirements AND MEETS YOUR NEEDS.

- Small size • Low power usage
- Can be used with more than one head
- A modern system for years to come

olving some of the confusion is the regional planning process. Each regional corporation was given \$100,000 by the last legislature to develop a comprehensive salmon plan for its region. Regional planning teams, made up of three corporation representatives and three ADP&G staff members, were formed to handle the job.

A draft report from each region is expected to be released when the legislature convenes.

Roy said the report will look at "strategies, needs and aspirations. What it takes to satisfy an area's specific needs." He calls the process "the best thing to ever happen to fish in the whole state."

In talking about how FRED gets along with the corporations, Roy said the relationship between PWSAC "and

limited entry

(Continued from previous page)

earlier campaigns haven't died. A seminar on limited entry at Fish Expo in Seattle provides a case in point.

Many salmon fishermen complained the panel selected by organizers of Fish Expo was stacked heavily against limited entry, and the stinging rhetoric against limited entry delivered by most of the panel members showed the accusation had a ring of truth.

The strongest denunciation was delivered by Jeff Stephan, manager of the United Fishermen's Marketing Association of Kodiak which has been a leading opponent of limited entry. Stephan said fish are a "common property to all citizens. I challenge any proponent (of limited entry) to explain why the right to harvest the common resource should be limited to a few."

Interestingly, when New England lobsterman Jim O'Malley asked the audience of roughly 500 fishermen for a show of how many had been hurt by the limiting of Alaska's salmon fisheries, only a handful raised their hands.

Deadline Only
3 Months
away

YES... WE INSTALL

POOR
ITSELF DOES

WE DO FREE ESTIMATES

WE HAVE PARTS IN STOCK

WE HAVE DO-IT-YOURSELF INSTRUCTION

WE SERVICE AND WARRANT WHAT WE SELL

MARINE SANITATION SPECIALISTS

AT MARINER'S SQUARE, SUITE 121

1900 N. Northlake Way, Seattle WA 98103. (206) 633-1110

Your Successful Season Starts Here

Your success starts with a dependable engine. Precision Engine specialists, Inc., have been rebuilding dependable engines for 20 years. Our fully self-contained shop eliminates expensive job-outs. We're fast, friendly and fair because we enjoy the engine business. We can keep your engine in business. Call, visit, or let us come to you.

Distributors and Dealers

Crane Carrier
Cummins Marine Engines
Graymarine Engine & Parts
Jabco Marine Pumps
Farymann Marine & Industrial Engines
Ford Marine & Industrial Engines
Twin-Disc Marine Reduction Gear & Parts
Wix O. & Fuel Filters
Borg-Warner Reduction Gears
Lima Generators
TRW Engine Parts
Federal-Mogul Engine Parts

Sealed Power Engine Parts

BCA-Bower-Roller-Taper Bearings
Stewart-Warner Instruments
Machine Shop Service and On-Board Ship Engine Repairs
EMD 567-645 Power Pack Reconditioning
ABS Approved Shop Engine, Gas & Diesel Rebuilt & Exchanged
Magnafluxing
Crankshafts Welded, Chrome Plated & Ground

Computerized Electronic

Balancing Rotors, Engines & Turbos
Connecting Rod Reconditioning
Cylinder Block Align Boring
Surface Grinding
Detroit Diesel Engines Rebuilt & Exchanged
Gas & Diesel Cylinder Heads Rebuilt & Exchanged
1000 H/P Dynamometer
Engine Test Cell
Cam Shaft Grinding
Cylinder Head Welding
Engine Block Welding

Rebuilders of Following Engines

Detroit Diesel (all models)
In-Line and V Type
71 Series
53 Series
92 Series
149 Series
Cleveland 268A & 278A
EMD 567-645
Caterpillar (all models)
Continental (all models)
Perkins (all models)
Cummins (all models)
Fairbank-Morse (all models)
International Harvester (all models)
Waukausha (all models)
Gasoline Engines (all models)



Precision Engine Specialists, Inc.

570 Mercer Street • Seattle, Washington 98109

Phones: (206) 284-0560, 284-8743, 284-8745

Washington State Watts: 800-562-2877 • Continental Watts: 800-426-2828

aquaculture

(Continued from page 9)

Alex's lawsuit attacked the aquaculture program on the narrow legal point that the mandatory assessment was an illegal tax. Still, Alex does have strong objections to the whole private non-profit regional corporation concept.

"This approach set back fisheries rehabilitation 10 years. Everything about it is wrong. Even if I hadn't filed suit, it would have floundered around."

Alex said the way the corporations are set up, they are not accountable to anyone. He believes people that don't know what they're doing could end up running them.

Alex sees other problems with the structure. "If you gave the logging industry this much power over their resources, the fishermen would scream." Alex said fishermen could be drawn into a conflict with the general public over an issue like the use of fresh water resources.

"This thing should be run by the state. Then all people would have a sayso, not just the harvesters."

The whole question of what role the state and the corporations should play in the overall rehabilitation program still is being defined.

Bob Roy, FRED division director, said he would like to see the state "spend the bucks to work all the bugs out" of the aquaculture program. Let it "rationally develop, then bring the regional associations in."

The fishermen and the politicians, though, are impatient to get started.

"There's probably more than one group that can work the bugs out," said Jev Shelton. "We have access to all the experience in the world. We have lots of contact with academic programs. We have access to people that can solve practical, technical on-site programs."

He added that the technical side of

the department was pretty close. That's just the way the community is laid out. While avoiding specifics, he noted there have been conflicts with other corporations.

The ingredients for a successful hatchery program include pathology (fish disease prevention and control), genetics, engineering, biology and fish culture, Roys said. It takes time and knowledge and experience to determine whether something's successful.

Roys said some corporations have discovered aquaculture is "not quite as simple as they thought. In certain cases they have not recognized the complexity of projects. Every site has its own vagaries."

As for the popular political notion that whatever the state can do, private corporations could do better and cheaper, Roys said, "I can dig up information to show you the opposite. For the regional corporations' cost of running one hatchery, the state can run four or five for the same amount." The only problem, he added, is the program is too new to tell if the data had much validity.

Many different ideas and concepts about aquaculture are floating around and being tried out with varying degrees of success. "I think all the issues have to get in a pot and boil a bit," he said. "Then we see what flows out." Next Month: A look at FRED.

Shirley Fisherman, November 1979, page twenty-five

(cut out and save)

Commercial Fishermen's Directory

Our independent teams of experts are waiting to serve you individually or collectively, depending on your needs.

FIRM

PHONE (206)

A & B Service Distributors	838-5027
Marine Carpentry	244-1347
Harris Electric	282-8080
All your Electrical Needs	
M & M Steel Fabrication	878-4963
All your Welding Needs	824-7627
Seattle Refrigeration	762-7740
Sand Blasting & Painting	839-2555

(cut out and save)

All problems have alternative solutions...
you do have a choice, but only one of these is legal!



MANSFIELD TDX

The flow-thru treatment system that complies with USCG requirements AND MEETS YOUR NEEDS.

- Small size • Low power usage
- Can be used with more than one head

solving some of the confusion is the regional planning process. Each regional corporation was given \$100,000 by the last legislature to develop a comprehensive salmon plan for its region. Regional planning teams, made up of three corporation representatives and three ADF&G staff members, were formed to handle the job.

A draft report from each region is expected to be released when the legislature convenes.

Roy said the report will look at strategies, needs and priorities. What it takes to satisfy an area's specific needs. He calls the process "the best thing to ever happen to fish in the whole state."

In talking about how FRED gets along with the corporations, Roy said the relationship between PWSAC and

limited entry

(Continued from previous page)

earlier campaigns haven't died. A seminar on limited entry at Fish Expo in Seattle provides a case in point.

Many salmon fishermen complained the panel selected by organizers of Fish Expo was stacked heavily against limited entry, and the stinging rhetoric against limited entry delivered by most of the panel members showed the accusation had a ring of truth.

The strongest denunciation was delivered by Jeff Stephan, manager of the United Fishermen's Marketing Association of Kodiak which has been a leading opponent of limited entry. Stephan said fish are a "common property to all citizens. I challenge any proponent (of limited entry) to explain why the right to harvest the common resource should be limited to a few."

Interestingly, when New England lobsterman Jim O'Malley asked the audience of roughly 500 fishermen for a show of how many had been hurt by the limiting of Alaska's salmon fisheries, only a handful raised their hands.

Deadline Only
3 Months
away

YES WE INSTALL

NO ONE
ELSE DOES

WE DO FREE ESTIMATES.

WE HAVE PARTS IN STOCK.

WE HAVE DO-IT-YOURSELF INSTRUCTION.

WE SERVICE AND WARRANT WHAT WE SELL.

MARINE SANITATION SPECIAL

AT MARINER'S SQUARE, SUITE 121

1900 N. Northlake Way, Seattle WA 98103, (206) 633-1

Your Successful Season Starts Here

Your success starts with a dependable engine. Precision Engine specialists, Inc. have been rebuilding dependable engines for 20 years. Our fully self-contained eliminates expensive job-outs. We're fast, friendly and fair because we're in the engine business. We can keep your engine in business. Call, visit, or let us see you.

Distributors and Dealers

Crane Carrier

Cummins Marine Engines

Graymarine Engine & Parts

Jabaco Marine Pumps

Farymann Marine &

Industrial Engines

Ford Marine & Industrial
Engines

Twin-Disc Marine Reduction
Gear & Parts

Wix Oil & Fuel Filters

Borg-Warner Reduction
Gears

Lima Generators

TRW Engine Parts

Federal-Mogul Engine Parts

Sealed Power Engine Parts

BCA-Bower-Roller-Taper

Bearings

Stewart-Warner Instruments

Machine Shop Service and

On-Board Ship Engine

Repairs

EMD 567-645 Power Pack

Reconditioning

ABS Approved Shop

Engine, Gas & Diesel

Rebuilt & Exchanged

Magnafluxing

Crankshafts Welded

Chrome Plated & Ground

Computerized Electronic

Balancing Rotors,

Engines & Turbos

Connecting Rod

Reconditioning

Cylinder Block Align Boring

Surface Grinding

Detroit Diesel Engines

Rebuilt & Exchanged

Gas & Diesel Cylinder

Heads Rebuilt &

Exchanged

1000 H/P Dynamometer

Engine Test Cell

Cam Shaft Grinding

Cylinder Head Welding

Engine Block Welding

Rebuilders of Ford Engines

Detroit Diesel (all

In-Line and V Type

71 Series

53 Series

92 Series

149 Series

Cleveland 268A &

EMD 567-645

Caterpillar (all mo

Continental (all m

Perkins (all mode

Cummins (all mo

Fairbank-Morse (

International Har

models)

Waukausha (all m

Gasoline Engine

models)



Precision Engine Specialists, Inc.

570 Mercer Street • Seattle, Washington 98109

Phones: (206) 284-0560, 284-8743, 284-8745

Washington State Watts: 800-562-2877 • Continental Watts: 80

December 1979



Volume Seven
Number Four

Alaska Fisherman

United Fishermen of Alaska, Inc.
Nonprofit org. U.S. Postage paid
197 South Franklin St.
Juneau, AK 99801

Rags or riches?

Informational gap plagues efforts to
research fishermen's incomes

by Rodger Painter

Rich Alaska fishermen: Myth or reality?

Using available information, it's extremely difficult, if not impossible, to answer the question that has become a key issue in the debate over limited entry.

Mounting opposition to limited entry has prompted the state legislature to consider massive changes in the restrictive fishing program. In a nutshell, the opposition stems from the widely held impression that an exclusive group of fishermen is getting rich off resources belonging to all citizens of the state.

This attitude can be traced to news stories about Bristol Bay fishermen who took home huge checks for a month's work, herring fishermen who made \$100,000 without leaving the docks and the seiner who netted 47,000 pinks in one set.

this scarcity of data are numerous... but the principal cause appears to be insufficient funding for this purpose to the agencies responsible for fisheries economic research.

"The end result of this lack of current information is that some of the data series presented in (a preliminary report to the limited entry study group), particularly in regard to fishing costs and net earnings, have had to be estimated from outdated or generalized sources."

The report by the two economists carried statistics showing gear operators in many of the state's major commercial salmon fisheries actually lost money when operating costs and crew shares were deducted for the 1969-77 seasons. (See page 3.)

The primary cause of the informational gap is the lag in processing fish tickets. Gross incomes are figured by the Commercial Fisheries Entry Com-



Most Alaska fishermen fell below the poverty guidelines.

These are isolated examples of fishermen who struck it big, but they leave the reader feeling that most fishermen must fly to the fishing grounds in Lear jets.

The latest estimate of gross incomes of Alaska's salmon fishermen is for 1977. More current figures can be obtained by laboriously sifting through piles of state documents and independent research. The most meaningful figures — net incomes — simply aren't available, except for three drift gill net fisheries in 1976.

The only statewide net income survey of salmon fishermen was conducted in 1973, and only 520 fishermen, or seven percent of the active skippers, were questioned.

Two economists researching fishing incomes for the legislature's "Limited Entry Study Group" had this to say about the information they had to work with:

Considering the importance of Alaska's fishing industry to the state's economy and its residents, very little concrete economic information is available in this area. The reasons for

2).

Spurred by inquiries from the Alaska Fisherman, the University of Alaska's Sea Grant Program is conducting a mail survey of Alaska's commercial salmon fishermen in an attempt to compile net income statistics for 1979. The survey, co-sponsored by the United Fishermen of Alaska, was developed with the cooperation of the Commercial Fisheries Entry Commission and the Limited Entry Study Group.

Sea Grant hopes to have the survey results compiled by February or March.

Meanwhile, available information suggests salmon fishermen are not getting rich through the state's exclusive fishing program.

The most reliable information on incomes of salmon fishermen is "gross income estimates by the entry commission. The commission's figures show the average annual gross earnings from 1969 to 1975 were \$20,382 for a purse seiner, \$3,524 for a beach seiner, \$7,520 for a drift gillnetter and \$2,280 for a set gillnetter. Trollers averaged \$1,568 each in annual gross earnings from 1969 to 1974; power trollers averaged \$6,136 a year in 1975-76 and hand trollers \$599.50 annually in the same period.

Gross incomes shot up dramatically during the 1977 in nearly all salmon fisheries: purse seiners \$58,295; beach seiners \$11,623; drift gillnetters \$18,914; set gillnetters \$7,384; hand trollers \$1,787; and power trollers \$14,113.

Gross earning estimates, however can be very misleading, as they fail to take into account overhead expenses and crew shares. Comparing gross incomes of set gillnetters and purse seiners is akin to mixing apples and oranges.

Unfortunately, information on net incomes is much more sketchy and outdated than gross income data.



Karl Olin photo/Alaska Fisherman

Aquaculture in transition: Part II

Fish culturist Dedra Holm takes scale samples from female cohos for the Division of Fisheries Rehabilitation, Enhancement and Development (FRED) at the Deer Mountain Hatchery in Ketchikan. The second installment of our series on aquaculture—an in-depth look at FRED's troubled history—begins on page 8. For a profile of Ketchikan's low-budget hatcheries see page 10.

The only major effort to examine the economic health of the salmon fisheries was a statewide survey of fishermen by the entry commission in 1973, the last year of unrestricted access to the commercial salmon fisheries.

"Data was gathered from interviews with 520 active commercial fishermen from all over the West Coast and Alaska," said a 1974 report issued by the commission. "Extensive use was also made of records held on the computerized files of the Alaska Department of Fish and Game."

"Completed interviews represented approximately 7% of the fishermen in the fisheries studied. While generally valid, the results reflect the randomness of the sample picked for each fishery and the percentage and accuracy of completed responses."

The commission made some rather startling conclusions about the real earnings of salmon fishermen during 1973:

"A nonfarm family of four living in Alaska on an adjusted gross income of less than \$5,250 per year falls below Federal Poverty Guidelines. Without supplementing his income from other sources, the average gear operator in 15 of 18 salmon fisheries examined made less than this amount. In seven

fisheries, gear operators actually showed a net loss."

The health of the salmon fisheries has improved dramatically since 1973, but quantifying the gains in fishermen's incomes is impossible without directly surveying fishermen or getting the state's confidentiality laws changed.

Alaska law prevents researchers from having direct access to individual tax returns, even if the information is to be compiled in statistical form that wouldn't compromise individual privacy.

The Alaska Department of Revenue does not compile tax return information in computer banks in a form that could be translated into statistical averages, so department auditors have to perform any computations by hand. Entry commission spokesmen say such an effort would be more expensive and time consuming than directly contacting fishermen.

The last net income survey of salmon fishermen by the commission was conducted by mail and personal interviews in 1977. Four hundred thirty-eight drift gillnetters who fish in Prince William Sound, Cook Inlet and Bristol Bay were surveyed in the effort.

The surveys, the most complete analysis of net returns to salmon

(Continued on page 4)

inside

Since switching to a new computer system designed to speed up the processing of catch information, Fish and Game has fallen two and one-half years behind. See page 2.

The Coast Guard said it learned a lot about dealing with oil spills in the Bering Sea when a 324-foot Japanese factory ship went aground in the Pribilof Islands. See page 16.

Everyone at Petersburg High School learns about the fisheries. See page 18.

Two fishermen aren't about to let the state forget about financing the conversion of their surplus military freighter into a floating processor. See page 21.

(cut out and save)

COMMERCIAL FISHERMEN'S DIRECTORY

Our independent teams of experts are waiting to serve you
individually or collectively, depending on your needs.

- Marine Enterprises** PHONE (206) 244-1347
Fine Carpentry Specialists
- rris Electric** 282-8080
Your Electrical Needs
- LM Steel Fabrication** 878-4963
Conversion Specialists — Hydraulic
Installations, Circulating Systems,
Rigs and Structural Fabrication
- Northwest Instruments** 284-8080
Best Marine Instruments and
Electronics
- MR Painting & Sand Blasting** 839-2555
Power Washing, Specialty Coatings,
Fiberglassing
- Cattle Refrigeration** 762-7740
Fast Freezing, Brine
Items and Storage

(cut out and save)

Bottomfishing in the Bering Sea?

But, won't a fleet of large off-shore
catcher/processors be filing all the
quotas?

Certainly, large catcher/processors will play a role in
developing a bottomfish industry in Western Alaska, as many
of the prime fishing grounds are located beyond the reach of

Hand troll limits again delayed

The Commercial Fisheries Entry Commission has delayed imposition of limited entry on Southeast Alaska's burgeoning hand troll fleet.

The Nov. 29 decision to postpone adoption of regulations bringing the fishery under limited entry means the commission will not be able to issue hand troll permits until after the 1980 fishing season, according to acting commission chairman Robert Simon.

The delay also will allow fishermen who started hand trolling in 1979 to qualify for a permit, if the fishery eventually is limited.

The action was not expected to please the Board of Fisheries which was scheduled to consider regulations for troll fleet on Dec. 6. The growing hand troll effort has created allocation problems for the fisheries managers and heavy regulations have been slapped on the last of the open salmon fisheries.

incomes

(Continued from page 1)

fishermen, demonstrates how deceptive gross income averages can be as an indication of the health of the salmon fisheries. Following are the results of the surveys:

- Bristol Bay drift gillnet permit holders grossed an average of \$15,143, had \$10,971 worth of expenses and netted \$4,172 each.

- Cook Inlet drift gillnetters grossed an average of \$17,969, and expenses averaged \$13,618, leaving \$4,351 as net income to the permit holder.

- Prince William Sound drift gillnetters averaged \$21,151 as gross income, had \$9,445 worth of expenses and individual net incomes of \$11,706.

Simon attributed the delay to the need to compile more information on the hand troll fleet and confer with the board at its December meeting.

The board is managing the fishery with the intent of maintaining the historical allocation of catch between the hand troll and power troll fleets," Simon said in a news release. "They've (the board) told us that they want to see us significantly reduce the size of the hand troll fleet so it can be managed in conjunction with the power trollers. We don't believe that's possible if the historical use pattern is to be maintained."

"What we would like to do is keep the hand troll fishery similar to what it has been in the past, meaning a relatively low cost, low income fishery. The message we received from testimony is that the public wants it managed as an entry level fishery."

The only fresher information on net incomes the *Fisherman* was able to locate was estimates by the Bristol Bay Native Association of the 1978 earnings of Bristol Bay drift gill net fishermen.

Noting the difficulty of coming up with "cold, hard facts for the average fisherman," Association Deputy Director Kay Larson said, "it is safe to say that the average crew made between \$10,000 and \$20,000. This of course, had to be split between captain and boat puller(s)."

While available information on fishing incomes seems to dispell contentions that salmon fishermen are getting rich off limited entry, the myth is not likely to be dispelled until current net income data is developed.

SUZIE

Biological risks remain for salmon aquaculturists

Third in a series.

by Karl Ohls

Although a lot of unknowns still exist with the biological aspects of aquaculture, biologists and fisheries managers are confident they know enough to proceed with their goal of enhancing Alaska's salmon resource. But because of the unknowns, they hasten to point out the protection of natural runs is their highest priority.

The state follows a tight set of policies regarding aquaculture and natural runs. The abundant wild salmon are considered one of Alaska's greatest resources and no one talks about replacing them with a race of artificially bred super salmon.

"We have a lot of wild fish left here," said Dr. Roger Grischkowsky, principal pathologist for ADF&G's Division of Fisheries Rehabilitation, Enhancement and Development (FRED). "No one wants Alaska to end up like other states that have no wild stocks."

Biological risks certainly do exist. If sound scientific practices are not followed, potential problems include:

- Wild salmon catching diseases from hatchery fish.
- The intermingling of hatchery and wild salmon that could mix up the gene pools and potentially alter the fish's all-important homing instinct.
- Wild stocks being decimated in the mixed stock fishery. Hatchery-produced salmon can stand up to 95 percent exploitation, but how can a fisherman sort natural salmon from the artificial ones?

Aquaculture biology is divided into genetics and pathology. The two sciences work closely with each other at their best.

The research laboratory was set up in 1974. Its space currently is being expanded.

Grischkowsky said that as far as research into biological problems goes, Alaska is "essentially on par with the lower 48 states. We're not behind. And if they don't watch out, we're going to be ahead."

He said the laboratory does combined research into pathology and genetics problems and finfish and shellfish diseases. An active information exchange program is maintained with federal and academic researchers.

There are 21 diseases that afflict or could potentially afflict Alaska's salmon stocks. The "potentially" means they could easily exist in Alaska's environment, but have not yet been detected.

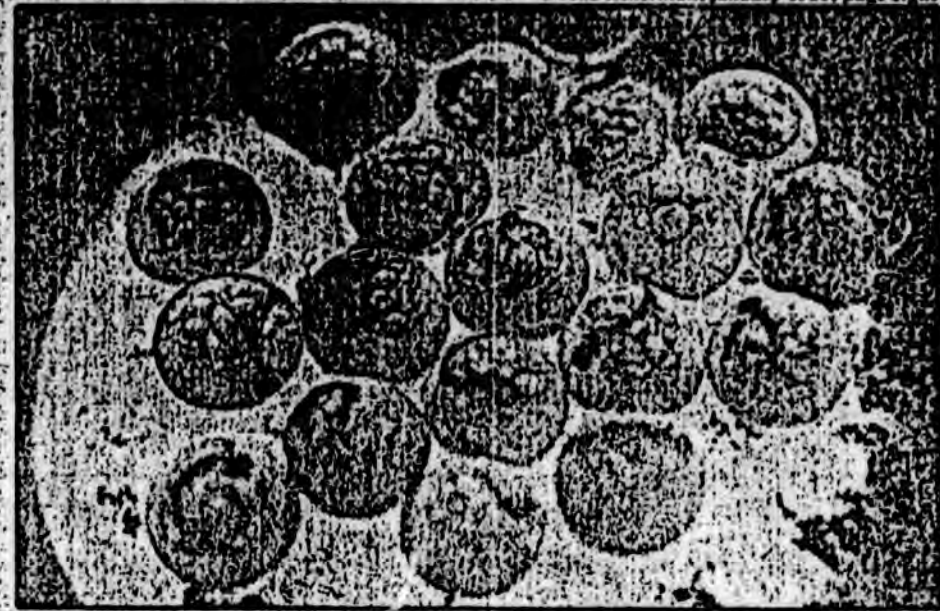
The afflictions include nine different bacterial, three viral, six parasitic and three environmental diseases.

The most common diseases in Alaska appear to be bacterial kidney disease (BKD) and infectious hematopoietic necrosis (IHN) virus.

IHN is particularly prevalent among sockeyes.

An outbreak at FRED's Big Lake hatchery, north of Anchorage, resulted in the destruction of all the sockeye juveniles there last summer. By May, nearly half the 10 million sockeye had died of IHN or related maladies. Following FRED policy, the remainder were destroyed to prevent them from becoming carriers.

The hatchery was in its third year of production. Grischkowsky said the facility has been thoroughly disinfected and con-



Mark Kissel photo/ADF&G

Healthy sockeye eggs sit in a fish culturist tray, the beginnings of salmon clearly visible inside them. Alaska sockeyes, both wild and artificial, have a demonstrated susceptibility to the IHN virus.

sockeyes.

Grischkowsky said the IHN virus has been here during his six field seasons in Alaska and he believes it caused "mortality before that."

Research into the disease has uncovered a useful diagnostic technique that works in less than two weeks and a means of using hormones to speed maturation of adult sockeye, possibly controlling IHN by reducing pre-spawning mortalities. A vaccine also is being tested for potency.

The studies of the virus may be helpful in working with wild stocks, as well. "Preliminary indications are that there's a relationship between the size of returns to the prevalence of IHN virus in parent year stocks," Grischkowsky said. The information may be helpful in predicting the size

can aggravate pathogens already present in the stocks.

Also, the population density of hatchery fish and a shared water supply, makes it easy for a disease to infect a facility once it gets in there. "It's like 30 people in a fallout shelter for three months," Grischkowsky said. There's a "derivative situation" in regard to health.

FRED's solution is to stress preventive measures.

Brood stocks should be certified free of diseases.

The water source should heavily weigh in the decision about where to locate a hatchery. Well water is preferred since it is much purer than water from lakes, creeks and rivers. The water still should be cleaned up before it's run through the in-

quarters at FRED's Anchorage office, where they have broad responsibility for monitoring the state's aquaculture program.

Grischkowsky has been with the section since it started in 1973. He first operated as a one-man consulting service offering advice on hatchery design, fish nutrition, genetics and other problem areas.

cleaner.

IHN pathogens are present in most wild sockeye stocks. The only recorded outbreaks in Alaska, however, have been in hatchery stocks. IHN outbreaks also have occurred in hatchery chinooks in California and in hatchery rainbow trouts in Oregon. The only documented case in wild stocks was with British Columbia

of sockeye runs. Data suggests IHN has a "cyclical nature."

FRED division director Robert Roy said wild stocks are a "reservoir of diseases." But when a disease wipes out a wild stock, no one necessarily knows about it.

There's nothing inherently unhealthy about a hatchery-produced fish. The main problem is that conditions in a hatchery

incubators, either by ultraviolet light, ozone generation or chemical treatment.

Grischkowsky theorizes disease can break out if the fish are put under too much stress. Stress can be caused by overcrowding and too much handling.

Fish are very sensitive to change," he said. Another thing to avoid is an inadequate diet.

Besides dealing with what nature throws its way, the pathology section must cope with man-made problems like pollution.

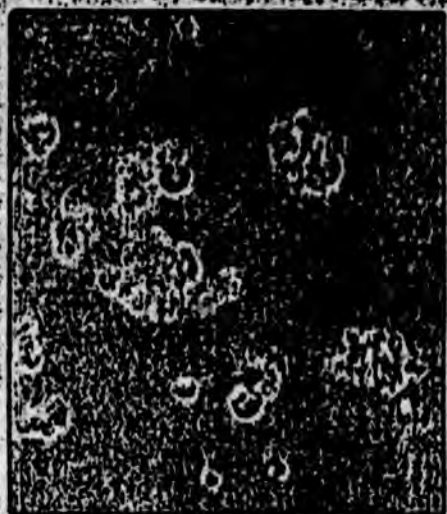
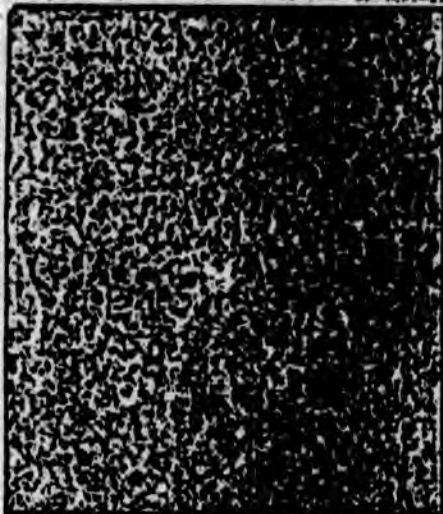
Grischkowsky said pollution exists at the Fort Richardson hatchery in Anchorage. Oil still is present in the ground and leaking into the water supply from a now closed disposal site. He said the pollution and an outbreak of furunculosis—which takes the form of skin blisters—might be related.

"The petroleum residue reduces the fish's ability to cope with the furunculosis agent," he speculates. "Pollution in general reduces the ability of the fish to resist pathogens."

The pathology section is working on vaccines for the various diseases. Salmon are vaccinated by dipping a net full of them in the chemical solution.

Grischkowsky said another project is to research the genetics of disease resistance.

FRED's genetics section develops genetic profiles of stocks through the examination of samples in the laboratory.



Roger Grischkowsky photos/FRED

This sequence, taken through a microscope, shows the progress of the IHN virus. At left is a healthy cell. The second picture shows the cell after the virus has been introduced. The third shows the cell in an advanced state of deterioration.

Rozema's Boat & Machine Works

"Your Seine Skiff Center"

Offering 4 Models

19' x 10'

17' x 9'

16' x 8'

15' x 8'



1120 Bayview - Edison Road
MOUNT VERNON, WASHINGTON
Phone: 757-0186

Boat Building . . . Wood, Steel, Aluminum

The profiles show the stocks' variation in gene pools. A low variation indicates a reduced fitness for survival. Geneticist Bob Davis said it raises problems similar to those of inbreeding in humans.

As the pathology section screens potential hatchery brood stocks for disease, the genetics section looks at them for their genetic content. The section is charged with protecting the gene pool of wild salmon and maintaining the viability of hatchery brood stocks.

From a genetic standpoint, Davis doesn't see many problems with eliminating the natural selection process that wild salmon go through. "A lot of the mortality (in natural stocks) is not due to genetic differences," he said. Much of the credit for survival has to do with "luck" rather than genetic superiority.

Little is known about the salmon's homing instinct. Davis said a genetic component may be involved with the homing instinct, but it may be small. The olfactory sense is believed to play the largest role in homing. "Data suggests second generation stocks" may fare better after movement to another system, he said.

One aquaculture concept that has fallen into disfavor in recent years involves the central incubation facility (CIF). One idea behind the CIF is to take eggs from an area where stocks are abundant, incubate them at a hatchery located elsewhere and release them at various sites where stocks are depleted.

This practice now, however, is strictly regulated.

Davis said, "I don't much like the idea" as it eliminates the natural selection process in the receiving streams.

Grischkowsky said he had problems with "the movement of fish to different water systems."

FRED takes the position that the transfer of fish and eggs to distant watersheds will be strongly discouraged, while the use of native or resident stocks in all enhancement projects will be strongly encouraged. Problems have cropped up in Alaska when alien stocks with their own peculiarities were brought into a watershed where the fish

Harris said the current catch level of chums is so low, SSRAA would have to wait 12 years to get enough stock to meet its goals.

Under the "honest thief" method, "You take some number of fish from a stream, probably more than the stream can really afford to give up, Harris said. "You bring them to a hatchery" where the egg survival rate would be 80 to 90 percent. "In a stream you have 10 to 15 percent survival. Then you return a certain portion of the fry to the stream. You return at least as much as you take."

Harris recognizes the biological risks, but asks how else does one achieve the goal of producing fish for fishermen to catch?

The risks are unacceptable, though, to Paul Novak, the project leader for FRED's Ketchikan office. Novak said wise management dictates you keep something in the stream for future use. If a catastrophe were to hit the hatchery, nothing would be left.

Ketchikan also is the location of some of the most vocal opposition to hatcheries. The seiners have directed most of their protest, though, toward SSRAA activities rather than the creation of artificial salmon.

In a letter to the Alaska Board of Fisheries, Michele Zerbetz, executive director of the Southeast Alaska Seine Boat Owners and Operators, expressed concern over trend developing to give hatchery stocks priority treatment over

natural stocks. "The decisions being made by the state today are going to have far reaching effects on just what kind of fish stock will be fished twenty years from now...natural or unnatural runs," she wrote.

Zerbetz said the seiners are concerned about unnatural runs because they don't want to be forced into terminal fisheries.

Fishermen find they have a better product if they can catch fish in the outside waters. "By the time the fish gets that far inside (for a terminal harvest), it's pretty far gone," she said.

Alaska fisherman, January 1980, page nine. In conclusion, one might note that a lot is left to be discovered in the fields of salmon pathology and salmon genetics.

Bob Davis said that if pathology is in its infancy, than "genetics is in the gestation stage."

Roger Grischkowsky notes, "fish pathology is a very young science...not a definitive science, not an exact science."

He added, "It's hard to come to any cut and dry conclusions as far as hatchery and natural stocks go."

Next month: A look at the economics of aquaculture.

COMMERCIAL FISHERMEN

Notice of Changes in Regulations

SEE LEGAL NOTICES

Commercial Fisheries Entry Commission

Pouch KB

Juneau, Alaska 99811

"Union Bay Is Probably Building the Most Cost Effective

Because of this, the public and private hatcheries follow a policy of not importing stocks from outside Alaska.

FRED has a review procedure set up for people in the hatchery business to make sure they're following good aquaculture practices. FRED certification, however, is not mandatory, Grischkowsky said. "But people involved in hatcheries, both public and private, have for the most part realized that if they work with the fisheries pathology section they get better results."

As Robert Roys said, "No Goddamn eggs move in this state without review by the pathologist and geneticist."

FRED has written proposed legislation, now in the governor's office, that would make its disease control procedures mandatory for all public and private hatcheries.

The other concept behind a CIF—that eggs are taken from a site, incubated, and put back at the site—meets with more acceptance.

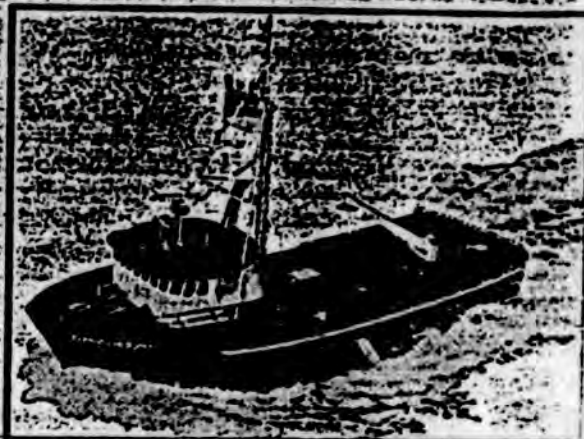
Grischkowsky, though, is concerned about the actual movement of the fish. "There's an inherent risk in moving fish," he said. "We're aware of only a portion of the potential problems." He worries the movement of extreme densities could cause stress in the population and possibly trigger the pathogens.

Working around problems like this is one of the things the Southern Southeast Regional Aquaculture Association (SSRAA) has to contend with in discussions with FRED about how it can use its CIF at Whitman Lake near Ketchikan. Many of the problems should be solved by regional planning process, where FRED personnel and people from the regional associations draw up a regional salmon plan.

SSRAA, for instance, would like to release some cohos at Whitman Lake so it can have brood stock return directly to the hatchery, according to field operations manager Rick Harris. The cohos, however, would pass through the mixed stock fishery and there would be no way to manage the returns to prevent the wild stocks from being overexploited. Fish and Game prefers releases in terminal areas.

Another plan SSRAA is exploring is the "honest thief" method of procuring brood stock. SSRAA raises chums at its CIF.

Fishing



Discovery



Nordic Venture

UNION BAY S CORP

Designers, Builders and
4125 Ninth N.W., Seattle

Too early to judge economics of hatcheries

Editor's note: The final article in our four-part series on aquaculture looks at the economics of salmon hatcheries. In previous articles, we explored the state-run aquaculture program, private, non-profit hatchery associations, and the biological risks of artificially bred salmon.

by Karl Ohls

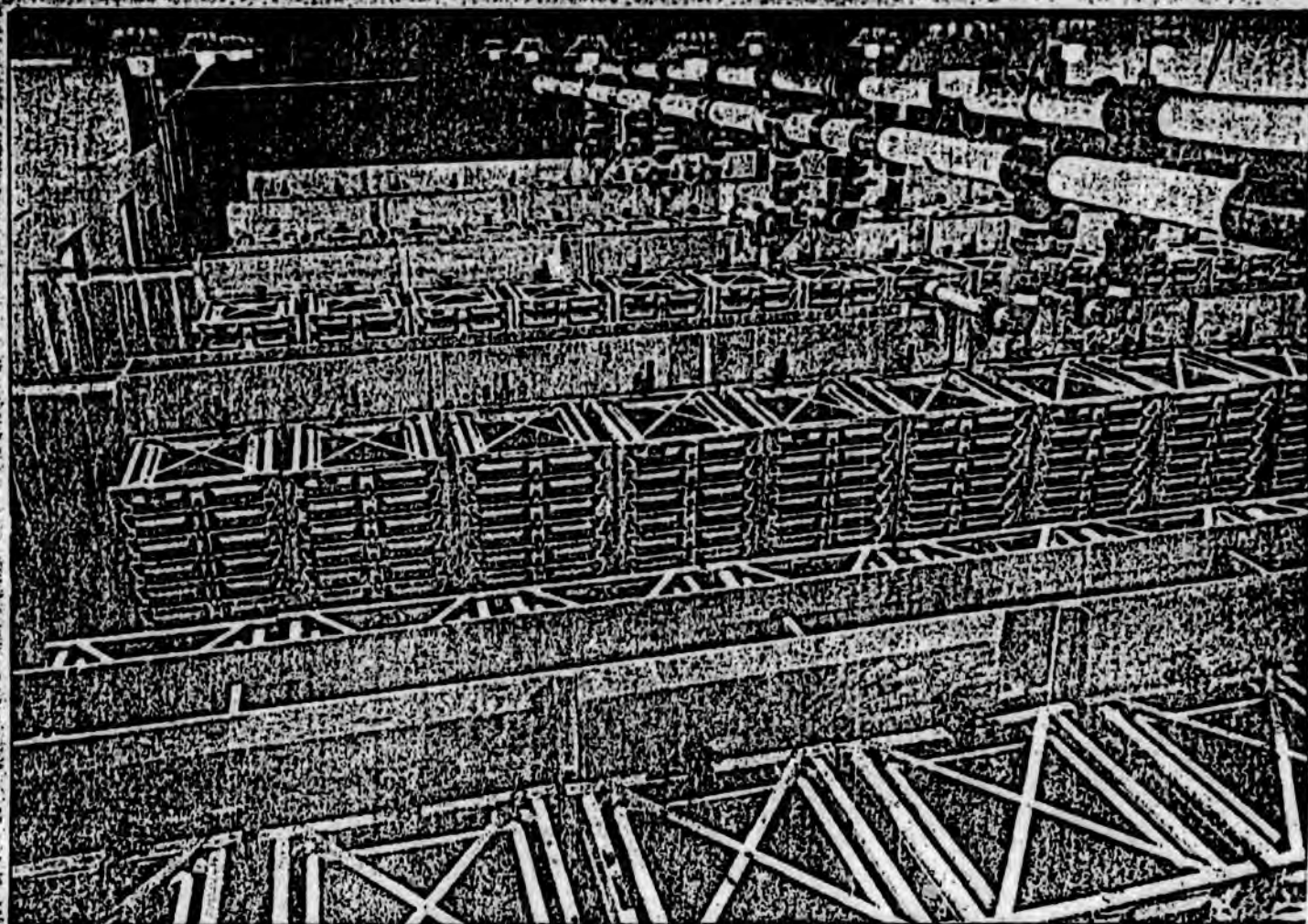
On paper it looks good.

The plan calls for network of public and private hatcheries across the state to produce enough fish to level out the downs in the cycle of natural salmon runs. Once the wildly fluctuating supplies of Alaska salmon to the world marketplace evened out, a lot of the perennial problems plaguing one of Alaska's most important industries will be solved.

Since the State of Alaska started working toward that goal in 1971, there have been pretty encouraging results. About 400,000 adult pink salmon returned in 1979 from releases by the state-run hatchery at Tutka Lagoon, and up to one-fourth of the 1980 commercial pink harvest in Cook Inlet is expected to be from Tutka stocks. After only five years of operation, the Prince William Sound Aquaculture Association hatchery at San Juan is in the black and expecting more than a half million pinks to return in 1980.

But there also have been many problems with Alaska's fledgling hatchery programs. For the most part, the private nonprofit aquaculture associations have been stalled in the initial stages by legal challenges to their primary source of funding. Despite an investment of some \$70 million in hatcheries, the state program still is waiting for the big returns to materialize.

Many questions need to be answered about public and private hatcheries. The



Karl Ohls photo/Alaska Fisherman
Stacks of incubation trays in Southern Southeast Regional Aquaculture Association's 26 million egg capacity hatchery. The central incubation facility has encountered many problems in obtaining brood stocks, and the project is lagging behind schedule. SSRAA director Ron Wendt says the association could use an extension in its state loan repayment schedule.

aquaculture managers have been basing all their calculations on assumptions. These guesses are no basis for credible long-range financial planning, according to Armin Koernig, president of the Prince William Sound Aquaculture Corporation.

Even when the data does finally come in, the question of cost effectiveness has to be addressed from a philosophical viewpoint. Making a contribution to the common property fishery is one way to judge economic returns, but having to sell enough fish to cover hatchery expenses is quite a different measure of cost-benefit.

In general, when aquaculture supporters are asked if the state can afford to have a large-scale hatchery system, they reply the state can't afford not to.

"I think it's important, for people to understand this, to go back to the early Seventies when all the species were at rock bottom. And they still are in a lot of areas," said Bob Roys, Director of the ADF&G Division of Fisheries Rehabilitation, Enhancement and Development (FRED).

overexploitation — had made state involvement in fisheries rehabilitation a major priority of every politician from the governor on down.

Now, however, the health of the natural runs—up to an 87 million harvest in 1979—has made many lawmakers question the wisdom of a large state investment in aquaculture.

Roys notes that by the time FRED was at a point to be able to counteract the low runs, the problem had passed. "To plan ahead for the bad years, we would have had to initiate action in the 1960's." But he adds, "The bad years will come again."

Roys wants to be ready for them with a solid, fish-producing system.

FRED has a capital investment of \$69,775,000 in facilities that, when they reach full capacity, should produce 9.5 million adult fish annually.

Roys said that will be a significant impact on the fishery. "Say we had nine and a half million adults in 1971. You don't think 9.5 million in a 20 million catch statewide wouldn't be significant impact?"

an annual harvest of 115 million. Researchers calculated that was the number of fish needed to level out the bottoms, based on what the estuarine environment could handle.

Looking at the long-range goal, Roys said, "If we're going to capture a major portion of the world's salmon market, we're not going to do it with wildly fluctuating natural stocks." He points to the Japanese success with chum hatcheries in Hokkaido. "They blew the market all to hell."

Roys said huge artificial runs in Alaska will not overpower the natural runs if the hatchery sites are carefully selected. He notes, "They didn't do it that way in Washington and Oregon."

Roys hopes to have all his facilities up to full production within 10 years.

On paper, every hatchery now operating in the state or in the planning stages works out to be cost-effective. The value of the projected fish production equals or exceeds the construction and operational costs.

This equation, however, doesn't take into consideration very significant external

Brood stock procurement is a continuing statewide problem since egg takes are managed on the basis of first assuring enough escapement to protect a stream's natural production. The egg takes are regulated by the state Board of Fisheries, which has had to weigh approval a couple times between the needs of a hatchery and the interests of fishermen that want to harvest those extra salmon.

The hatchery program's cost-effectiveness can be figured either on what economists call "micro" or "macro" scales.

A micro scale includes whether a hatchery can pay for itself and its direct dollar contribution to a fishery. Other factors can be figured in such as the overall value of a hatchery to a community both in terms of the extra money generated by the additional fish and the wages of the hatchery personnel.

The macro scale looks at the collective economic value to the state of all hatchery projects. A consultant's report to the legislature's Aquaculture Study Policy Group, however, said, "Based upon the current lack of reasonably accurate macro-

TOGIAK HERRING

Catch them with our help



STANDARD FEATURES ON OUR DRUMS

- ★ Aluminum Tube Construction (stronger than angle for same weight)
- ★ Ross 17.7 cu. in. motor (free-wheeling)
- ★ Spun Ends 5086 Aluminum 3/16" thick
- ★ Reusable Hydraulic Fittings (great for emergency repairs)
- ★ Stainless Spools in Control Valves
- ★ Stainless Hardware throughout
- Options Also Available
- ★ Nickel Chain and SS Shaft

For more information about our products, call Paul (206) 671-3320

sound engineering

1600 Kentucky St.
Bellingham, WA 98225

◀ CYLINDERS ▶

Hy Power

◀ CABLES ▶

Felsted

◀ VALVES ▶

Gresen, Cross

◀ PUMPS ▶

Borg Warner, Vickers

◀ PILLOW BLOCKS ▶

Fafnir, Ashia

◀ CHAINS & SPROCKETS ▶

Brown, Morse

◀ HOSE & FITTINGS ▶

Synflex, Gates

◀ MOTORS ▶

Ross, Charlyn

◀ WINCHES ▶

Braden, Tulsa

UMPS MARINE

Box 81244

670 South

Lucile Street

Seattle, WA 98108

(206) 762-4720

Specialists

In

**Hydraulic
Components
and
System
Design**

economic information, the State of Alaska is not in a position to evaluate its investment opportunity in the fisheries. Moreover, the current lack of this information effectively precludes the state from explicitly formulating an economically sound fisheries development policy."

FRED uses a simplified micro scale to evaluate its hatcheries. The total development cost plus the anticipated annual operational costs are measured against the prices the fishermen will get for the fish over an arbitrary 20 year period.

Bob Lium, a hatchery developer in FRED's Juneau headquarters, said that with this method one can determine a reasonable benefit and get consistent results. "After trying several different techniques, 'I decided this was the most logical one and it was very easy to get my hands on the figures."

Benefits also can be calculated from how many tax dollars went into the general fund from the catch of hatchery-produced fish, the gross income to fish wholesalers and hatchery-related income to fishing communities. The consultant's report to the Aquaculture Policy Study Group recommends the first level wholesale price for processed salmon be used to determine benefits as represents the best average of all the different figures.

Lium said the cost-benefit analysis is a good tool for comparing hatcheries, "but there are so many different ways of determining benefits and arriving at costs that you can't say it's the best way of determining absolute value."

He said anyone trying to sell a project on the basis of its cost-benefit ratio would be "better off trying to sell it on its merits."

Roy said the cost-benefit analysis "does weigh in quite a bit" in deciding whether to build a hatchery. FRED makes sure that it will get at least a slightly better return on every dollar it spends on a facility. "If it comes in below one, we get very edgy."

Based on FRED's still limited experience, Lium said chums and cohos appear to be the best species to raise. Chums are easy and have a good value. Cohos are

more expensive to take care of, but have a very good rate of return.

Sockeyes also make good economic sense, Lium said. "If we could overcome the difficulties raising them, they'd be a great fish. But because of the difficulties, we're just trying to cool it." Sockeyes are extremely susceptible to the fatal infectious hematopoietic necrosis (IHN) virus.

So far, the only hatcheries that have become or are close to becoming financial successes are those that raise pinks. Pinks are a two year fish and the returns come back fast. Other species still are in the build up phase.

In 1979, the Tutka Lagoon hatchery got back 369,000 pinks. The Kitoi Bay hatchery on Afognak Island logged returns of 235,000 pinks.

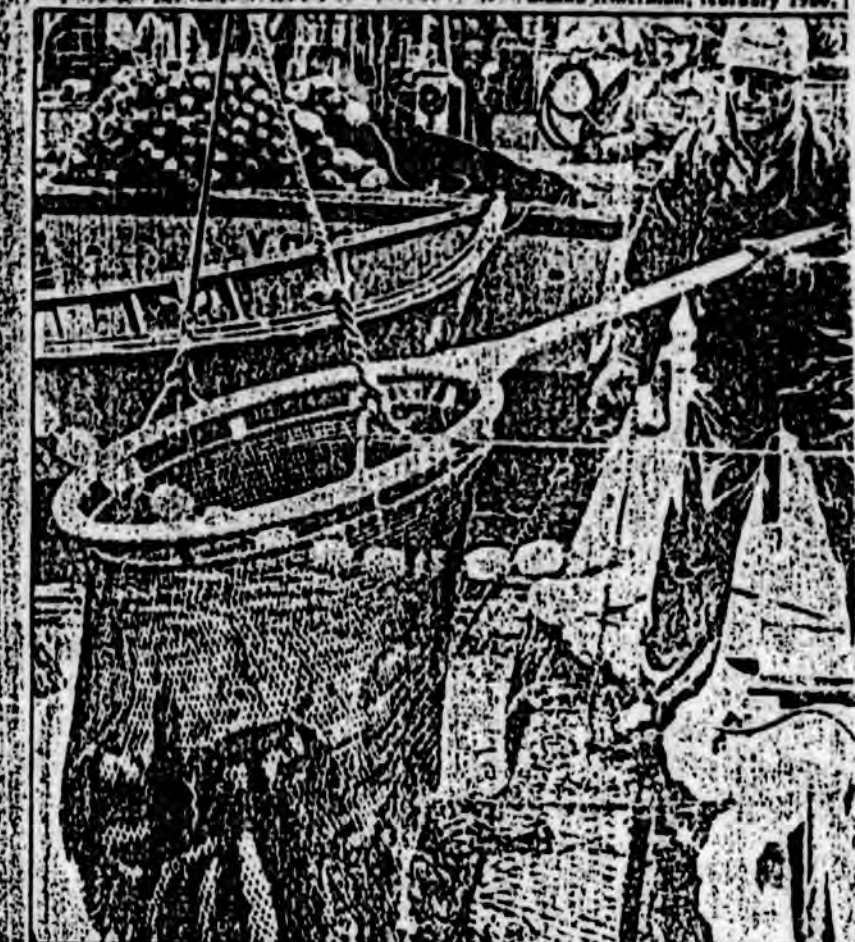
Pinks also are cornerstone of the Prince William Sound Aquaculture Corporation (PWSAC). Approximately 550,000 were accounted for in 1979. Around half of them were caught by purse seiners, adding at least \$350,000 to the fishermen's gross incomes. PWSAC harvested another 215,000 itself to help offset the costs of the hatchery.

For the first time in its five year existence, PWSAC balanced its revenues and expenditures. More than one million dollars was received both in income from fish sales and assessments from fishermen and processors.

The 1980 return is projected at 557,000 salmon. This return should be particularly significant since the wild stock forecast is not good—five million as compared to 1979's 18.4 million. If PWSAC's pinks come in at the expected 10 percent of the total run, Alaska will see a demonstration of a hatchery contributing a significant amount to stabilizing a fishery's low cycle.

Prince William Sound is used as an example of one of the regions in Alaska that can't afford not to have an aquaculture program. Wallace Noerenberg, a co-founder and now a consultant to PWSAC, wrote in a paper delivered to a 1976 aquaculture conference that "all the good management in the world" would never stabilize the Sound's stocks.

"We were quite encouraged through the 1960's in the rising trend of produc-



Alaska Department of Fish and Game photo. A commercial fisherman hauls pinks from his seine during an emergency commercial opening at Tutka Lagoon last summer. So many pinks returned to FRED's at Tutka Lagoon hatchery that commercial fishermen had to be called in to take care of the surplus. In Alaska's still limited experience with hatcheries, the greatest economic success has been recorded with pinks because big returns result within a short amount of time.

tion; but it is now clear that environmental factors, specifically adverse winter conditions in the streams which devastate eggs and alevins in the stream gravel, at times of certain weather sequences will continue to cancel much of this improved management," he said. "This occurred in the early 1970's and led to very depressed conditions after a lot of hopeful periods in the 1960's. I think the crashing of these stocks in the 1970's has had more to do

with the formation of our corporation than anything else."

Other regional aquaculture corporations have not been as prosperous and as successful as PWSAC.

The Inarpi Regional Aquaculture Corporation in Bristol Bay was formed in 1976. The Cook Inlet Aquaculture Association is in a holding pattern because

aquaculture

(Continued from page 9)

legal confusion over funding, but has a few small projects underway. Executive Director Floyd Heimbuch said hatcheries can be economical "as long as you don't put eggs ahead of biology."

The two Southeast corporations, Northern Southeast Regional Aquaculture Association (NSRAA) and Southern Southeast Regional Aquaculture Association (SSRAA), have had the most problems. Personality clashes, long-time ear conflicts and the physical and social separation of the region's communities have combined to hamper operations. The two were especially hard-hit by a Superior Court decision throwing out their main source of funding — a mandatory assessment on the catches of all fishermen in a region.

NSRAA was barely off the ground when got hit with the lawsuit.

SSRAA already was well-established, its activities to date have generated a lot of controversy.

A debate still is raging among fishermen and fisheries managers over RAA's wisdom in building a \$2.8 million central incubation facility (CIF) just outside of Ketchikan. Problems include a severe shortage of brood stock and restrictions imposed by FRED on what SSRAA can do with it.

FRED tends to look with suspicion on the CIF concept — which involves taking eggs from a stream, incubating them at a hatchery and taking them back to a stream, though not necessarily the one they came from — because of biological problems associated with introducing fish in stocks in a watershed and physical movement of the fish.

SSRAA's Whiteman Lake facility has a 26 million egg capacity, but now holds 4.3 million summer chums, 1.3 million fall runs and 500,000 cohos. Executive Director Ron Wendte said SSRAA's board of directors probably "recognized that it was not easy to develop brood stock, but could SSRAA feel the regulations and application to brood stock develop-

Some state officials contend state hatcheries should pay their own operating costs. The idea is to relieve Alaska's taxpayers of the burden of supporting a program that primarily benefits one group — the commercial fishermen.

The concept has wide support among lawmakers.

FRED is formulating some options. An alternative to having every state hatchery raise money through its own terminal harvest is to designate one hatchery in a region — or even the state — as the revenue producer for all the others.

"This would make up for the places where you can't alter the fishery to make it pay for itself," said Stan Moberly, FRED's Southeast regional supervisor.

The value of the nine million adult salmon FRED eventually hopes to add to statewide runs would amount to an estimated \$52.4 million a year. This year's 87 million catch was valued at approximately \$350 million.

Bob Roys said the state just now is starting to get returns. He expects FRED's costs to level off while the "returns keep increasing until we get 9.5 million fish."

For getting those runs, Roys puts his faith in hatcheries rather than lower cost rehabilitation projects like stream clearance and portable incubation boxes. He said they are the "most reliable over time" in meeting fish production objectives.

Hatcheries also are good for overcoming bad environmental conditions, he added. "One of the major working hypothesis that we're working under is that the biggest mortality occurs within 60 days after the fish leaves the freshwater environment."

Alaska fisherman, February 1980, page thirty-one
We can time the release so it coincides with better conditions and we can release them at a larger size."

Roys doubts Alaska can base its escalating subsistence, sport and commercial needs of salmon on natural runs.



alaska coastal
real estate

FOR SALE IN JUNEAU

- WATERFRONT ACCESS 6+ ACRES
- 20,000 SQ. FT. OFFICE/WAREHOUSE
- BARGE LANDING AREA COMMERCIAL ZONE
- TO QUALIFIED BUYER: 8 3/4% ASSUMABLE MORTGAGE

PRICE: \$550,000

CALL HENRY D. TIFFANY AT

586-1212

195 South Franklin St. Juneau, Alaska 99801



**"Union Bay Is
Probably Building the
Most Cost Effective
Boats in the Pacific"**

their application to brood stock development have been overly restrictive, both for our facility and the FRED facilities."

Wendte said the board was aware of a CIF's difficulties but went ahead because of its flexibility. "We'll be able to enhance various fisheries in a wide range of areas," he said.

Many Ketchikan fishermen accuse SSRAA of turning itself into a bureaucracy and building a useless concrete monument. Wendte said that when the board decided on a facility, they wanted it to have a "significant and positive impact on the fishery," and that involved a minimum feasible size. "They initially looked at a much larger facility" with a 40 to 50 million egg capacity, but because of cost, scaled it down to 25 to 30 million.

Much of the bad feeling about SSRAA stems from reports it wasted a lot of money in its early years of operation. Seiners, as a whole, were particularly critical. Michele Zerbetz, executive director of the Southeast Alaska Seine Boat Owners and Operators, said that was because of personalities, conflicts over brood stock and the rumors of overspending.

Now, however, "we don't have that worry," she said. "All the money's been spent. SSRAA is operating on a shoestring."

Wendte notes that SSRAA might have trouble paying for the Whitman Lake CIF. It was financed by a 25-year note from the state Department of Commerce and Economic Development. SSRAA won't have to start paying it off until 1985.

"The theory being that in a six-year period we will be able to develop sufficient returns to cover the cost of retiring the debt service and to cover the operating costs," he said. However, the six-year period is "based on the assumption that in the first year we'll have a full hatchery operation. Evidently, that's not possible. That's why we're considering changing it to a more realistic 10 years."

The change is being readied for introduction in the legislature.

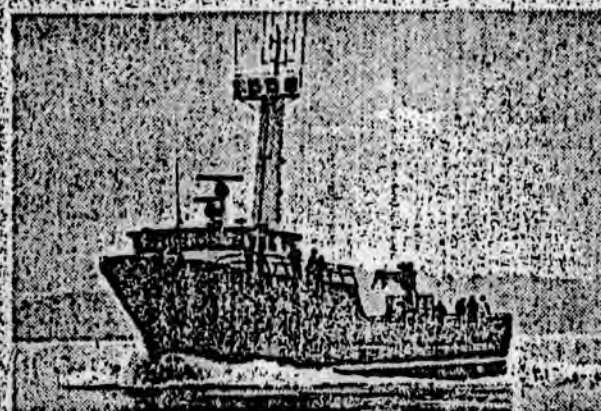
Bob Lium recommends the private non-profit hatcheries stay away from the cost-benefit analysis and work on a profit-loss basis. That way they'll know on a

Doubts in the Pacific Fishing Fleet Today."

— Capt. Mark O'Brien



Discovery



Nordic Venture

How does Captain O'Brien come to that conclusion? From experience. He is co-owner and skipper of the first Union Bay-built crabber-trawler, the 96-foot *Discovery*.

Union Bay's exclusive hull design gives its crabbers an enormous payload capacity—200,000 pounds in the *Discovery*; 225,000 in the 106-foot *Nordic Venture*—the equal of much larger (and proportionately more expensive) vessels.

A big payload, plus high performance levels, plus lower capital and operating costs is the textbook formula for cost efficiency. An added dimension to every Union Bay-built boat.

UNION BAY SHIPBUILDING CORPORATION

Designers, Builders and General Vessel Repairs
4125 Ninth N.W., Seattle, Washington • 206/782-0300

ALASKA'S SALMON HATCHERIES

1891- 1959



By
Patricia Roppel

"When all is said and done, and all criticisms on early hatchery procedures and techniques are made, it is true part of these were well founded, but in the main, we made those mistakes due to lack of experience. We were groping in the dark and it simply took time. They didn't send a man to the moon without tremendous research. In the same vein, given the knowledge we have now, scientific and practical, salmon hatcheries, particularly in Alaska where the natural environment hasn't been tampered with, should be highly successful."

Alphonse Kemmerich

Alaska Historical Commission Studies in History No. 20.