

SCOMM

74:22



Alaska State Senate

Office of the President

Senator Richard I. Eliason, President

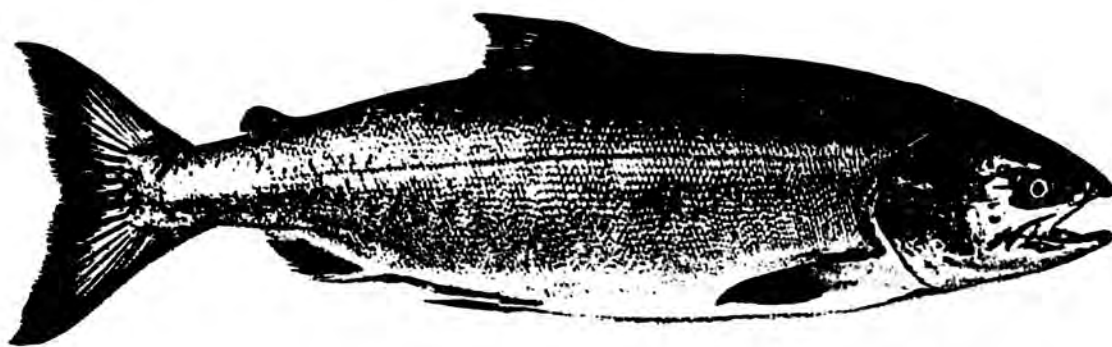
Original
Full Draft
Report -

Double-sided, and
includes Exec. Summary

(ready for making
more double-sided
copies)

DRAFT DRAFT DRAFT DRAFT DRAFT DRAFT

**LEGISLATIVE REVIEW
OF THE ALASKA SALMON ENHANCEMENT
PROGRAM**



**Senate Special Committee on
Domestic & International Commercial Fisheries**

February 10, 1992

DRAFT ** DRAFT ** DRAFT ** DRAFT ** DRAFT

**LEGISLATIVE REVIEW OF ALASKA'S FISHERIES
ENHANCEMENT PROGRAM**

February 10, 1992

Executive Summary & Options to Consider

- I. Introduction
- II. History & Development of Hatcheries in Alaska
- III. Production Policies and Trends in Alaska and Worldwide
- IV. Fisheries Management Issues
 - A. Mixed-Stock Fishery Management
 - B. Quality
 - C. Tagging Needs
- V. Legal Issues Raised by Board of Fisheries
- VI. Planning and Permitting Process
- VII. Biological Issues
- VIII. Enhancement Funding
- IX. Economics
- X. Marketing
- XI. Other Issues
 - A. Use of Hatcheries as Environmental Mitigation
 - B. Role of Hatcheries in International Treaties
 - C. Environmental Regulations
 - D. Use of Hatcheries as Tool for Economic Development
 - E. Importance of Hatcheries to Sport Fish
 - F. Contribution to Subsistence Fish
 - G. Enhancement of Other Species

CHAPTER I. INTRODUCTION

In the late spring of 1991, the Alaska Senate's Special Committee on Domestic and International Commercial Fisheries initiated a review of fisheries enhancement in Alaska. The committee recognized that while hatchery and other enhancement projects in Alaska have been highly successful, the statutes that regulate them and the role that they play in the overall fisheries picture in the state have not been thoroughly reviewed since the original enabling legislation was enacted nearly twenty years ago. Besides the change, growth and success experienced by the enhancement program itself, the entire fishing industry, of which this program is an important component, has undergone enormous change. New variables have entered the fisheries scene that were not anticipated or factored into our enhancement laws: the implementation of limited entry, the advent of fish farming, oil spills, a worldwide glut of salmon markets, the rising and crashing of various fish and shellfish stocks, impacts of trawling and highseas driftnets, annual state revenues that grew dramatically for some years and are now declining, and the possibility of the enhancement and pen-rearing of fish and shellfish species not thought to be feasible in the past.

Since the fisheries enhancement program in Alaska is statutorily established and regulated, the Legislature has a clear obligation to stand back and take a comprehensive look at where this program started, where it has gone during these first two decades, and where it ought to be headed in the future. Consideration must be given to how the context in which this program operates has changed over the years, in order to ensure that current and future enhancement efforts will be economically and biologically sound and fulfill the goals for which they were established.

The Committee did not begin with any preconceived notion of the conclusions, recommendations, or actions that might result from this review, just a desire to gather and study information in hopes that some patterns, gaps, and areas which need legislative direction would become evident. It was decided that a group of legislative staff members would do the bulk of the research, assisted by the Legislative Research Agency and private contractors as necessary. Upon release of the draft report, public input would be solicited and hearings held to finalize the report and consider legislative action.

The Senate Special Committee on Domestic and International Commercial Fisheries and the other legislators and staff members who have worked on this review recognize and commend the outstanding successes of the salmon enhancement program in Alaska over the last two decades. It is our hope that the attached review will serve as a starting point for the scrutiny and eventual fine-tuning that will ensure that Alaska's fisheries enhancement programs are the best they can be.

It should be noted that an important segment of the review is not included in this draft report. The economic analyses, contracted to professional researchers, will not be complete and available for several months. Therefore, this draft contains information on the other topics of the review, with options presented at the end of each chapter regarding that specific chapter. Overall conclusions regarding Alaska's salmon enhancement program will be developed after the economic studies have been completed and analyzed in relationship to the information contained in this draft report.



Alaska State Legislature

Official Business

SENATE SPECIAL COMMITTEE
ON DOMESTIC AND INTERNATIONAL FISHERIES

P.O. Box V
State Capitol
Juneau, Alaska 99811

February 10, 1992

Dear Reviewer:

Attached is the Executive Summary of the Draft Report of the Legislative Review of the Alaska Salmon Enhancement Program which is being released today for public comment by the Senate Special Committee on Domestic and International Fisheries.

Many issues and concerns relating to the state's salmon enhancement programs have been brought to the Legislature's attention over the last few years. Last spring it became apparent that it was time the Legislature, as the state policy-setting body, step back and take a broad look at these programs. The Committee decided to undertake this review with the participation of all interested Alaskans.

I must strongly emphasize that this report is only a DRAFT. It is the result of an effort to identify and research various issues, concerns and conflicts associated with the state's salmon enhancement program, and to begin laying out some possible options (not recommendations at this point) to consider for improving the program.

This draft report has been prepared by legislative staff with the assistance of the Legislative Research Agency and the input of state agencies and others. It is a starting point. Now it is time to enlist the help, and incorporate the suggestions, of other legislators, hatchery operators, fishermen, scientists, processors and others who care about the state's enhancement programs.

It should be noted that one important segment of the review is missing. That is the economic analysis that was contracted to professional researchers at the University of Alaska. This analysis will not be complete and available for several months. Therefore, this draft report contains information gathered on other aspects of the program, with specific options presented at the end of each chapter. Until the economic studies are incorporated into the entire review, we cannot presume to be looking at the "whole picture." When that last major piece of the puzzle is in place, we will begin the process of formulating some overall conclusions.

Our goal now is to fine-tune the chapters contained in this draft report, see what conclusions can be reached with the information before us, and develop those options which we can act on right away. We are counting on your comments on the contents of this

draft report, especially regarding your thoughts about the lists of options: which ideas you like or dislike; which ones should be addressed immediately, and how; what additional options should be added to the list for consideration. Please let us know of any errors, omissions, or misinterpretations you see in this draft.

We urge you to participate in a teleconferenced hearing on this report scheduled for Monday, February 24, from 1:30 to 5:00 p.m. This will be the first of several hearings on the various aspects of the enhancement program and any legislative action that may be proposed. In addition to your testimony at the teleconference, it would be helpful to have your comments in writing as soon as possible. (To: Sen. Eliason, Senate Fisheries Committee, State Capitol, Juneau, AK 99801-1182, or to FAX #907-465-4928). Public input is vital to the success of this review!

Please note that what we are sending out is the executive summary of the draft report which includes the lists of possible options for consideration at the end of each chapter, and a table of contents for the full report. The complete draft report is several inches thick. If you would like to receive a copy of any particular chapter(s), please call my office at 465-4916, or check with your local Legislative Information Office as we will be sending a complete draft report to most LIOs to have available to the public.

Thank you for your interest in this review project, and for any ideas and input you can contribute. We look forward to working with you.

Sincerely,



Senator Dick Eliason, Chairman
Senate Special Committee on
Domestic and International Fisheries

DRAFT REPORT ** DRAFT REPORT ** DRAFT REPORT

**LEGISLATIVE REVIEW OF ALASKA'S FISHERIES
ENHANCEMENT PROGRAM**

February 10, 1992

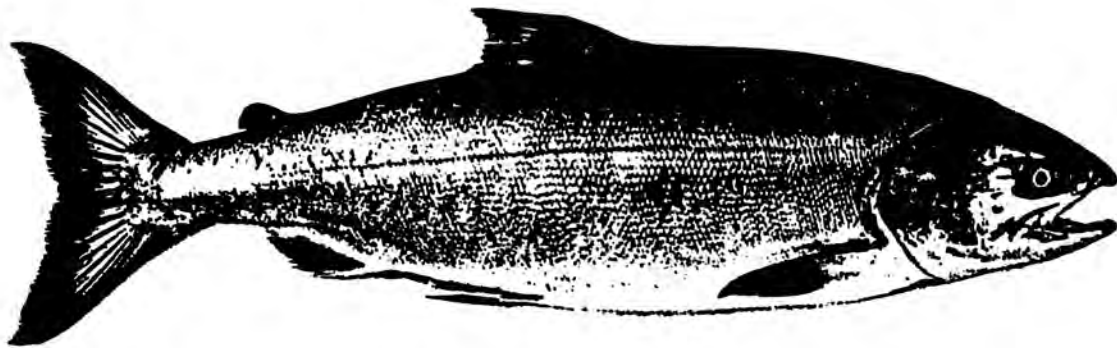
Executive Summary & Options to Consider

- I. Introduction
- II. History & Development of Hatcheries in Alaska
- III. Production Policies and Trends in Alaska and Worldwide
- IV. Fisheries Management Issues
 - A. Mixed-Stock Fishery Management
 - B. Quality
 - C. Tagging Needs
- V. Legal Issues Raised by Board of Fisheries
- VI. Planning and Permitting Process
- VII. Biological Issues
- VIII. Enhancement Funding
- IX. Economics
- X. Marketing
- XI. Other Issues
 - A. Use of Hatcheries as Environmental Mitigation
 - B. Role of Hatcheries in International Treaties
 - C. Environmental Regulations
 - D. Use of Hatcheries as Tool for Economic Development
 - E. Importance of Hatcheries to Sport Fish
 - F. Contribution to Subsistence Fish
 - G. Enhancement of Other Species

DRAFT DRAFT DRAFT DRAFT DRAFT DRAFT

**LEGISLATIVE REVIEW
OF THE ALASKA SALMON ENHANCEMENT
PROGRAM**

EXECUTIVE SUMMARY



**Senate Special Committee on
Domestic & International Commercial Fisheries**

February 10, 1992

Chapter I

INTRODUCTION

In the late spring of 1991, the Alaska Senate's Special Committee on Domestic and International Commercial Fisheries initiated a review of salmon fisheries enhancement in Alaska. The committee recognized that while hatchery and other enhancement projects in Alaska have been highly successful, they have not been comprehensively reviewed since the program's inception nearly 20 years ago. Since the program was initiated by the Alaska Legislature, and setting policy for state programs is a legislative responsibility, it is appropriate that the Legislature be the entity to conduct this review.

The committee began its work with no pre-conceived notions regarding its eventual findings and conclusions. Rather, legislative staff were directed first to compile relevant information, question interest groups, and develop a series of recommendations or options for action that could be taken to improve the state's program. This review is to serve as a starting point for a process of scrutiny and fine-tuning that may become an established part of the enhancement program itself.

It should be noted that an important segment of the review is not included in this draft report. The economic analyses, contracted to professional researchers, will not be complete and available for several months. Therefore, this draft contains information on the other topics of the review, with options presented at the end of each chapter regarding that specific chapter. Overall conclusions regarding Alaska's salmon enhancement program will be developed after the economic studies have been completed and analyzed in relationship to the information contained in this draft report.

Chapter II

HISTORY AND DEVELOPMENT OF HATCHERIES IN ALASKA

The development of Alaska's hatchery program was an evolutionary process. Beginning as early as the late 1800s, attempts at hatchery production of salmon were undertaken by the federal government and private industry. As harvests of salmon declined, interest in efforts to mitigate the economic impacts through enhancement and hatchery production increased. However, enhancement efforts were minimal until a dramatic drop in salmon harvests in the 1960s and 1970s prompted state action.

The expressed goal of the state hatchery program was to produce additional fish to supplement the existing wild salmon stocks. The Legislature acknowledged concern about the potential for detrimental biological impacts of large-scale hatchery development on wild stocks, particularly from the interaction between wild and hatchery fish. However, program development was primarily driven by concern about the economic decline of the fishing industry.

In 1969 the state began receiving large sums of revenue from oil and gas leases on the North Slope. The Legislature decided to channel some of the future public income from such nonrenewable resources into development of renewable resources for long-term economic stability. The salmon resource was an obvious candidate for this type of investment.

Throughout the 1970s, laws were enacted to facilitate development of a major fisheries enhancement program in Alaska. Program components included:

- creation of the Division of Fisheries Rehabilitation, Enhancement and Development (FRED) within the Alaska Department of Fish and Game,
- passage of a number of bond issues authorizing tens of millions of dollars for capital improvements for state hatchery facilities,
- authorization of private nonprofit (PNP) corporation hatcheries, and
- creation of regional aquaculture associations (as PNP) responsible for the regional planning and coordination of salmon enhancement activities.

After the initial start, it became increasingly apparent that a successful hatchery program was going to be more expensive than originally anticipated. New methods of financing were sought. The Legislature made funds available to PNP hatcheries through the Renewable Resources Development Fund, and by expanding the commercial fisheries loan program to include hatcheries. A separate fisheries enhancement loan program was later established. Statutes were also amended to allow proceeds from PNP sales of salmon or eggs to be applied to debt retirement, as well as operating costs.

A salmon enhancement tax was enacted that allows commercial fishermen in a region to vote to pay an assessment of 1 to 3 percent of the ex-vessel value of the landed salmon catch. The proceeds of this assessment are appropriated by the state to regional aquaculture associations. State law also provided for the establishment of other PNP operations run by private nonprofit corporations which are independent of regional associations, sometimes called "Mom and Pop" hatcheries. Both regional associations and "mom and pop" hatcheries are "PNPs" under state law. In this report, any reference to PNPs refers to both types unless otherwise indicated.

Legislation was passed creating a Fisheries Enhancement Revolving Loan Fund within the Department of Commerce and Economic Development. Over the years, a variety of other provisions were passed to assist in the construction and operation of hatcheries. These include such things as property tax exemptions, the granting of special harvest area entry permits to PNP hatchery operators for harvesting of their own broodstock and cost-recovery fish, exempting these broodstock and cost recovery fish from salmon enhancement taxes, and allowing the state to contract the operation of state hatcheries to regional associations.

Currently the state operates 12 hatcheries throughout the state, and PNPs operate 25 hatcheries, of which 4 are state-owned facilities. Hatchery fish represented 24 percent of Alaska's commercial salmon harvest in 1990. The FRED Division maintains two pathology labs, one genetics lab, one limnology lab, and a coded-wire tag processing lab. The Division also provides technical and management assistance to the PNP hatcheries. While PNP's tend to focus on production for the commercial fishery, FRED hatcheries emphasize research, some production of sport fish species, and experimental farming of shellfish and aquatic plants.

A review of legislative history reveals that many facets of the hatchery program which have evolved over the past two decades, such as financing, related fisheries management issues, and biological concerns, were not foreseen or were only briefly acknowledged or discussed by the Legislature during the initial stages of development of the program. The record does reveal legislative intent in some broad areas, but it appears that many current questions and concerns

regarding the role and future of hatcheries will have to be addressed without benefit of clear statutory or historical direction.

Chapter III

PRODUCTION POLICIES AND TRENDS IN ALASKA AND WORLDWIDE

In 1980, Alaska salmon harvests accounted for 41 percent of world salmon supply. By the end of 1990, wild and enhanced Alaska salmon accounted for just 31 percent of the world supply. This occurred, despite the 50 percent increase in Alaska's production during the same period, as a result of the dramatic increase in farmed-salmon production. Farmed-salmon production nearly doubled between 1988 and 1990, increasing from about 310 million pounds to over 600 million pounds. In 1990, farmed salmon composed about 30 percent of world salmon production, up from a mere one percent in 1980. The increased supply of salmon on the world market has lowered prices. Lower salmon prices and rising operating costs have brought economic hardship to salmon farming operations worldwide, although many farms remain competitive. Recent trends indicate a slight reduction in farmed salmon production. Lower prices have also adversely impacted commercial salmon-fishing operations worldwide.

One interesting development in the salmon farming industry is that the glut of salmon on the world market has forced many salmon farmers to freeze their product for later resale. This trend could increase the competitiveness of Alaska frozen fish since it eliminates the perceived "fresh versus frozen" advantage of farmed fish.

The countries and regions which commercially harvest the largest quantities of *wild and hatchery* salmon are the United States (Oregon, Washington and Alaska), Canada (British Columbia), Japan and the U.S.S.R. Other areas have experimented with salmon ranching, but as yet produce few fish. Major salmon-farming industries are located in Norway, Scotland, Chile, U.S. and Japan. Iceland, the Faroe Islands, Ireland, Australia, New Zealand and France also farm salmon but are not considered major producers.

CHAPTER IV

FISHERIES MANAGEMENT

The success of the state's enhancement program has made managing Alaska's salmon fisheries more complicated. Much of this research project was initiated by a request from the Board of Fisheries to provide clearer legal and policy direction on the issues of managing fisheries for a wild stock priority, providing for broodstock, and providing for cost-recovery fisheries. These three issues encompass a number of legal questions and are addressed in Chapter V, Legal Issues. In this chapter a variety of other management issues are discussed.

MIXED-STOCK FISHERIES

A fundamental issue facing fisheries managers is how to control fishing effort in mixed-stock fisheries composed of both hatchery and wild stocks. The predominant management concern is that the weakest stocks will be overfished. In cases in which hatchery productivity is significantly greater than natural stock productivity, wild stocks face the risk of being depleted. In cases where hatchery stocks are smaller, these stocks run the risk of being lost among the wild stocks. Smaller stocks are more likely to be in danger of depletion in mixed-stock fisheries because there is a tendency to optimally harvest the larger stocks before quality declines in terminal fisheries.

With large scale hatchery enhancement, ADF&G's Division of Commercial Fisheries is concerned that the additional costs of managing mixed stock commercial fisheries composed of wild and hatchery stocks are not always accounted for in the planning and operation of hatchery facilities, and fisheries managers are often not given adequate funds to properly manage what can become a very complicated fishery.

QUALITY

State law requires that fish returning to hatcheries and sold for public consumption be of comparable quality to fish harvested by commercial fishermen in the area. Prince William Sound is the major focal point for the issue of managing hatchery and wild stocks to optimize quality and marketability.

During the planning process for the Prince William Sound hatcheries, the Basic Management Plans that addressed the harvest of hatchery fish were developed cooperatively by the department and hatchery operators. *Returning adults were to be primarily harvested in terminal areas, thereby minimizing harvest conflicts with wild stocks.* Additional harvest management costs were not considered under this strategy. Initially, fish quality was not an issue as terminally caught fish were of high quality. However, as the program grew, processing capacities became fully utilized, sometimes forcing delays in harvesting terminal fish. Such delays resulted in poorer quality fish, and thus, the demand to harvest fish farther away from terminal areas. This issue was highlighted last season in Prince William Sound.

During discussions at recent meetings of Governor Hickel's Salmon Strategy Task Force, it became apparent that there is no definitive information on how close to their spawning areas salmon can be harvested without sacrificing quality. ADF&G has suggested a research project be funded to analyze salmon quality at various distances from their spawning areas in an effort to determine how best to manage fishing effort to produce a top-quality and marketable product.

TAGGING NEEDS

Since hatchery-produced fish often complicate fisheries management, a way to simplify management is to determine the mix of hatchery and wild stocks in a mixed-stock fishery. For most mixed-stock fisheries composed of hatchery fish, an adequate program of tagging, recovery and analysis is required.

*The tagging method most commonly used now is the coded-wire-tag (CWT). However, otolith marking is seen as the most viable mass marking technique on the horizon. The benefit of otolith marking is that virtually **all** hatchery fish can be marked at the same time. FRED Division is also actively pursuing genetic stock identification (GSI) research and applications using both protein electrophoresis and deoxyribonucleic acid (DNA) analysis.*

The extent of any particular tagging program is determined by funding. The general assumption is that the people who tag the fish pay for the tagging. In the case of hatchery operators, that usually means the state or the PNP operator. However, the greater expense lies with the recovery and analysis of tags by the state, and the issue of who pays for that portion has never been resolved. Commercial fisheries managers would like to see more tagging to enable increased management precision. The Board of Fisheries would also like to see additional tagging in order to provide information for allocation disputes.

FRED Division is informing hatchery operators that new increments of hatchery production will be permitted with a requirement that the operator pay for tagging and analysis. Whether or not to require that of existing production is being debated. Some people, including some members of the Board of Fisheries, advocate for a requirement that all hatchery production be categorically tagged and analyzed. However, existing operations have permits that do not require tagging. These operations were planned, permitted and funded without accounting for tagging in their costs. It is likely that imposing a tagging requirement on permitted facilities would be subject to legal challenge.

Another issue, however, is whether an all encompassing tagging requirement is necessary. In some cases, a multi-year tagging study to show migration patterns and run timing would be sufficient. In other cases, where tagging is intended for in-season management, a large tagging program would need to be maintained. Not all hatchery production results in complicated, mixed-stock fisheries that would necessitate extensive tagging.

The question has also been raised concerning the extent of tagging or marking of natural stocks, and whether the current level is sufficient to provide the necessary information in mixed-stock fisheries composed both of hatchery and wild stocks.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Development of a state policy on managing mixed-stock fisheries composed of hatchery and wild stocks.
- Requiring hatchery production to have tagging, recovery and analysis programs. This could range from a blanket requirement for all production to site-specific requirements.
- Development of a policy regarding funding for tagging, recovery, processing and analysis.
- Funding a study to analyze salmon quality at various distances from terminal streams to determine the effect of fishery management effort on product quality and marketability.

- Direction to the Board of Fisheries on how to factor managing for quality into fisheries management plans.
- Funding research and development of new tagging and marking techniques suitable for mass marking.
- Clarifying the roles and uses of tagging---for biological information, allocation, or management purposes.
- Expanding tagging and stock identification studies of wild fish stocks for the purpose of comparing wild and hatchery stocks.

Chapter V

LEGAL ISSUES RAISED BY BOARD OF FISHERIES

The Board of Fisheries ("board") has expressed to the legislature its concern over perceived ambiguities in the Alaska statutes relating to wild stock and hatchery fish management. *One problem is that there is no clear statutory policy for the board to follow when it must make decisions that would favor wild stocks over hatchery fish or vice-versa. An additional problem is that the statutes are unclear about the state's duty to provide for hatchery broodstock and cost recovery, and about the hatcheries' obligation to contribute to the common property fisheries.*

The Alaska Statutes contain only two direct references to wild stock protection from hatchery-related dangers: AS 16.10.400(g), which requires the commissioner, during the development of a comprehensive regional plan and before a hatchery permit is issued, to determine that such an action would not jeopardize wild stocks; and AS 16.10.420(g), which directs the department to require, as condition of a permit, that the hatchery be located in an area where "reasonable segregation" from wild stocks occurs.

The board is concerned that these statutes protect wild stocks only prior to the start of a hatchery operation. This raises the inference that, once a regional plan is completed and/or a hatchery permit is issued, wild stocks no longer enjoy a statutory protection from hatchery operations.

Article VIII, sec. 4 of the Alaska Constitution ("Sustained Yield") states:

Fish, forests, wildlife, grasslands, and all other replenishable resources belonging to the State shall be utilized, developed, and maintained on the sustained yield principle, subject to preferences among beneficial uses.

The board was created "for purposes of the conservation and development of the fishery resources of the state." AS 16.05.221. The Alaska Supreme Court has stated that, "'conserving' implies controlled utilization of a resource to prevent its exploitation, destruction or neglect" and that "'development' connotes management of a resource to make it available for use." Kenai Peninsula Fishermen's Coop. Assn. v. State, 628 P.2d 897, 903 (1981).

ATTORNEY GENERAL OPINION

In an August 1990 opinion letter to the commissioner of the Department of Fish & Game, assistant attorney general Stephen White concluded that the board had the authority, and was in fact directed by law, to manage for hatchery broodstock. He further concluded that the board had the power to manage for cost recovery, but that it was not required to do so. He based these conclusions in part on the unstated assumption that the constitutional "sustained yield" requirement applied to hatchery fish. This assumption, coupled with the board's statutory charge to "conserve" the fishery resource, formed the basis for White's conclusion that the board was required to manage for broodstock.

White's conclusion that the board has the authority to manage for cost recovery was based on the board's statutory authority to "develop" the resource and to allocate among various user groups. Although hatchery operators are not specified on the list of user groups for which the board may allocate, AS 16.05.251(d), White concluded that the board had the power to make such an allocation by treating hatchery operators as a "subgroup" of commercial users. He noted that the Alaska Supreme Court, in *Meier v. State*, 739 P.2d 172, 174 (1987), has upheld a board allocation between two subgroups of commercial users.

OPINION RESPONSES

The White opinion generated two critical responses. The first was from *Juneau attorney Michael A.D. Stanley, in a February 1991 letter to the Southeast Alaska Seiners. Stanley argued that the "sustained yield" clause may not apply to hatchery fish for a number of reasons.* First, because humans play such a significant role in the development of hatchery fish, there is some question whether the framers of the constitution would have considered them "natural" resources "belonging to the state" as those terms are used in article VIII. Stanley then points to AS 16.10.440(a), which provides that hatchery fish are to be treated "in the same way as fish occurring in their natural state until they return for harvest by the hatchery operator." He argues that the "in the same way" language indicates the legislature did not view hatchery fish as already subject to article VIII.

Stanley also takes issue with White's conclusion that hatchery operators could receive a cost recovery allocation as a subgroup of commercial users. He asserts that the definition of "commercial fishing," AS 16.05.940(5), would have to be "strained" to include hatchery operators, and that such a broad reading would allow other inappropriate users (such as salmon derby operators) to be considered as a subgroup. He also notes that the definition of "commercial fisherman," AS 16.10.940(4), contemplates a "natural person," not a nonprofit corporation.

Finally, Stanley asserts that only the department, not the board, can make an allocation of fish for hatchery operators. He argues that AS 16.10.440(a), quoted above, allows for harvest only at an area designated by the department, and only after the hatchery fish have travelled through the common property fisheries. Stanley argues that for the board to decide otherwise would be a circumvention of the existing statute.

The second opinion that questioned assistant attorney general White's conclusions was from Legislative Counsel George Utermohle, in an April 8, 1991 letter to Senator Dick Ellason. He argues that, if the legislature had intended for hatchery fish to be managed on a sustained yield basis, it would have used the phrase "belonging to the state" when it wrote AS 16.10.440(a), quoted above. Utermohle reasons that the legislature intended hatchery fish to be treated as if they were a part of the common property resource, but only until they return to the designated harvest location; at that point, the hatchery operator may harvest the fish. Utermohle asserts that this language "suggests some form of lingering private property interest in hatchery fish by the hatchery operator," and indicates that the fish do not "belong" to the state for purposes of sustained yield.

Utermohle also argues that if hatchery fish belong to the state, it does not mean they necessarily must be managed for sustained yield. He points out that the sustained yield principle is always "subject to preferences among beneficial uses." Citing commentary and minutes from the Alaska Constitutional Convention, Utermohle asserts that the delegates understood this qualification to mean that the state "could make reasoned decisions to prefer certain renewable resources over other renewable resources to achieve a more beneficial public purpose." He concludes that this "may permit the state to harvest hatchery fish without providing for sustained yield;" and points to AS 16.10.430(b), which allows the termination of a hatchery operation "in the best interest of the public, if the adverse effects of the operation are irreversible and cannot be mitigated."

The Stanley and Utermohle opinions generated a vigorous and lengthy response from Anchorage attorney A. William Saupe, contained in an October 17, 1991 opinion letter to the president of the Prince William Sound Aquaculture Corporation (PWSAC). Saupe concluded that any regulation significantly restricting PWSAC's broodstock and cost recovery practices would be inconsistent with existing statutes and with the Alaska Constitution. He further concluded that legislative history suggests the board was never intended to have the power to limit hatchery production.

Saupe points to the legislative history compiled by Linda J. Snow of the Legislative Research Agency as evidence that the legislature intended to assert state ownership of hatchery fish, and relies on statements made by several legislators and lobbyists to that effect. He also cites commentary from the framers of the constitution which states that the sustained yield principle is applicable to "plant and animal life subject to the immediate control of the state." Saupe argues that hatchery fish are so subject and therefore must be managed for sustained yield.

He answers the "beneficial use" argument by asserting that article VII, sec. 15, which speaks to the "efficient development of aquaculture in the state," indicates the importance and value of hatchery operations to the state; he also argues that hatcheries, specifically PWSAC's, would be seriously harmed if broodstock harvest was curtailed.

Saupe also points to "an extensive web of statutory provisions that evidence an unwavering legislative intent to sustain and expand hatchery operations through hatchery harvest," as evidence of the legislature's belief that harvests are necessary and beneficial. Among these provisions: AS 16.10.443, which requires the department to assist permit holders in the operation of their hatcheries; AS 16.10.450(a), which contains certain expenditure requirements for hatcheries that sell salmon or salmon eggs after harvest; AS 16.43.420, which allows for the sale of fish caught under the authority of a special harvest area entry permit; and AS 16.10.430(b), which allows sale, but not release, of fish during the period

of time that a hatchery operation is being terminated; AS 16.05 020, which requires the commissioner to "improve and extend" the fisheries of the state. Saupe concludes that the cited statutes, and legislative history, demonstrate the legislature's intention that cost-recovery harvests be the primary method of funding private nonprofit hatchery operations.

Saupe also takes issue with Michael Stanley's questioning of the board's authority to allocate for cost recovery. Saupe argues that the language of AS 16.05.440(a), quoted above, applies only to the time and location of a special harvest and not to allocation. To support his conclusion, he points also to legislative history indicating approval of board authority to regulate hatchery harvests, as well as to provisions of the Limited Entry Act that subject entry permit holders to board regulations.

On the question of board restrictions on local hatchery production, Saupe is less certain. He cites evidence to the effect that the legislature did not consider such restrictions during the time the private nonprofit hatchery system was put in place; and he takes the position that AS 16.10.440(b), which allows the board to amend hatchery permit terms relating to source and numbers of salmon eggs, was intended by the legislature to relate only to harvests and not to limiting hatchery production. On the related question of the board's ability to limit hatchery production on a regional basis, Saupe acknowledges that the answer is unclear, but he asserts that such a policy would conflict with many statutes already cited, and with the constitutional provisions relating to sustained yield and promotion of aquaculture.

CONCLUSIONS

1. There is no specific statutory mandate directing the board to give wild stocks preferential management treatment relative to hatchery raised fish.

2. The Alaska Constitution may require that hatchery fish be managed to allow for broodstock and cost recovery by the hatcheries, but that requirement may be invalidated by a determination that the sustained yield of hatchery fish is not as "beneficial" a "use" of the fishery resource as that of protecting the health of the wild stocks.

3. Existing statutes appear to allow the board to allocate fish to hatcheries for broodstock, but are less clear as to the authority for cost recovery.

4. Existing statutes are not clear on the board's authority to restrict hatchery production on a local or regional basis.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Placing a wild stock priority into state statutes; or alternatively, making the status of wild and hatchery stocks of equal priority, or leaving the statutes ambiguous.
- Clarifying in state statutes whether or not the Board of Fisheries is required to provide for hatchery broodstock or for cost-recovery fisheries.
- Clarifying the Board of Fisheries' authority to restrict hatchery production.

Chapter VI

PLANNING AND PERMITTING PROCESS

A major element of the statewide salmon enhancement program is the planning and permitting process.

CURRENT PLANNING AND PERMITTING PROCESS

The Department of Fish and Game (ADF&G) is responsible for planning enhanced salmon production which is conducted on a regional basis throughout the state. Regional aquaculture associations have been formed in some regions to plan and implement enhancement projects. *Regional Planning Teams (RPTs)*, composed of department personnel from the fisheries divisions and representatives from the regional aquaculture associations (or local fishermen if there is no association), are charged with developing long-term comprehensive salmon production plans. The state also involved the private sector in the enhancement effort through private nonprofit (PNP) corporations which can plan and build hatcheries. Those PNPs that are not part of a regional aquaculture association are referred to as "Mom and Pop" operations.

The RPTs not only develop the comprehensive salmon plans, but also review and comment on all hatchery permit applications, annual hatchery management plans, and annual reports. Each hatchery enhancement project is reviewed, based on some relatively consistent criteria:

- Will the hatchery make a significant contribution to the common property fishery?
- Does the proposed project allow for continued protection of natural stocks?
- Is the proposed project compatible with the comprehensive plan?
- Does the proposed project make the most appropriate use of the site's potential?

The PNP permit application process is rigorous and includes substantial review, as well as a public hearing and full review by state and federal agencies through the coastal zone review process. Even in a best-case scenario, the review and approval process of a permit application takes at least six months.

Fish released by hatchery operators are available for common use as natural stocks, until they return to the location established by the department for hatchery harvest. The Board of Fisheries may, after a permit has been issued, amend by regulation the terms of the permit relating to the source and number of eggs, the harvest by hatchery operators, and the locations of hatchery special harvest areas. This is the basis for the board-regulated Fish Transport Permit process (see Biological Issues chapter), establishment of hatchery special harvest areas, and board-approved terminal harvest area plans. The statutes also appear to give the Board the authority to limit or control production at individual hatcheries based on egg-take for broodstock. This authority has never been used, and there is a strong difference in opinion as to whether or not the Legislature

actually intended the Board of Fisheries to regulate hatchery production, or instead, to regulate the taking of eggs from wild stocks for hatchery production.

A *Basic Management Plan* (BMP) is developed as part of the actual permit. Marking programs for hatchery-produced fish can be required in the hatchery permit and BMP. Tagging is usually considered optional, unless during the permit or permit alteration process fisheries managers specify the need for special in-season management capability. When a permit is approved and operational, an *Annual Management Plan* (AMP) is developed for each year of operation.

FISH TRANSPORT PERMITS

The possession, transportation or release of live fish and their reproductive products (eggs) into the waters of the state requires a *Fish Transport Permit* (FTP) from ADF&G. The FTP permit application covers only one specific operation and is quite detailed. The application is intensively reviewed by the regional supervisors of the FRED, Commercial Fish and Sport Fish Divisions, the FRED pathologist and principal geneticist, as well as the FRED chief of technology and development and the FRED director. A signature page is attached to the actual permit which includes recommendations and comments. The permit is then approved or disapproved by the commissioner of ADF&G. The potential for disease and genetic impacts are the primary considerations in the FTP review process.

FISH RESOURCE PERMITS

ADF&G is currently developing a policy on *Fish Resource Permits* (FRP). The FRP was previously called a scientific/educational (sci/ed) permit. This policy is being developed as a result of a lack of standards for the scientific and educational projects allowed. Under the proposed policy, Fish Resource Permits will be issued with the stipulations of no commercial activities, no human consumption, and no sale of the species. These permits are classified into collecting permits for scientific or educational purposes, holding permits for either exhibition or scientific research, and limited propagation permits for various scientific or educational purposes.

PROBLEMS AND ISSUES

1. Lack of statewide goals and objectives for enhancement program.

The original goal of the enhancement program was to rehabilitate the state's depressed salmon fisheries. This goal has essentially been met, with the numbers of Alaska's wild and hatchery fish at an all time high. Other than the problems of marketing and price, most of the state's salmon fisheries are no longer depressed. *The state does not have a clearly defined policy for future management and development goals for hatcheries and other enhancement efforts that goes beyond increased production.*

2. Regional v. Statewide Planning.

State law directs salmon production planning to be done on a regional basis. Little comprehensive statewide planning is done, with only minimal interaction between regions

of the state. At the time these provisions were enacted, it was not envisioned that hatchery-produced fish would become such a large proportion of the statewide harvest. *Fisheries managers argue that the state needs a statewide planning policy that will take into account the potential impacts of the production of one region on another, as well as closely scrutinizing potential management problems and marketing feasibility. Others involved in the industry argue that regional differences are so unique and contentious, that such a statewide process would be futile.*

The Board of Directors of the United Fishermen of Alaska (UFA) in January 1992, requested the FRED Division to involve all RPTs in a statewide review process of hatchery production.

3. Funding and support for planning.

Fishermen, hatchery operators, and state fisheries managers agree that the RPT planning process provides an important forum for discussing and resolving difficult issues on an ongoing basis.

However, *state support for planning has declined since the early 1980s* when FRED had a budget of over \$500,000 for grants to aquaculture associations. Despite the need for more rigorous planning due to increased enhanced production, FRED planning staff has declined from two to one and a half positions. These positions coordinate all enhancement efforts statewide, including state facilities, provide technical assistance to the PNPs, and plan new ventures. *Budget reductions have forced state planners to shift priorities from plan development and implementation to plan maintenance.* Those involved in planning say the current funding level is inadequate for FRED to properly oversee the functions of the 37 hatcheries in operation in Alaska. As a result, they believe many more conflicts and issues will develop that should have been resolved early in the process.

RPT members also complain that the cutback in funds for planning has limited their contribution to a cursory discussion and approval of permit changes. If a hatchery requests a change in a permit, they often have to wait six months or longer to be considered because funds are not available for some RPTs to meet more than twice a year.

4. Composition of Regional Planning Teams

Although many people believe the regional planning team (RPT) process is a good one if adequately staffed and funded, there are others who believe that the entire structure of the RPT should be changed. A frequent complaint is that the composition of the RPT is heavily weighted towards the commercial sector of the fishing industry, without sufficient representation of subsistence and sport fishing users, community and regional governments, environmentalists, and the general public. These critics argue that in order to have a truly *balanced* decision, all the varied interests of the region need to be adequately represented. Some RPTs have tried to address this complaint by broadening the composition of the team to include all interested groups.

Another, more fundamental concern is that ADF&G managers are usually out-numbered on the RPTs. As a result, the group can pressure department managers into approving projects that should probably be denied. Department personnel who raise future management concerns are under considerable pressure to be a *positive* presence in the

RPT process, which in some cases, translates into withdrawing or modifying their objections without these concerns being adequately addressed. On the other hand, concern has also been expressed that department managers sometimes have a strong, anti-hatchery bias that can influence their management recommendations.

There is also the concern that the non-Fish and Game members of the RPT may not be sufficiently capable of evaluating and making decisions on issues that are increasingly technical in nature.

5. Allocation issues.

The RPT does not have allocation authority; that responsibility is delegated by state statutes to the Board of Fisheries. *Without the ability to consider allocation issues as part of the permit review process, ADF&G may approve a hatchery permit that could create future allocation problems.* By the time the Board of Fisheries begins to consider allocation problems resulting from hatchery production, millions of dollars may have been invested through state loans. In addition, allocation conflicts over hatchery-produced fish may eventually require tagging programs as part of their resolution. The question of tagging--and who should pay for it--is one that is more easily addressed early in the planning and permitting process.

Recent developments seem to indicate a change for the future. *In 1988, the Board of Fisheries charged the Prince William Sound Aquaculture Corporation (PWSAC) with development of an allocation plan for enhanced stocks in Prince William Sound.* After an intense planning effort and several drafts, PWSAC was able to come up with an allocation scheme that all user groups and the department could support. The allocation plan was approved by the Board of Fisheries in 1991 and was in effect this past fishing season. Using the success of PWSAC as a model, the Board of Fisheries has also directed the two Southeast regional aquaculture associations (NSRAA and SSRAA) to develop an allocation plan for hatchery stocks by 1993.

6. Management issues.

Another complaint is that regional comprehensive salmon plans often focus exclusively on production goals for a hatchery, but provide little specific information on fishery management. FRED now requires an initial Management Feasibility Analysis (MFA) be completed before a final application is submitted. The MFA covers the basics of siting, species, timing, and magnitude of production, and is developed by the Commercial Fisheries and Sport Fisheries Divisions to avoid potential management problems. FRED planners believe that they have never permitted a hatchery or enhancement project that fisheries managers did not initially approve.

7. Uniform review.

State hatcheries and projects are not subject to the same permitting requirements as PNPs. Some fishermen believe that state projects cause the most allocation, management, and potential biological problems because of the lack of this additional layer of scrutiny. They would like to see permits required for state hatcheries and projects, as well as for PNP projects. FRED Division believes adding this requirement is unnecessary because of the many other layers of review these projects receive.

8. Criteria to show public benefit.

Four criteria must be considered by the RPT to determine if a permit application is in compliance with the regional comprehensive salmon plan:

- the contribution the proposed hatchery would make to the common property fishery,
- the provisions for protecting wild stocks from any adverse effects which may originate from the proposed hatchery,
- the compatibility of the proposed hatchery with the goals and objectives of the comprehensive salmon plan for the region, and
- whether the proposed hatchery would make the best use of the site's potential to benefit the common property fishery.

Critics say these criteria should be expanded to consider other public benefits and costs.

9. Operation performance reviews and permit revocation.

State managers and RPT gear group representatives are also concerned about ADF&G's authority over hatcheries that are out of compliance with state laws, regulations, and permit requirements. *With the potential risk of impacts on the state's common property fisheries, managers and some RPT members believe a mechanism to allow for the timely revocation of a permit is necessary.*

10. Hatchery Siting Privileges

If a region has an organized aquaculture association, that association, under state statutes, has the preference rights to all potential hatchery sites in that region. Non-association PNPs (Mom and Pops) have expressed concern that giving priority use of potential to future sites to an association is not good public policy. The Mom and Pop operators believe that any unused hatchery sites should be available to both associations and non-association PNPs.

11. Canadian evaluation model.

The Canadian government is considered to have a model evaluation program of its national salmon enhancement program. The first evaluation project began in 1985 and concluded that there was not enough production and biological data available to carry out a proper program evaluation. The program audit branch then designed the optimum evaluation framework and determined what kind of data would be needed. These data included biological and production information, as well as an analysis of economic costs and benefits. With that data in hand, program auditors are now preparing to spend a year reviewing the entire program, with a final report due in March 1993. Federal funds are being used for this project, although university staff and consulting firms are conducting the actual evaluation.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Working with the public and user groups to develop statewide goals and objectives for the state's entire fisheries enhancement program.
- Directing FRED Division to develop a program to implement these goals and objectives.
- Declaring a moratorium on further hatchery development or increased production until the Legislature's economic cost-benefit studies are complete and a full assessment of the hatchery program can be made.
- Development of a statewide planning process.
- Development of a statewide production plan.
- Requiring FRED to develop a comprehensive annual report that not only compiles production figures from state and PNP facilities, projects, and current management regimes, but also includes future production and management plans.
- Evaluation of the composition and procedures of the RPT to determine if changes in the RPT structure are necessary.
- Expansion of state statutes to require all hatcheries, including state facilities, to comply with a single planning and permitting process, with the same requirements for monitoring and review.
- Widening the scope of RPT review, including recommendations for allocation of enhancement production.
- Providing adequate funding for planning.
- Reviewing the required Management Feasibility Analysis to determine if it needs to be a more comprehensive review.
- As part of permit review and solicitation of state loans, consideration of adding new criteria to show public benefit, including marketability, a detailed cost/benefit analysis instead of a financial feasibility analysis, a more specific indication of the "significant contribution" to be made to the common property fishery, and some kind of environmental assessment.
- Providing concrete direction for the timely performance review of PNP hatcheries and a more workable mechanism for closing or converting hatcheries not making a "significant" contribution to the common property fishery.
- Exempting the alteration, suspension or revocation of an enhancement permit for violations from the Administrative Procedures Act.
- Instituting a regular review process similar to the Canadian model.
- Clarifying Board of Fisheries authority to regulate hatchery production levels.

- Re-evaluation of the policy of giving regional aquaculture associations the preference rights to develop future hatchery sites in the region.

Chapter VII

BIOLOGICAL/GENETIC ISSUES

In November 1991, in Cordova, Alaska, the Prince William Sound Science Center (PWSSC) and the School of Fisheries and Ocean Sciences, University of Alaska Fairbanks, convened a group of world-renowned experts to examine "The Biological Basis for Maintaining Strong Co-existing Stocks of Natural and Enhanced Salmon Populations in Alaska." This workshop followed a series of international symposiums on this topic during the past two years. Top fisheries biologists, ecologists and geneticists from the United States, Norway, Sweden, the Soviet Union and Japan were present at the Cordova workshop. As a follow-up to the workshop, the group intends to produce a summary report and list of recommended policies and procedures to be considered by the state of Alaska in managing its wild and enhanced salmon stocks. That report is expected in late February.

The cumulative effect of hydroelectric dams, habitat destruction, overfishing, and large-scale hatcheries has led to the decimation of many wild salmon stocks in Pacific Northwest states. Biologists in states with a long history of hatchery programs are generally less enthusiastic about these programs than biologists in areas such as Alaska and British Columbia with comparatively recent programs. *Although poor hatchery practices can clearly endanger wild salmon populations, scientists do not agree on the extent to which hatcheries with sound practices can co-exist with sustained healthy runs of wild salmon.*

The lack of consensus among scientists largely results from insufficient data and research, and at times, professional bias. Even where information exists, however, it is often subject to conflicting interpretations. To complicate matters, results of specific studies may not be transferable to other areas or salmon species, and year-to-year environmental changes may affect the results of these studies.

THE GENETIC EFFECTS OF HATCHERIES

Most scientists agree that it is essential to have healthy wild stocks to maintain the health and genetic diversity of both wild and hatchery stocks; genetic diversity must be preserved. Scientific knowledge about the genetic impact on wild stocks of hatchery fish, however, is still incomplete. Reduction in the fitness of salmon stocks, to the extent it has been documented, may involve numerous factors. Most scientists agree that hatcheries can complicate mixed-stock fisheries and affect the genetic composition of wild fish stocks. Scientists do not agree on the extent to which genetic changes affect the short- or long-run fitness of wild stocks.

Straying and intermingling of stocks is a major concern to scientists. The extent of straying, the variables involved in imprinting, and the effects of interbreeding are largely unknown. Large-scale ocean ranching appears to set the stage for straying of wild stocks in the harvest areas of enhanced stocks and also for hatchery fish to stray into the natural streams. What impact this has on the genetic diversity of salmon stocks in a given

region is a question that remains to be answered. However, the concern is that intermingling may reduce the fitness of the locally adapted populations.

It is known that the greater the distance between the donor stream or hatchery and the release site, the greater the amount of straying. Many scientists are concerned about the extensive releases at remote sites practiced by many hatchery operations today, with many more planned for the future. They fear that such straying could potentially, in time, destroy genetic diversity -- resulting in a permanent, irreversible loss. Some scientists believe remote releases should be banned altogether. Others believe they should be permitted with stringent controls and careful monitoring.

OCEAN CARRYING CAPACITY

Some scientists suspect that the carrying capacity of nearshore marine waters and the high seas for salmon may be exceeded by large-scale releases of hatchery salmon. A reduction in the average size of salmon was reported throughout the Pacific region in 1991, but various factors may be responsible. Since 95 percent of the growth of salmon occurs at sea, some researchers believe ocean conditions affect the size of salmon more than competition. Much evidence, however, supports the theory of density-dependent growth for some salmon species, although there is considerable debate regarding its occurrence. More information is needed on the effects of predation and competitors.

DISEASE

Few studies document the transmittal of diseases between hatchery and wild salmon, and there is no documentation of such transmittal in Alaska. Where transmittal of a disease by hatchery salmon has been documented, it occurred after fish were transplanted long distances. Hatchery fish appear to be more vulnerable to disease than wild fish because of the stress of hatchery conditions and large concentrations of eggs and fry. Norway has had considerable problems with disease transmitted by farmed salmon that have escaped and mixed with wild stocks.

Active fish pathology laboratories are maintained by the FRED Division in both Juneau and Anchorage. Their basic function is to implement policies and procedures that guard against the spread of fish and shellfish diseases in Alaska. Reviewing fish transport permits in order to reduce the occurrence of disease is a major task of the labs, as is examining each broodstock for disease prior to its use in a hatchery.

STATE GENETICS PROGRAM AND POLICY

The state genetics program is intended to implement policies and procedures that protect and maintain the genetic uniqueness of Alaska's wild salmon stocks in the face of North America's largest salmon enhancement program. The state's fish genetics policy, considered to be one of the most stringent in the world, was last revised in 1985, and will be reexamined and updated this year.

Alaska's genetic policy contains guidelines and restrictions intended to protect the genetic integrity of wild stocks. The *goal* is to maintain adequate genetic variability, ensuring that the enhanced stock will be able to adapt to changing environmental conditions.

Geneticists have two primary concerns in protecting wild stocks and implementing a successful enhancement program. The first is possible genetic impacts due to gene flow between wild or enhanced stocks; the primary concern being, of course, for wild stocks. The second concern is the loss of genetic variation within or among stocks. Both impacts can potentially cause the reduction of total fitness in wild stocks and hatchery broodstocks. These problems are addressed in the policy's three main topic areas: stock transport, protection of wild stocks, and the maintenance of genetic variation.

Since specific knowledge of salmon population genetics and the genetic impacts of salmon enhancement on wild stocks was limited, the 1985 genetic policy was based primarily on information from agricultural genetics and research on other species. As a result, the policy contains guidelines that are rather flexible. The policy suggests that because scientific knowledge is limited, fish transport should be evaluated conservatively. For example, if genetic similarity decreases with distance, arbitrary limits must be set on the distance a stock can be transported. For that reason, the Fish Transport Permit process is the prime regulatory tool in the genetic policy. *ADF&G is attempting to clarify some of the flexible guidelines in the revised policy by incorporating knowledge gained from recent studies of the population genetics of salmonids.*

The genetic policy also acknowledges that all salmon runs are not of equal importance. The effect of a salmon enhancement project depends to some degree on the relative value of the stock that might be impacted. However, the policy says that the concept of "significant stock" only relates to the size of a fish population in the context of local importance and use. A population that would be considered insignificant in size in one region, may be of vital importance in another region.

OPTIONS FOR POSSIBLE CONSIDERATION:

Although a report of recommended management actions resulting from the Cordova workshop is expected in late February, some preliminary options for consideration include:

- Evaluation of how well the current hatchery program protects wild salmon from possible negative effects of hatchery salmon. Such a review would help policy makers determine the risk of various alternatives for the future of Alaska's hatchery program.
- Increasing the amount of genetic monitoring required of hatchery operators, and directing ADF&G to continuously review and analyze resulting data statewide.
- Obtaining consensus about research priorities concerning the interaction of hatchery and wild fish in Alaska, coordinating future studies, and deciding how and when to apply the results of those studies to current management practices.
- Conducting research to define the minimum conditions for imprinting for remote release programs.

- Review of current and future programs for their compliance with the state genetics policy.
- Placing greater emphasis on management concerns in the permitting process in order to protect wild stocks.
- Re-examination of escapement goals in order to maximize wild productivity.
- Increased use of marking and tagging programs to monitor interactions between hatchery and wild populations.
- Policy development to minimize inbreeding and straying, including an evaluation of remote releases.
- Treating a remote release site as a de facto hatchery site in terms of broodstock and hatchery site guidelines, even if all fish are expected to be harvested.
- Identification of genetic population structures to determine what populations are genetically distinct.
- Survey of populations prior to any enhancement activity to provide a baseline for subsequent genetic monitoring. Evaluation of genetic consequences of hatchery production on adjacent populations during phased-in expansion, with production increases halted if adverse impacts are noted.
- Monitoring wild and hatchery stocks to determine extent of straying and intermingling.

CHAPTER VIII

FUNDING OF THE ALASKA SALMON ENHANCEMENT PROGRAM

Sources of funds for the Alaska salmon enhancement program and projects include bond issuances, state general fund appropriations, salmon enhancement tax assessments paid by fishermen, state enhancement loans, and cost-recovery sales of fish.

STATE PROJECT FUNDING

Funding for the operation of the state salmon enhancement program and state project construction, operation, and maintenance has been primarily through state bonds and general fund appropriations to ADF&G, FRED Division. From FY 72 - 92, funding for the FRED Division totalled approximately \$210.3 million, the majority of which was for salmon enhancement. Bond issues totalling \$56.17 million were authorized by the 1976 and 1978 Legislatures, and overwhelmingly endorsed by voters, to fund the construction and operation of hatchery production and other enhancement projects in each region of the state. Of the \$56.17 million in bond issues for FRED enhancement projects, \$50.3 million was spent on hatcheries, while the remainder was used for other enhancement projects. State funding for FRED division construction of state facilities totaled approximately \$24.8 million through FY 92.

FUNDING FOR PRIVATE NON-PROFIT HATCHERIES

Funding for PNP hatcheries is primarily through state loans, the salmon enhancement tax, and cost recovery sales of fish. To a lesser extent, the state has provided grants to some facilities and fishing organizations; these have totalled approximately \$12.3 million.

Since 1977, a significant portion of the funding necessary for the implementation of salmon rehabilitation and enhancement activities by PNP corporations has been provided through the *Fisheries Enhancement Revolving Loan Fund* administered by the Alaska Department of Commerce and Economic Development (DCED), Division of Investments (AS 16.10.500-620). The loan program has gone through several modifications by the legislature, the most recent occurring in 1987. The maximum loan amount available for an individual project is \$10 million at approximately 9.5 percent interest, with a payback period of up to 30 years. According to state statute (AS 16.10.525), payments and accrual of interest on these loans *must* be deferred for 6 to 10 years. Loans for non-regional aquaculture association projects have these same terms with the exception that the loan maximum is limited to \$1 million. Loans are available for the purpose of planning, construction, and operation of salmon rehabilitation and enhancement projects, primarily salmon hatcheries.

The *Salmon Enhancement Tax* (AS 43.76.010-.015) is charged to limited entry permit holders who are members of qualified regional aquaculture associations. State law allows the associations to set enhancement tax rates at either 1 - 3 percent of the ex-vessel value of the salmon catch, subject to the vote of the membership.

Through November, 1991, \$71.0 million has been borrowed by PNP corporations. Approximately \$67.7 million (95 percent) of the \$71.0 million principal balance is currently outstanding. Including state appropriations (\$12.3 million), approximately \$83.3 million has been provided in state loans and grants to PNPs. Another \$46.2 million has been generated through enhancement tax assessments. To date, PNP operators have sold approximately \$70.9 million worth of cost-recovery fish to help pay for hatchery operations. The amount and percentage of funding by category is shown below.

\$71.0 million	35 percent	State Loans
\$12.3 million	7 percent	General Fund Grants
\$46.2 million	23 percent	Enhancement Tax Assessments
<u>\$70.9 million</u>	<u>35 percent</u>	<u>Cost Recovery Sales of Fish</u>
\$200.4 million		Total

As can be seen, the private sector has provided over 58 percent of the direct funding for PNP operation and construction through self-imposed taxes and cost recovery sales of fish.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Requiring a more extensive public benefit-cost analysis before providing enhancement loans. This means that a project or facility expansion would not only have to be financially feasible--capable of paying back loans--but also provide net benefits to the public.
- Eliminating the statutory loan repayment deferment requirement on operating loans.

- Development of a mechanism for placing moratoriums on state enhancement loans for increased fish production. Consideration of a moratorium on loans until results of the Legislative Enhancement Program Review economic studies are complete.
- Implementing a requirement for more complete analysis of transfers of the operation of state hatchery facilities that includes factors such as upfront capital costs to state to expand or upgrade facility before transfer is accepted, fisheries management implications, increased need for cost recovery, and the impact on traditional common property fisheries.
- Analysis of the enhancement tax program to determine 1) whether costs are distributed in proportion to benefits, and 2) the impact of a mechanism to allow specific gear groups to opt out of the program or pay in proportion to the enhancement benefits they receive.
- Analysis of increasing the salmon enhancement tax so fishermen who benefit from the program will pay for more of the costs.
- In light of declining state revenues and lower fish prices, development of an auditing mechanism to ensure that annual PNP operating costs, paid by loans, enhancement tax receipts and cost recovery, are "reasonable."
- Development of a requirement that funds provided in treaty agreements for enhancement be used for fish production to the maximum extent possible. In addition, a requirement for a comprehensive feasibility analysis of using enhancement as part of treaty agreements could be considered.

Chapter IX.

ECONOMICS

Note: This section summarizes the economic studies that are currently in progress under contract. The results of these studies are not yet available and, therefore, are not included in this draft. The full chapter on economic studies provides more detailed information on the contracts. The final report will include the results of the economic studies.

The main focus of the review of the economic impact of salmon hatchery production on Alaska salmon prices is to determine:

- whether current levels of Alaska salmon harvests are over- or under-supplied from a world-market perspective, and
- whether increased hatchery production of salmon will lower prices, fishing and processing revenues, and the total net value of Alaska's salmon fisheries.

To answer these questions requires a complete benefit-cost analysis. Initially, the study group reviewed current research and identified specific issues that need additional economic research. Review of available data revealed that there are considerable gaps and insufficiencies in information compiled to date. Proposals were developed for additional research contracts by professional researchers. The proposal was designed with assistance from the Alaska Department of Fish and

Game. Funding for the research contracts was approved by the Legislative Council on November 1, 1991.

Due to time constraints, the research contracts were awarded on a "request for proposal" basis and funded through reimbursable service agreements (RSAs) between the Legislature and the University of Alaska.

The research is divided into five principal components, and is aimed at providing information on Alaska's salmon enhancement programs, and developing models that can be used for evaluating salmon management policy questions.

RESEARCH COMPONENTS

The five principal research components are:

- ***Hatchery Production and Cost Model***

Principal Investigators: Economics Group, Legislative Research Agency, and the ADF&G FRED Division staff
Anticipated Cost: \$0

- ***Biological Population Model***

Principal Investigators: Dr. Jeremy Collie, Juneau Center for Fisheries and Ocean Sciences, Univ. of Alaska, Fairbanks
Anticipated cost: \$10,000

- ***Salmon Demand Model***

Principal Investigators: Dr. Mark Herrmann, Dept. of Economics, Dr. Joshua Greenberg, School of Land Resources Management, Univ. of Alaska Fairbanks
Anticipated cost: \$18,000

- ***Fishing Cost Model***

Principal Investigator: Dr. John Boyce, Dept. of Economics, Univ. of Alaska Fairbanks
Anticipated cost: \$20,000

- ***Combining of Models for Policy Analysis***

Principal Investigators: Drs. John Boyce and Mark Herrmann, Dept. of Economics, and Dr. Diane Bischak, School of Management, University of Alaska Fairbanks
Anticipated cost: \$10,000

Preliminary reports on the research being conducted under these contracts are to be submitted to the Legislature in April, 1992, and the final reports in June, 1992. The remainder of the Legislature's hatchery review project can move forward in the meantime. Information gathering and the formation of some conclusions, options and courses of action, regarding the other portion of the project can be accomplished independent of these economic studies.

It is hoped that research currently being conducted by the Alaska Department of Commerce and Economic Development and the Alaska Seafood Marketing Institute on developing new markets and products for Alaska salmon will also be available and useful to the Legislature in its look at the overall economic picture of Alaska salmon and salmon enhancement.

Chapter X.

MARKETING

As a result of the precipitous decline in Alaska salmon prices in 1991, Governor Hickel formed the Salmon Strategy Task Force to identify the problems facing Alaska's salmon fishing industry and recommend state actions to address these problems. A primary focus of the task force was salmon marketing. The task force recently finalized its recommendations. To avoid duplication with the task force's efforts, it was decided that the Legislative review of the Alaska salmon enhancement program would analyze the economic costs and benefits of the enhancement program and review past state salmon marketing efforts. A summary of the Salmon Strategy Task Force's final recommendations is included (a copy of the Task Force's report is attached).

INTRODUCTION

The Alaska Seafood Marketing Institute (ASMI) was established in 1981 as a quasi-state corporation in the Alaska Department of Commerce and Economic Development (DCED). The institute's statutory responsibilities include:

- To conduct educational, research, advertising, and sales promotional programs to increase awareness of all species of seafood and their by-products that are harvested in Alaska.
- To develop quality specifications to enhance the high quality image of Alaska seafood worldwide, and to adopt recommendations for the handling of seafood from the moment it is caught until it is shipped to the marketplace.
- To prepare market research and product development plans for all species of seafood and their by-products harvested in Alaska.

State statutes prohibit ASMI from favoring any region, product, or processor. For that reason, ASMI uses "generic" marketing campaigns aimed at enhancing the sales of particular "species" of fish or broad product categories (such as canned or frozen) rather than specific products. Also, because it is likely to favor individual processors, ASMI does not promote new products.

ORGANIZATION

To accomplish its statutory mission, the ASMI organization consists of a board of directors, numerous committees, and a relatively small number of staff. Policy and program direction is set by the 18-member board of directors. The ASMI committee system is extensive with the largest portion being a system of marketing committees. The ASMI executive director is selected by the board of directors and permitted to hire additional staff upon approval of the board. The central staff members include: communications manager, comptroller, quality coordinator, special projects coordinator, and office manager.

ASMI FUNDING SOURCES

A portion of ASMI's funding is derived from a self-imposed seafood marketing assessment. All fish processors who purchase annually \$50,000 or more (ex-vessel value) of seafood pay an

assessment of 0.03 percent of their total purchases. These assessments are collected in the state's general fund and are appropriated annually to ASMI. The balance of ASMI's funding is derived from state general fund and federal appropriations.

Federal funding, which has increased as a result of the Targeted Export Assistance (TEA) program, is restricted to international marketing efforts. *State general fund appropriations and industry contributions are used primarily to fund domestic marketing efforts. Since these are declining, ASMI will have fewer resources for domestic marketing at a time when the domestic market has been identified by analysts as having the greatest potential for increasing sales of Alaska salmon.*

EFFECTIVENESS OF THE ASMI PROGRAM

When ASMI was established, the Alaska salmon industry provided most of the U.S. production and about half of the world production from wild and ocean-ranched salmon stocks. When Alaska was the dominant supplier, the generic marketing of Alaska salmon was relatively effective.

A recent Legislative Audit report evaluated whether there has been an increase in awareness of Alaska seafood since ASMI's inception. The Legislative Audit review of market research provided by ASMI, concluded that increases had occurred in consumers' perception of Alaska seafood. In addition, consumers are more aware of Alaska as a seafood-producing region.

Despite these overall improvements in consumer perceptions and increased consumption of seafood, Alaska has lost a significant share of both the domestic and international salmon markets as a result of the tremendous growth in world farmed-salmon production. The dramatic rise in production and growing acceptance of farmed salmon as a source of fresh salmon represents the single greatest threat to the Alaska salmon market.

A significant problem is the fact that canned salmon production represents 59 percent of all of Alaska salmon sold in retail markets. U.S. per capita consumption of canned salmon declined 60 percent from 1980 to 1989, at the same time that harvests of pink salmon--the majority of which is canned--increased approximately 50 percent.

Analysts who are critical of ASMI's marketing programs maintain that the "generic" approach promotes all salmon, regardless of origin, because Alaska products are not clearly identified in the market. They argue that without brand identification and a quality assurance program to guarantee that Alaska salmon is superior, generic marketing may actually be helping Alaska's competitors.

LABELING OF ALASKA SALMON

A recent *Consumer Reports* article attacking the quality of seafood sold in the United States has caused considerable concern within the Alaska fishing industry. The article illustrates the problem of insufficient labeling of seafood products when sold in retail markets. Alaska does have a statute that requires that any farmed salmon sold in the state must be labeled that it is farmed and is from outside Alaska. The Alaska State Legislature recently requested the Alaska delegation to introduce federal legislation requiring the labeling of all seafood products sold in the United States.

THE SALMON STRATEGY TASK FORCE RECOMMENDATIONS

The Salmon Strategy Task Force finalized its recommendations on January 24, 1992. These included:

Recommendations for Immediate Action. 1) ASMI should develop a budget and strategy for selling the existing inventory surplus of Alaska salmon; 2) processors and fishermen should initiate price negotiations early; 3) The University of Alaska, DCED, and ADF&G should provide the best possible information to fishermen regarding world salmon markets; 4) DCED should review Prince William Sound processing capacity; 5) DCED and the Alaska Commercial Fishing and Agriculture Bank (CFAB) should provide loan extensions as needed.

Mid-Range Recommendations. The mid-range recommendations include actions for product and market development, salmon quality, and marketing, and a review of ASMI's role.

Long-Term Recommendations. The long-term recommendations include the development of a strategic plan to help strengthen the fishing industry and its support sector.

ASMI'S SALMON RECOVERY PROGRAM

One of the recommendations of the Salmon Strategy Task Force is to support ASMI's Salmon Recovery Proposal. According to an ASMI briefing paper, the *goal* of the Salmon Recovery Program is to increase annual per capita U.S. salmon consumption from 1 to 1.5 pounds. The *cost* of the proposal is \$10 million annually for five years, totalling \$50 million. Senator Jones has introduced legislation to appropriate \$10 million to ASMI for domestic salmon marketing efforts during Fiscal Years 92 and 93.

ALTERNATIVE PROPOSALS TO INCREASE MARKETING EFFORTS

Proposed Changes to Alaska Statutes:

A number of pieces of legislation have been introduced to address the salmon marketing problem. The general intent of the legislation is to provide funding for the immediate increased promotion of Alaska salmon and to increase the voice of fishermen in those marketing efforts either through changes to ASMI or creation of a new salmon marketing association. Funding for increased marketing efforts would be provided through temporary marketing assessments.

- Representative Gene Kubina has proposed legislation to create six regional salmon marketing committees and the Alaska State Salmon Marketing Association. Two fishermen from each committee would sit on the association. Funding for marketing efforts would be provided through a 1 percent marketing tax on value of salmon landed.
- Representative Dave Choquette introduced legislation that would expand ASMI's statutes to allow for targeted development of Alaska salmon markets and product development.
- Representative Bill Hudson introduced legislation that would impose a temporary one percent (1%) marketing tax on the value of salmon landed and increase the ASMI Board of Directors by two positions that must be filled by commercial fishermen.

- Senator Dick Eliason introduced a bill that would establish a temporary one percent (1%) salmon marketing tax and a committee within ASMI to provide fishermen with control over how the funds would be expended.

- Representative Cliff Davidson and Senator Fred Zharoff have introduced legislation that would endow the Alaska Fisheries Development Foundation to fund fisheries development research projects.

Development of a Salmon Marketing Council

Under the federal Seafood Promotion Act of 1986, after rigorous fisherman and processor review and approval, a salmon marketing council could be developed to increase the U.S. marketing efforts of salmon.

Marketing Efforts by Groups Such as PWSAC

Recognizing the need to develop markets for their very successful salmon hatchery production program, PWSAC has a Product Development Strategy. In the short-run PWSAC would like to pre-sell all 1992 cost-recovery fish by January 1992, ensure the utilization of all cost-recovery fish, and negotiate one-to-three year contracts for the sale of fish. *The primary marketing obstacle identified by PWSAC is processing capacity for frozen fish.*

OPTIONS FOR POSSIBLE CONSIDERATION:

- Review of the state's role in the marketing of Alaska seafood, and salmon in particular, including a review of the ASMI program.
- Given that ASMI's generic approach to marketing was statutorily established prior to the significant increase in world farmed-salmon production, expansion of ASMI's statutes to reflect changes in world salmon markets. In particular, ASMI's marketing efforts could be expanded to include new product and market development, including targeting and distribution of salmon products at the wholesale and retail levels.
- Providing funding for ASMI's Salmon Recovery Proposal.
- Supporting the Salmon Strategy Task Force's recommendation that ADF&G review the impact of fisheries management practices on fish quality, especially related to the quality of cost-recovery fish harvested in terminal areas.
- Conducting a comprehensive analysis of ASMI privatization including whether 1) privatization would provide greater flexibility and possibly more effective marketing and 2) privatization would result in the loss of control over marketing activities to the detriment of Alaska and Alaska fishermen.
- Encouragement of the development of a national salmon marketing council.

CHAPTER XI.

OTHER ISSUES

A. HATCHERIES AS ENVIRONMENTAL MITIGATION

Hatcheries are sometimes built with the goal of mitigating environmental damage caused by such things as construction of dams and other projects, and water pollution. While the goal of environmental mitigation has been a driving force in salmon hatchery development in the Pacific Northwest, Alaska's hatchery system has been developed for fisheries enhancement, mitigation of the effects of overfishing, and offsetting reductions in fishing quotas due to treaty provisions.

However, Alaska law does contain several provisions regarding use of fisheries enhancement projects as a means of mitigating environmental damage. The primary one is the *Fishways Act* which can require the builder of a dam or other obstruction across a stream containing fish to provide and maintain a fishway or other device for fish passage; pay a lump sum to the state Fish and Game Fund; convey land and fund the construction, maintenance and operation of a fish hatchery, rearing ponds, buildings and other facilities; or agree to provide money to expand, maintain, and operate additional facilities at existing hatcheries.

Since passage of the Fishways Act of 1959, other environmental protection laws and regulations pertaining to fish habitat have been enacted setting water quality standards and regulating the types, locations, and designs of development projects. The *Anadromous Fish Act* (AS 16.05.870) is especially important as it spells out requirements for pre-approval of any projects which could potentially impact fish or fish habitat.

The construction of a fishway or spawning channel is frequently required in Alaska. *Although the state rarely imposes the other provisions of the Fishways Act which require construction of hatcheries or monetary compensation, those provisions encourage modifications in project plans that will avoid the actual stream obstruction and serious risk to fish that would activate the very expensive mitigation measures.*

In other states and countries, where environmental protection measures have not prevented a project from damaging fish habitat, hatcheries have indeed provided enough fish to avoid the total destruction of fisheries. However, *there is growing concern that when natural stocks decline to very low levels, hatcheries may actually cause the further depletion, even to the point of the extinction of natural stocks.* These concerns are further addressed in Chapter VII of this report, Biological Issues.

It is important to consider how the federal Endangered Species Act (ESA) relates to the use of hatcheries for mitigating environmental damage. In the state of Washington, where hatcheries have been used extensively with mitigation as a goal, it is apparent that even very productive hatcheries cannot prevent the federal government from invoking the provisions of the ESA if wild stocks are determined to be endangered. In 1991 several Washington salmon stocks were listed as *endangered* or *threatened* by the National Marine Fisheries Service, which has jurisdiction over endangered species. Decisions regarding two other stocks are pending.

The Washington Legislature is considering legislation to address ESA salmon issues. These include salmon habitat, wild stock protection, tagging of hatchery stocks, and defining *species* or *stocks* of fish.

Declaration of a salmon stock as *endangered* can have enormous impacts on fisheries and local and state economies, even those which are far from the spawning area of that stock.

The ESA sets the parameters within which hatcheries can be used to mitigate environmental damage. *Because of the Act, efforts to mitigate damage through hatcheries can result in the closure of fisheries if the hatcheries contribute to the further depletion of a stock.* A preservation of wild stocks focus is necessary to avoid the impacts of the strict protective measures which can be imposed under the ESA.

In some instances, such as where dams have irreparably destroyed the habitat of a particular salmon stock, a carefully designed hatchery or other enhancement project may represent the only hope for survival of that stock. Thus, *while the ESA serves as a warning against hatchery development that could deplete natural stocks, it also recognizes the potential usefulness of hatcheries in the ultimate survival of an endangered stock.*

The use of hatcheries to mitigate damage must be employed with the understanding that salmon which have been provided *free* and perpetually by nature, are being replaced by salmon that will initially and continuously cost money to produce. This cost, along with the possibility that hatcheries may harm remaining natural stocks, must be realistically evaluated in each case.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Re-evaluation of the state Fishways Act and Anadromous Fish Act in light of the provisions of the federal Endangered Species Act.
- Evaluation of whether specific consideration of potential consequences of the ESA should be required before the commissioner can pre-approve a project (under the Anadromous Fish Act) or approve of mitigation measures (under the Fishways Act).
- Tracking the current and upcoming debate and actions occurring in other areas, particularly the state of Washington, regarding environmental mitigation of damage to fish habitat. Determine the relevance of findings to Alaska.

B. ROLE OF HATCHERIES IN INTERNATIONAL TREATIES

U.S./Canada Pacific Salmon Treaty

After many years of negotiation, the United States and Canada signed a treaty in 1985 regarding the interception of Pacific Salmon. *The primary goals of the treaty were to protect and rebuild depleted salmon stocks, assure the long-term viability of salmon stocks within the jurisdiction of the treaty, and bring equity by providing that each country receive benefits from the fisheries which are roughly commensurate with their respective production of salmon in the treaty area.* Fisheries management guidelines for the region covered by the treaty

(Oregon, Idaho, Washington, Southeast Alaska and British Columbia, Canada) are provided in a series of annexes to the treaty which are renegotiated on a regular basis. The annexes establish baseline-harvest numbers for many areas but the authority over allocation of fish between user groups within specific areas is maintained by the respective states, provinces, and tribes.

In 1983, a tentative treaty agreement was reached, but Alaska fishing groups found the provisions to be unacceptable and the treaty was not signed. Concerns centered on the concessions to be made by Alaska in the treaty. The reduction in the level of chinook salmon that Alaska trollers would be allowed to harvest was especially controversial. Key to the eventual acceptance of the treaty by Alaska was an offer by the U. S. federal government to give Alaska approximately \$20 million for salmon enhancement to help offset impacts of the treaty. *This mitigation money was not part of the negotiated multi-party treaty. It was a separate agreement between Alaska and the U.S. federal government, offered fundamentally as an incentive to Alaska to agree to the treaty.*

Under the terms of the treaty, Alaska hatchery fish caught after 1985 were not to be counted as part of the negotiated quota of allowable catch, and could be taken in addition to that quota. *While everyone involved seemed to understand that the federal mitigation money was intended to replace what the Southeast Alaska fisheries groups had lost in the treaty settlement, the specific purpose of the money was not clearly spelled out at the time of the agreement. This lack of clarity and documentation has caused considerable confusion and controversy over the years.* Initially many fishermen and the Alaska Department of Fish and Game believed that the money was to go towards an annual production goal of 100,000 chinook for the trollers, 1,000,000 chum for the seiners, and 20,000 to 40,000 sockeye for the gillnetters. Although the state appears to have honored the general purpose of salmon enhancement with the mitigation funds, it has not spent the funds in accordance with the most widely-held understanding of the intent for those funds.

The governments of Washington and Oregon have not allocated any funds specifically for enhancement projects related to this treaty. British Columbia instigated a treaty-related enhancement project on the Fraser River, but has since run out of funds to continue it.

A computer model was developed to calculate the allowable catch of each of the parties to the treaty, and to update that quota annually. Information about hatchery-bred fish indicates the health and numbers of the natural stocks for the computer model.

Alaska fishermen agreed to the Pacific Salmon Treaty, despite the sacrifices it requires, in their allowable catch levels, because of guarantees that increased hatchery efforts and production would result in increases in these allowable catches. For reasons which may have included misunderstandings of original intentions, a lack of clear binding language in the treaty, or ineffectual negotiating at annual sessions to update agreements and re-negotiate treaty annexes, many fishermen are dissatisfied with what the treaty has accomplished. Hatchery efforts funded with mitigation funds have indeed produced salmon, but fishermen, particularly trollers, do not believe they have received the benefits they were promised from that production.

While fishermen may not have seen the specific benefits they had hoped for in the form of increased allowable catches, the state hatchery program has received more funding than it would have had without mitigation funds, and the Alaska Department of Fish and Game has been able to use mitigation money to supplement their budget for projects and personnel which are related directly or indirectly to the goals of the treaty.

Yukon River Treaty

Salmon restoration and enhancement have been discussed as part of the United States/Canada Yukon River salmon negotiations since 1985. The goal of the United States in these talks has been to ensure the long-term health of salmon stocks and assure consistency in harvest for both countries of the Yukon River system.

The U.S. proposal, agreed to by the Alaska Department of Fish and Game, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Yukon River Drainage Fisheries Association, includes:

- Restoration projects to increase production of transboundary stocks that do not respond to harvest management.
- Fisheries enhancement projects where appropriate, consistent with state genetics and disease policies.
- Planning strategies to allocate and manage restored stocks before the program starts.
- Operational plans for enhancement projects, with protection of wild stock genetic diversity as the paramount concern.

The FRED Division has developed a Yukon Fisheries Enhancement Initiative with its key components being overall design and planning work, expansion of the Clear Hatchery near Nenana, Alaska, and rehabilitation of natural salmon production. The cost of this initiative is estimated to be more than \$13 million.

Fishermen along the Yukon are primarily interested in bringing natural stocks back to historic levels. Rehabilitation projects and protection of wild stocks are their top priorities.

Some biologists believe that supplemental hatchery production on the Yukon River will only further complicate mixed stock fisheries management, and risk the reduction or elimination of small wild stocks. They are also concerned about the risks of genetic dilution of natural stocks, reduced stock fitness, and disease. The Alaska Chapter of the American Fisheries Society is currently considering a resolution to support setting aside the Yukon River drainage as a Wild Stock Management Zone (hatchery-free).

OPTIONS FOR POSSIBLE CONSIDERATION:

- Evaluation of the effectiveness of enhancement as an international treaty component.
- Requirement of a comprehensive feasibility and benefit-cost analysis of enhancement in treaty proposals prior to treaty agreements. Because state agency budgets tend to "benefit" from enhancement agreements, consider contracting these reviews to disinterested third parties.
- Development of an auditing mechanism to determine if enhancement benefits are realized by fishermen impacted by treaty agreements.

C. ENVIRONMENTAL REGULATIONS RELATED TO HATCHERIES

There are a number of environmental considerations involved in the siting, construction, and operation of hatcheries. In addition to the biological and genetics matters associated with the fish and eggs themselves, other environmental protection issues include the siting of hatcheries, their water usage requirements, the effluent they produce, and the disposal of fish carcasses (of broodstock or fish which are excess or diseased).

While Alaska law does not contain many environmental statutes and regulations which are specific to hatcheries, it does have a number of general provisions regarding protection of the environment which come into play during the planning, development, and operation of hatcheries. These include the Anadromous Fish Act which controls and requires approval for any construction projects or other action which might affect "rivers, lakes or streams or parts of them that are important for the spawning, rearing or migration of anadromous fish"; the Fishways Act which requires the construction of a fishway or hatchery construction if a dam or other obstruction will impact the passage of fish (see section on environmental mitigation); plus many laws and regulations about water quality and pollution, protection of genetic purity of fish stocks (see chapter on biology and genetics), fish health inspections (AS 16.05.868), and siting of hatcheries.

A significant environmental protection issue associated with hatcheries is the discharge of waste into public waters. The procedures and permits required of hatchery operators in this regard have been confusing and in a state of flux for several years, but now seem to be headed for some resolution and streamlining. Part of the confusion stems from the fact that both the Federal Environmental Protection Agency (EPA) and the Alaska Department of Environmental Conservation (DEC) have some jurisdiction in this matter.

It appears that both EPA and DEC have been fairly lenient about requiring the various waste disposal permits that have technically been required. Even so, there have been very few complaints or problems regarding hatchery impacts on water. Hatcheries do discharge effluent which may contain organic fish waste, as well as some disinfectants or other chemicals used to prevent or control disease, but generally they discharge only very small amounts of pollutants. *However, recent developments necessitating the disposal of large numbers of fish carcasses have raised the subject of waste disposal monitoring.* These developments include 1) a joint decision by the Federal Food and Drug Administration and the Alaska DEC in 1990 that the carcasses of hatchery broodstock (mature fish used for the taking of eggs and milt) should no longer be sold for canning for human consumption, and 2) the recent huge returns of fish, particularly in Prince William Sound, which have resulted in the inability of hatcheries to sell large numbers of their "cost-recovery fish." Both of these developments demonstrated the need to establish procedures for hatcheries to dispose of large numbers of fish carcasses.

The federal Clean Water Act prohibits the point source discharge of pollutants by any person into the waters of the United States, except in compliance with the terms and conditions of a National Pollutant Discharge Elimination System (NPDES) permit issued by EPA. *Under federal regulations, discharges of concentrated aquatic animal production facilities require NPDES permits.* The regulations identify the annual level of production and feeding of a facility to require an NPDES permit, but also leaves to the EPA the discretion to require the permit of any facility it deems to be a significant contributor of pollutants.

In a January 1991 letter to all hatchery operators in Alaska, the EPA explained these requirements and noted that even if the regular operations of a hatchery did not fall under the NPDES permit guidelines, a permit would be required if the operator planned to dispose of fish carcasses in the water. It further explained that fish processors who dispose of greater than 1000 pounds of waste per day may be covered by the "Authorization to Discharge Under the National Pollutant Discharge Elimination System for Alaska Seafood Processors" general permit (the GP), and that for the purposes of carcass disposal, the EPA was willing to cover hatcheries under the same GP. The letter explained that this "greatly simplifies the administrative process and reduces the time frame in which a NPDES permit is obtained." The letter ended by asking that hatchery operators notify the EPA of their plans for fish waste disposal prior to the 1991 season.

In April 1991, the Anchorage EPA office sent another letter to all hatchery operators stating that many of the responses they had received to the January letter had raised a number of issues to be considered. Since resolving these issues is likely to take some time, the EPA established an interim policy to allow the hatcheries to operate and to provide for environmental protection in the interim period. The letter goes on to lay out three conditions under which the disposal of whole fish carcasses would be permissible. The criteria include 1) the depth of water where discharge may occur, 2) a requirement of pre-approval of the discharge site by EPA, and 3) a requirement that the skipper of the discharge vessel maintain records of each discharge occurrence, its location, and the date.

Alaska is currently operating under the interim criteria spelled out in the EPA's April 1991 letter. Many hatcheries, particularly state-run hatcheries, have submitted their applications for the NPDES permits to EPA. However, the EPA considers these state hatcheries to be minor dischargers and has agreed to turn over to the state the authority for permitting and monitoring of their waste discharge. EPA has forwarded copies to DEC of all the NPDES permit applications they have received from hatchery operators, and has asked that the state implement a hatchery waste permitting process.

Under current state law, hatchery effluent is covered under the DEC waste disposal permit statute (AS 46.03.100). DEC reports that few hatcheries apply for this permit but DEC has been comfortable with the situation, and has made permitting hatcheries a low priority, since hatcheries generally handle effluent in a manner that maintains acceptable water quality standards.

DEC has drafted a "General Waste Disposal Permit for Fish Hatchery Discharges," to be issued to hatcheries to fulfill the state waste permit requirement. Once the state has officially adopted this permit, hatchery operators will obtain waste permits only from DEC under the operating agreement between DEC and EPA. This state permit would in effect fulfill both state and federal waste permit requirements. This centralization and consolidation should simplify the permitting and reporting processes for hatchery operators, ensure more compliance, and improve uniformity in the monitoring and information available.

The state's draft permit contains a provision stating that the permit is effective until a specified date, "unless superseded before that time by a state certified EPA permit." This statement is included in order to provide for any potential situation in which EPA might require an NPDES permit, which would then supersede the state permit. The draft permit contains specific language regarding discharges, carcass disposal, drugs, chemicals and medications, operational, monitoring and reporting requirements, and so on. It lacks specific language to address disposal of diseased fish or eggs but other general provisions

in the permit, or language in the hatchery operational permits from ADF&G may sufficiently provide for that circumstance.

Despite the lack of clear regulations and enforcement, and the confusion over federal and state requirements, there have been very few problems reported regarding such things as hatchery waste disposal in Alaska. Even during the situation in Prince William Sound during the 1991 season when processors would not buy many of the hatchery fish that later had to be dumped, both DEC and EPA report that their agencies worked very closely with the hatcheries to devise and carry out plans for large-scale carcass disposals, and things went quite smoothly. The Alaska Departments of Fish and Game and Environmental Conservation, and the federal Environmental Protection Agency, generally believe that for this aspect of environmental protection, current laws are adequate.

Other environmental issues related to hatcheries are covered in this report in the chapters on Biology and Genetics, Planning and Permitting, and Environmental Mitigation. The topics covered in those chapters appear to raise more serious and complex environmental concerns and questions, and need more extensive review, than the more direct environmental protection regulations discussed here.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Encouraging DEC and EPA to coordinate waste disposal permitting requirements to the extent possible.
- Ensuring that adequate direction is provided in regulation regarding the disposal of any diseased hatchery fish.

D. USE OF ENHANCEMENT AS TOOL FOR ECONOMIC DEVELOPMENT

The state's financial support of hatchery production and other enhancement efforts has focused primarily on Southeast Alaska, Prince William Sound, Cook Inlet, and Kodiak. However, fisheries enhancement is increasingly being viewed in other rural areas of the state as a tool for local economic development. Potential benefits from enhancement activities include the increased number of jobs, the potential for attracting processors or other value-added businesses to the region, as well as increased harvest for fishermen.

In some cases, the regions interested in enhancement for economic development have small, localized commercial fisheries based on local stocks of fish which in many cases are depleted, and which local residents would like to see replenished. In other areas of the state, residents are interested in the potential of creating entirely new fisheries. For many rural areas of the state, fisheries development represents the most viable -- and in many cases, perhaps the only -- opportunity for economic development.

Some of the projects being discussed and planned include:

- Sikusuilag Springs Hatchery.* Residents of Kotzebue Sound are meeting with a planning core group that includes ADF&G, the National Park Service, and the Northwest Arctic Borough to develop increased production proposals as part of a basic management plan for this small state hatchery located on the Noatak River.

A regional aquaculture association will probably be established in 1992, and a comprehensive salmon plan for the region should be completed in 1993.

- Yukon Enhancement Initiative.** Residents of the Yukon River area are organizing an aquaculture association and seeking legislative funding so that regional enhancement planning can be reactivated and expanded. A draft comprehensive salmon plan could be completed by the fall of 1992. Enhancement efforts are also being considered as part of the U.S./Canada Yukon River treaty negotiations.

- Western Alaska.** Feasibility studies are underway for potential fisheries enhancement projects in the Nelson Island/Chevak area. Local villages and the Bering Sea Fishermen's Association are contributing to the effort, with additional funding requested from the Bureau of Indian Affairs and the National Coastal Resources Research and Development Institute. Although there are no natural runs currently, fishermen in this region are interested in developing salmon returns in streams that are ice-free year round.

- Norton Sound Economic Development Initiative.** Under this proposal, developed in February 1991, FRED Division is providing technical support in developing a fisheries enhancement program at Elim, including stream rehabilitation and a possible hatchery.

- Port Graham Salmon Development Project.** The goal of this pink salmon development project is to create a local village economy based on high quality value-added salmon products. The goal of the hatchery is to produce fish for the processing plant.

- Kake Nonprofit Fisheries Corporation.** This southeast Alaska community proposes to expand its Gunnuk Creek Hatchery with the express goal of contributing to the economic development of the village. Kake has historically been a fishing village, but in recent years saw logging replace fishing as the major form of employment in the community. Logging is now on the decline, and the village wishes to expand its fishing industry.

It should be noted that these enhancement proposals are subject to the same concerns and conflicts generated by enhancement projects elsewhere in the state. The continued interest in enhancement and in hatcheries however, should be a prime reason for addressing the issues highlighted in other chapters.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Evaluation of how much weight to give the need for local economic development when considering a new hatchery permit application.

E. IMPORTANCE OF HATCHERIES TO SPORT FISH

While the Senate Special Committee on Domestic and International Commercial Fisheries initiated the Legislative Review of Alaska's Fisheries Enhancement Program to evaluate the contribution of the program to commercial salmon fisheries, the role of the program in

sport fisheries warrants attention. This section summarizes information provided by a FRED Division report attached to this chapter.

Many projects in the statewide enhancement program produce fish, primarily chinook, coho, pink, sockeye, and chum salmon, steelhead, rainbow trout, grayling, and Arctic char, that are highly valued by sports fishermen. Fish targeted for sport fisheries are released in over 350 locations around the state. Many of the projects operated by the FRED Division are entirely dedicated to improving recreational fishing opportunities.

Sport fishing has been growing in Alaska as evidenced by the increase in the number of licensed anglers from 1977 (200,000 total license sales) to 1990 (425,000 total license sales). This dramatic increase in sport fishing participation can be attributed to many factors, including changes in population, real per capita income of residents and non-resident visitors, and the opportunities for quality sport fishing experiences. A major component of a high quality fishing experience, especially for resident anglers, is the probability of catching a fish during the fishing experience (called the harvest per angler day). According to ADF&G, the economic value of fishing experiences are directly related to higher harvests per angler day. The statewide enhancement program has been a key factor in maintaining and augmenting these harvests despite increasing fishing effort.

The statewide salmon enhancement program has grown to the point of supporting a significant portion of total sport and commercial fishing harvests. For example, total 1990 recreational harvests of salmon, trout, grayling, Arctic char, and steelhead was approximately 1.3 million fish. The enhancement program is estimated to have contributed 28 percent of the harvest. State facilities provided 73 percent of the enhanced harvest while PNPs provided 27 percent.

According to recent studies completed by the ADF&G, sport fishing provides significant economic benefits in Alaska.

OPTIONS FOR POSSIBLE CONSIDERATION:

- If the Legislature initiates an on-going enhancement program review similar to Canada's, include sport as well as commercial fishing aspects of the program in order to achieve a more comprehensive performance report.
- Increasing the sport fish license fees to pay for a larger portion of the enhancement projects that benefit recreational fisheries.
- Encouraging Congress to increase Dingle-Johnson funds provided to Alaska to support increasing sport fishery enhancement and rehabilitation efforts.

F. CONTRIBUTION TO SUBSISTENCE FISH

In addition to commercial and sport fisheries, there is increasing demand for the state's enhancement program to provide fish for subsistence and personal use fisheries.

Sikusilaq Hatchery on the Noatak River provides a substantial number of chum salmon for subsistence gillnets in Kotzebue Sound and on the Noatak. Subsistence users in southern Southeast harvested 5,000 sockeye salmon produced from the McDonald Lake

fertilization project. Production from the Klawock Hatchery, located on Prince of Wales Island, is extensively used by subsistence fishermen.

OPTIONS FOR POSSIBLE CONSIDERATION:

- If the Legislature initiates an on-going enhancement program review similar to Canada's, include subsistence and personal use as well as commercial and sport fishing aspects of the program in order to achieve a more comprehensive performance report.

G. ENHANCEMENT OF OTHER SPECIES

In addition to its work on such sport fish species as grayling, rainbow trout, and arctic char, FRED Division is also exploring king crab rehabilitation in a cooperative effort with Kodiak fishermen and the Kodiak Island Borough. Additional funding is being requested from the Alaska Science and Technology Foundation in order to examine shellfish rehabilitation projects in other countries and states.

Currently, research and production of non-salmon species is done almost entirely by the FRED Division. If private entities became interested in taking on such efforts, statutory changes would be required since the entire PNP program is based on salmon production.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Amending statutes to allow the private sector to enhance non-salmon species.
- Taking action to encourage the production of non-salmon species.

This page intentionally left blank

CHAPTER II. HISTORY AND DEVELOPMENT OF HATCHERIES IN ALASKA

See the attached memorandum from Linda J. Snow of the Legislative Research Agency, regarding "Legislative History of Alaska's Fish Hatchery Program."

This page left intentionally blank.

Alaska State Legislature

Legislative Research Agency



P.O. Box Y
Juneau, AK 99811-3100
Phone: (907) 143-3991
Fax: (907) 143-3351

July 31, 1991

MEMORANDUM

TO: Senator Richard I. Eliason, Chairman
Senate Special Committee on International and Domestic Fisheries

FROM: Linda J. Snow *L. Snow*
Legislative Analyst

RE: Legislative History of Alaska's Fish Hatchery Program
Research Request 91.296

You asked us to review the legislative history of Alaska's salmon hatchery program and to assess legislative intent regarding several current program issues. This memorandum has two sections. The first reviews the development of the hatchery program. The second addresses 12 specific questions about probable legislative intent.

Few relevant legislative records exist from the early 1970s, the formative years of Alaska's hatchery program.¹ We examined the few committee files and hearings records, as well as other available documents. Also, we interviewed several key players in the development of the hatchery program, including former Representative Terry Gardiner; former Senators Bob Palmer, Chancy Croft, Clem Tillion and Kay Poland; Bob Roys, former director of the Fisheries Rehabilitation, Enhancement and Development (FRED) Division within the Alaska Department of Fish and Game (ADF&G); Dr. Mike Kaill, former private nonprofit coordinator for the FRED Division; and Dr. William J. McNeil, a former biologist with the U.S. National Marine Fisheries Service (NMFS).

Attachment A presents a list of all legislation introduced in the Alaska Legislature concerning Alaska's hatchery program from 1959 to 1990.

¹Alaska's salmon hatchery program involves salmon ranching, where salmon eggs are hatched, reared to a juvenile stage, and released into the natural waters of the state. Salmon farming involves hatcheries also, but Alaska does not allow salmon farming in the state. Therefore, in this report, all reference to Alaska's hatchery program refers to salmon ranching, not salmon farming.

DEVELOPMENT OF ALASKA'S HATCHERY PROGRAM

The development of Alaska's hatchery program was an evolutionary process. Prior to statehood, several attempts at hatchery production of salmon were undertaken by the federal government and by private industry. These attempts proved largely unsuccessful, as hatchery technology was crude and undeveloped. In the late 1960s, Alaska was faced with the crisis of a severely depleted commercial salmon fishery, which wrought economic hardships for fishermen, fish processors, and others who depended indirectly on the fishing industry. The state legislature took the lead in revitalizing Alaska's commercial salmon fishery. The development of Alaska's salmon hatchery program was a crucial component in that revitalization. Generally speaking, this development had three phases. Initially, the legislature established state-owned and state-operated hatcheries and research programs. Then the emphasis shifted to encouraging the private sector to participate in hatchery development and operation. As the nonprofit hatcheries grew in number and scale of operation, the legislature turned its attention to the problems of economic viability and improved methods of hatchery funding.

A recurrent controversy underlies the development of Alaska's hatchery program. Although during initial development of the program in the early 1970s it was unknown if salmon hatcheries would be successful in Alaska, many people--including fishermen's groups and processors--believed that because the fishery was already depressed, there was nothing to lose by a failed attempt to propagate fish by means of hatcheries. The legislature seemed enthusiastic about the program, apparently more so than professional fishery biologists, who perhaps feared the unknown biological and management problems associated with pell mell development of hatcheries. Such questions as genetic intermingling, disease, and habitat competition were raised, and the legislature understood that the venture was not without biological risks. However, the depression of the fishery was an immediate and pressing economic problem. The legislature decided to proceed, but with an eye toward protecting the wild stocks. It was hoped that potential problems could be solved or at least mitigated by reasonable precautions, such as regional management plans and careful siting of hatchery facilities to segregate hatchery and wild stocks.

Hatchery Development Before Statehood

By the late 1800s commercial salmon fishing was a major industry in Alaska. The fishing industry was not regulated, and it became evident that the huge catches were beginning to deplete the salmon runs. There was concern about sustaining the resource, and fish hatcheries were viewed as a possible solution. The first salmon hatchery in Alaska was built by several fish processors at Karluk Lagoon on Kodiak Island in 1891. Technology was new and expertise lacking, and consequently this and other early private hatcheries proved largely unsuccessful. In 1900, federal regulations were adopted that required fish processors to build hatcheries capable of releasing four times as many fish as the company processed in a year. The regulations were not enforced. In 1905, the U.S. Bureau of Fisheries built the first government

Senator Eliason

July 31, 1991

Page 3

hatchery in Alaska. Beginning in 1906, the bureau instituted a federal tax credit for fish processors with hatcheries in order to encourage this type of enhancement.

Despite the operation of private and government hatcheries, depletion of the salmon runs continued. In 1915, the U.S. Bureau of Fisheries office in Alaska made an unsuccessful attempt to have Congress buy out all private hatcheries in Alaska. Franklin Roosevelt closed all government hatcheries in 1932 after the Commissioner of the Bureau of Fisheries declared that they had been a "complete waste of public funds." Only one private hatchery remained in operation, and it closed in 1936. Between 1932 and 1951, the U.S. Bureau of Fisheries approached the problem of depleted salmon runs by imposing regulations on fishermen in order to decrease the commercial catch, not by encouraging artificial propagation of salmon. During this time a few experimental hatcheries were started. The federal government built an experimental hatchery at Little Port Walter on Baranof Island in 1939, which stressed research on salmon biology, rather than fish production.

A territorial department of fisheries was established in 1949. Policy makers again looked to artificial propagation as a tool to sustain the fishery. The availability of king and coho salmon for sport fishing was increased by lake stocking and transplanting. Salmon enhancement research continued at the Little Port Walter facility. In 1952, the Deer Mountain hatchery near Ketchikan was built, and in 1953, the Kitoi research station on Kodiak Island became operational. When Alaska achieved statehood in 1959, the U.S. National Marine Fisheries Service was developing a fish culture research lab at Auke Bay near Juneau.

State-Operated Hatchery Program

Salmon runs in Alaska had been declining rapidly since 1936, and were in a state of depression during the 1960s and 1970s. The 30-year consecutive high average annual commercial harvest (1945 to 1975) was 83,300,000 fish, compared to an average annual harvest of 45,108,000 fish between 1960 and 1975, and an average annual harvest of 23,111,000 fish between 1973 and 1975. This dramatic drop in commercial salmon harvest prompted state action. Although the state Department of Fish and Game had been involved on a small scale with enhancement of the sport fishery, and with research and experimental hatchery production of salmon for the commercial fishery, the legislature sought to consolidate and expand the programs despite possible risks to Alaska's natural salmon runs.

By 1968, public concern about the depressed fishery was high, and the progress of hatchery programs in other states and countries was being watched with interest. A general obligation bond authorization for \$3,000,000 to build state hatcheries was passed by the legislature, and overwhelmingly approved by the general public that year.

In 1969, Alaska received \$900,000,000 from the sale of oil and gas leases on the North Slope. The legislature realized the potential of the future income

from oil production. It decided to channel some of the public income from nonrenewable resources (oil and gas) into development of renewable resources to provide a long-term source of employment and economic activity. The salmon resource was an obvious candidate for this long-term investment.

The basic idea behind the state hatchery program was to supplement the existing wild salmon stocks in the state with hatchery fish which would be available for harvest by commercial, sport and subsistence fishermen. Past fish runs indicated that the carrying capacity of the Alaska coastal salmon habitat was at least 100 million salmon. As there were only about 30 million fish in Alaska waters in the early 1970s, the legislature looked to a goal of producing 100 million salmon for a healthy fishery. Although some interest groups suggested depleting the wild stocks and replacing them with hatchery fish, the legislature preferred to protect the wild stocks to preserve the resource base. In the early days of the hatchery program, technology was unproven in Alaska and no one really knew for sure whether the experiment would work. Thus, the legislature did not want to expose the wild stocks to undue risk.

In 1970, HB 777 and HB 778 were introduced that would create and fund a long-range fisheries research and enhancement program within the Department of Fish and Game. Research functions existed within the department, but these bills sought to consolidate and expand the functions into a long-range program. These bills died in the House Resources Committee, but resurfaced later in the session as HB 828 and HB 829. The purpose of the program was to "...use funds realized by the state from nonrenewable resources to advance the orderly and long-range development of the state's fisheries, a renewable resource." There was controversy over the form of the program--should a long-term working fund be established, or should the program be evaluated and funded yearly? While the program enjoyed strong legislative support, the Alaska Department of Fish and Game (ADF&G) opposed it because some of its biologists felt that large-scale hatchery development should await scientific evidence that hatchery and wild salmon could safely coexist in the offshore and nearshore environments. House Bills 828 and 829 did not pass out of the Senate Resources Committee.

On May 28, 1971, SSSB 107 was signed into law (AS 16.05.092), creating a Division of Fisheries Rehabilitation, Enhancement and Development within the Department of Fish and Game. The division had four main responsibilities: 1) develop and maintain a state plan for long-range fishery rehabilitation, enhancement and development; 2) encourage private investment in the development and use of Alaska's fishery resources; 3) insure the perpetuation of Alaska's food resources; and 4) make an annual report to the legislature. No long-term funding mechanism was established by this legislation.

The poor fishing season in Bristol Bay in 1968 reinforced the legislature's interest in means to increase economic returns to Alaska's commercial fishermen. One such proposal was limiting entry of new fishermen so that the level of capitalization could be stabilized. Eventually, an amendment to Article VIII, Section 15 of the Alaska Constitution was approved by public vote in 1972. Section 15 originally stated "No exclusive right or special privilege of fishery shall be created or authorized in the natural waters of the State."

The amendment added "This section does not restrict the power of the State to limit entry into any fishery for purposes of resource conservation, to prevent economic distress among fishermen and those dependent upon them for a livelihood and to promote the efficient development of aquaculture." In 1973, legislation implemented limited entry in the commercial salmon fishery with the long-term goal of increasing economic returns to commercial fishermen.

In 1973 and 1974, the United Fisherman's Association (UFA) was formed, organizing commercial fishermen at the state level for the first time. Fishermen's groups such as UFA were a driving force behind Alaska's salmon hatchery programs.

Movement Toward Private Nonprofit Hatcheries

With the limited entry program in place, legislators felt more confident about expanding the hatchery program because the economic benefits of a rehabilitated fishery resource would not be dissipated among an ever-increasing number of fishermen. At this time, legislators were coming to the view that the private sector would be more efficient than the government in the operation of hatcheries. Also, nongovernmental hatcheries had much to recommend them from the perspective of public finance issues: the operation of private hatcheries could be funded from the harvest of returning fish and from tax assessments on the fishermen who had access to the hatchery production, thus shifting the cost of the facilities from the shoulders of the general public to the people who derived benefits directly from them. Thus, the next stage of the hatchery program was one of encouraging fisheries organizations to build and operate private nonprofit hatchery facilities.

By 1974, the FRED Division had several stream enhancement and stocking programs underway, as well as hatchery incubation and salt water rearing tests in several locations around the state. Several new hatcheries were in the planning stages at this time. A 1974 bond issue was authorized putting most of \$10,500,000 into capital improvements for state hatchery facilities. The concept of authorizing private nonprofit (PNP) corporation hatcheries took the form of law also in 1974 and was developed and refined over the next several years (AS 16.10.375 - 470). The legislature estimated it would take \$400 million to build up the entire fishery resource to a healthy level. It envisioned \$200 million for state hatcheries coming from state funds, with the additional \$200 million for private nonprofit hatcheries coming from other sources (fisheries groups, private foundations, and possibly federal grants). For the most part, there was great enthusiasm about the prospect of PNP hatcheries from fishermen's groups, education centers, Native corporations, and the legislature itself.

In these early years, little was known about the life cycle of wild salmon or the interaction between wild and hatchery fish. Concerns about adverse biological consequences from this interaction were expressed often by state and federal fishery management agencies. However, the legislature was preoccupied with the economic depression of the fishing industry. While biological

concerns were known to framers of hatchery legislation, such matters seemed overly speculative and hypothetical in the face of cries for relief from coastal communities. The sense of urgency felt by legislators, and their frustration with what they seemed to perceive as hand-wringing and foot-dragging by the department biologists, is expressed well in a 1975 letter from Representative Oral Freeman to Governor Jay Hammond (Attachment B). Representative Freeman bemoans the caution and reluctance of the biologists, who were worried about such things as the "unfavorable changes in the genetic composition of some wild salmon...stocks." To this, Representative Freeman remarked: "Governor, I'm sure that proper 'genetics' of salmon are important. However, I'll wager that if our fishermen have to make a choice between salmon with the wrong 'genetics' or no salmon at all they'll not worry that much about the salmon's parents or where he came from."

The biologists' preference for rehabilitating wild stocks over the propagation of hatchery stocks was also alluded to during the Aquaculture Policy Study Group meetings in late 1978 and 1979. It was suggested by Chairman Gardiner that the both state and federal fishery management agencies approached the problem of fisheries development from the point of view of the "resource," while the legislature approached it from the point of view of the "people" (excerpt of the minutes in Attachment C).

In 1976, Alaska legislation was passed creating regional aquaculture associations responsible for the regional planning and coordination of salmon enhancement activities. The legislation provides:

"Sec. 16.10.380. REGIONAL ASSOCIATIONS. (a) The commission shall assist in and encourage the formation of regional associations for the purpose of enhancing salmon production. A regional association is qualified if the commissioner determines that

(1) it is comprised of associations representative of commercial fishermen in the region;

(2) it includes representatives of other user groups interested in fisheries within the region who wish to belong; and

(3) it possesses a board of directors which includes no less than one representative of each user group that belongs to the association.

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

The legislature felt that comprehensive planning on the regional level, primarily careful hatchery site selection, would help mitigate potential

problems such as intermingling hatchery and wild stocks. Also in 1976, another bond issue was authorized and publicly approved, making most of \$29,205,000 available for capital improvements to state hatchery facilities.

Economic and Funding Issues

As the PNP hatchery program developed and hatchery technology progressed, it became evident that the costs of developing viable salmon hatcheries were far greater than initial expectations. Legislative focus fell on the economic viability of the program and on expanded methods of funding PNP hatchery development. New methods of financing construction and operation of PNP hatcheries were sought.

In 1974, AS 16.10.450 was amended to read that proceeds from the sale of salmon or eggs by a PNP hatchery could be applied to debt retirement as well as operating costs. Prior to 1974 there was no state funding available for PNP hatcheries. Funds became available through the Renewable Resources Development Fund established in that year. Additional state loans for construction of private nonprofit hatcheries became available when a 1975 bill was passed expanding the commercial fisheries loan program to include hatcheries. The following year, a separate fisheries enhancement loan program was established.

The 1976 legislation which created the Fisheries Enhancement Loan Program also gave authority to regional aquaculture associations to assess a fisheries enhancement tax of between two and three percent on the sale of salmon in established areas. Although Alaska has no private, for-profit hatcheries, private, nonprofit corporations independent of regional aquaculture associations have developed hatcheries in cooperation with regional salmon enhancement plans. These independent PNP hatcheries, sometimes called "mom and pop" hatcheries by ADF&G, are funded in the same manner as regional association hatcheries except that they have no authority to assess a regional salmon enhancement tax.

In 1977, legislators grappled further with the problem of financing private, nonprofit hatcheries. Building a hatchery requires a substantial capital outlay. It may take six to ten years (depending on the salmon species propagated) before a hatchery might expect viable fish returns which can be sold to cover operating costs and debt service. The initial loan program required the operators to provide 25 percent of the capital cost of the hatchery before loan approval. Although the law allowed qualified regional associations to assess a tax of up to three percent on the sale of salmon in their area, this assessment could not cover both the 25 percent of capital costs required to obtain a state loan and the operating costs of the hatchery.

The 1977 legislation (HB 264, §§ 2 - 19 Ch 154 SLA 1977) created a Fisheries Enhancement Revolving Loan Fund within the Department of Commerce and Economic Development. The conditions for obtaining loans were relaxed, requiring only "sufficient financial resources to insure the establishment of an equity

position in the project equal to ten percent of the loan within six years or less." House Bill 264 also gave regional associations the power to form regional salmon enhancement authorities, but this section was repealed in 1988. This bill also established property tax exemption status for the authorities on land used for salmon enhancement and made state matching grants for organization and planning (50/50) available to qualified regional associations.

Another general obligation bond authorization was approved in 1978. This issue was for \$26,965,000 for capital improvements to state hatchery facilities. The Commercial Fisheries and Agriculture Bank was also created in 1978. Although this institution did not directly benefit hatchery programs in the state, it did provide sources of credit for development of Alaska's fisheries businesses.

Also in 1978, HB 638 was introduced by Representative Haugen which would have added a new section to AS 16.10 which stated: "Sec. 16.10.480. TERMINATION DATE FOR APPLICATIONS FOR PERMITS. No application for a [private nonprofit hatchery] permit under secs. 400 - 470 of this chapter may be received by the department [of Fish and Game] after the effective date of this Act." The bill was later withdrawn by the sponsor. This bill would have stopped the development of the PNP hatchery program and indicates that not everyone in the legislature supported the program.

In 1979, after much legislative debate, a law was passed which allowed the granting of special harvest area entry permits to PNP hatchery operators. Chapter 64, SLA 1979 added a new section to AS 16.43 which reads "Special Harvest Area Entry Permits. (a) In addition to entry permits, interim-use permits, and educational permits, the [limited entry] commission may issue special harvest area entry permits to holders of private, nonprofit hatchery permits issued by the Department of Fish and Game under AS 16.10.400 - 16.10.475." The legislation also established that the permits are good for one year, renewable and nontransferable. Prior to enactment of this legislation, PNP hatchery operators were not allowed to harvest their own brood stock or cost recovery fish; they had to hire permitted fishermen to harvest these fish.

A general obligation bond issue of \$7,718,800 for state hatchery facility improvements was authorized in 1980. Also during that legislative session, the structure for imposing mandatory salmon enhancement taxes on the fishermen of specific regions was refined, prompted by a lawsuit challenging the constitutionality of the system established by SB 689 in 1976 (it represented an illegal delegation of the state's taxing authority). The new legislation required approval of the tax by a majority of the members of the qualified regional association which is to be taxed, and it involved payment of the tax to the state, which reimbursed the collections to the regional association.

In 1981, the Alaska Seafood Marketing Institute was established to spearhead Alaska's seafood promotion and marketing efforts. Also during that session, a House Concurrent Resolution (HCR 16) died in the Senate Resources Committee

without a hearing. This resolution states "BE IT RESOLVED that the Alaska State Legislature respectfully requests the governor, through the Department of Fish and Game, and the Board of Fisheries to provide for broodstock for fisheries rehabilitation and enhancement projects from already depressed fish stocks." It suggested that the priority for management of the fishery be shifted from wild stocks to hatchery stocks in the event of a depressed fishery.

In 1983, SB 156 passed the legislature allowing the lease, sale or grant of state hatchery facilities to qualified PNP hatchery permit holders. The bill reflected concern about the cost to the general fund of state-operated hatcheries, as well as the pervasive feeling that private nonprofit management was more efficient. It was vetoed by Governor Sheffield because he felt the question needed further analysis. Also, Governor Sheffield stated in his veto letter that the Attorney General felt there were possible constitutional problems with "granting" or other transfer of public property for other than public purposes. In 1988, SB 140 (Ch 14 SLA 1988) passed which allowed the state to contract the operation of state hatcheries to a nonprofit corporation, with preference given to qualified regional aquaculture associations located in the region where the hatchery is located. With this legislation, the state retains ownership of the hatcheries and passes the operation onto nonprofit corporations, thus avoiding the possible constitutional problems apparent in SB 156.

House Bill 38, sponsored by Representative Taylor in 1987, would have established limits on the dollar amount of state loans outstanding to regional aquaculture associations and independent private, nonprofit hatchery operators. The bill was later withdrawn by the sponsor. Senate Bill 410 (Ch 152 SLA 1988) passed in 1988, which exempted all broodstock and cost recovery fish from salmon enhancement taxes, and SB 62 (Ch 33 SLA 1989) which passed in 1989, allowed an additional one percent salmon enhancement tax to be levied under certain circumstances.

CURRENT HATCHERY PROGRAM

Currently, the FRED Division operates 16 hatcheries throughout the state and private, nonprofit corporations operate 21 hatcheries (including regional associations and independent corporations). Ownership and management of these facilities are changing as budget cuts have prompted the state to give control of some of their hatcheries to PNP corporations (through sales, leases and management contracts). FRED Division facilities saw returns of 6.3 million hatchery-reared fish in 1990, while PNP facilities saw returns of 42.3 million. Hatchery fish represented about 24 percent of Alaska's commercial salmon harvest in 1990. The FRED Division also maintains two pathology labs, one genetics lab, one limnology lab, and a coded-wire tag processing lab. The FRED Division also provides technical and management assistance to PNP hatcheries. FRED Division hatcheries tend to emphasize research while PNP facilities are more narrowly focused on production for the commercial fishery. The FRED Division is also concerned with the production of sport fish species

and with the experimental farming of oysters, mussels, scallops, abalone, clams and aquatic plants.

The attached table (Attachment D) presents fiscal year capital and operating appropriations as well as bond authorizations for state-operated hatcheries and administration of the FRED division from FY 68 through FY 92.² To date, a total of approximately \$208 million has been appropriated for operating expenses of the state hatchery program. Cumulative capital appropriations during the same time period have reached a total of \$41,334,600. Also, \$77,388,800 in bond authorizations have been approved, most for hatchery construction and improvement.

Attachment E presents a table of cumulative PNP hatchery funding from the 1990 FRED annual report to the legislature. Through December 31, 1990, private, nonprofit corporations have borrowed \$51,310,503 in state funds for capital construction, and \$19,762,723 in state funds for hatchery operations. They have also received \$42,219,711 from salmon enhancement tax assessments and \$13,644,040 from the sale of cost recovery fish during the same time period. At least \$30,509,323 of state funds has gone to PNP hatcheries in the form of grants and contracts between 1974 and 1990.³

LEGISLATIVE INTENT

This section addresses 12 questions about the legislative history of the hatchery program. The sketchy and incomplete documentation of the legislative history makes the answers to some of these questions elusive and ambiguous. However, a general response to each question is provided.

Did the legislature foresee management conflicts (in mixed stock fisheries or between gear groups) over the requirement of hatcheries to capture a sufficient number of returning salmon for broodstock and, in the case of PNPs, cost recovery?

Early in the development of the hatchery program there is no indication the legislature foresaw conflicts developing among user groups (gear groups), nor did we find evidence of anticipated conflicts over excessive escapement requirements for cost recovery. Perceived conflicts had mainly to do with competition and interaction between natural and hatchery-produced salmon.

²This table does not include supplemental appropriations or reappropriations, nor special appropriations for special projects (e.g., additional money to complete construction of the Snettisham hatchery) or appropriations to agencies other than the FRED Division.

³This information was obtained from the FRED division and the Governor's Office of Management and Budget grants tracking system.

However, later in the development of the program, potential *management* problems may have been foreseen. House Concurrent Resolution 8, which became Legislative Resolve 71, SLA 1977 (Attachment F) states: "BE IT RESOLVED by the Alaska State Legislature that the State of Alaska is committed to a fisheries management policy that encourages and promotes the coexistence of healthy hatchery and wild stocks of salmon, and to implement this policy the Department of Fish and Game, through regional planning teams, shall initiate planning to meet the potential conflicts which may arise from the harvest of hatchery and wild salmon stocks so that the wild stocks are adequately protected;" This passage seems to indicate that by 1977 management conflicts were foreseen and that the legislature expected ADF&G to handle them in favor of the wild stocks.

During a 1979 House Resource Committee hearing on HB 48, Bob Roys, director of the FRED Division from 1971 to 1982, stated that the division didn't anticipate PNP hatcheries operators becoming powerful enough to influence fish and game management policy in favor of their broodstock and cost recovery needs over the escapement needs of the wild stocks. He felt there were adequate safeguards in the program to prevent this kind of pressure on management from PNP hatchery operators.

Did the legislature discuss how or why wild stocks were to have priority over hatchery stocks?

According to Terry Gardiner, wild stocks had priority over hatchery stocks for genetic reasons. Wild stocks were genetically superior and contained a diverse gene pool which was needed to sustain the species. In the early years of the program, the legislature was not sure that the hatchery program would work, so there was concern about the risk of losing the wild stocks and their gene pools on a failed experiment. The legislature saw hatcheries as a tool to supplement the wild stocks, not replace them.

Bob Roys recalls that a statutory preference for wild stocks was urged by Rick Lauber, a lobbyist for several fish processing organizations. The processors felt that if fish and game management protected the wild stocks, then it didn't matter if the hatcheries worked or not.

Both Terry Gardiner and Bob Roys felt that the protection of wild stocks would be brought about through management via regional planning teams and through careful placement of hatcheries to minimize interference with wild salmon runs. In a mixed stock fishery, the harvest would allow for appropriate escapement of wild stock, without regard for escapement requirements of hatchery stock. Legislative Resolve 71, SLA 1977 (Attachment F) also speaks to the priority in managing for the wild stocks in a mixed stock fishery.

Did the legislature foresee competition between wild and hatchery stocks for ocean graze, stream bed nesting areas, or other habitat?

Whereas the issue of ocean graze is mentioned in the record, there is no evidence that the possibility of overgrazing was considered a serious issue. For example, Phil Daniels of the United Fishermen of Alaska mentioned the subject of grazing in testimony at a House Resources Committee hearing on HB 264 on March 7, 1977. He stated that Japan, Washington, Canada, Russia and Korea were all far ahead of Alaska in hatchery production. Whereas Alaska released six million smolts in 1976, Japan released one billion. At a 1976 conference in Japan which he attended, limits on available graze in the North Pacific ocean was discussed. Mr. Daniels felt that Alaska was in a bad position to negotiate for graze rights because we lagged far behind the rest of the pacific rim in hatchery production. Thus, the competition the legislature may have foreseen for ocean graze was between our fish and fish from other countries, not between hatchery and wild stocks.

According to Terry Gardiner, legislators assumed there was plenty of room in the North Pacific Ocean to graze all of Alaska's hatchery fish. The environment had at one time supported 150 million salmon from Alaska. At the time these programs were being instituted, there were about 30 million fish coming from Alaska's streams and rivers, so there was room for at least 100 million more.

The legislature intended the hatchery program to utilize barren and unproductive streams, thereby minimizing competition for habitat with wild stocks on the spawning grounds.

Did the legislature foresee possible intermingling and/or genetic deterioration of wild stocks from hatchery stock influence?

Everyone acknowledged the possibility of adverse genetic impact. However, legislators were willing to take risks posed by the theoretical possibility of genetic degeneration of wild stocks.⁴ According to former Senator Bob Palmer, genetic intermingling was a concern of the opposition to the hatchery program, not a concern of the legislature. According to former Senator Clem Tillion, the legislature expressed concern about genetics early in the program, but the people who wanted to mass produce salmon politically outweighed the people who wanted to be extra cautious about the intermingling of salmon stocks. The

⁴According to Dr. William McNeil, biologist with the National Marine Fisheries Service in the 1970s, genetics was just beginning to become an issue as Alaska's hatchery program got underway. Dr. McNeil also chaired the Alaska Fisheries Council for many years. This council was established through the Governor's Office and dealt with many issues involving the evolving hatchery program. Several members of the legislature sat on this council, and it appears to have been a legislative forum for many of these issues.

legislature later funded a fish pathology and genetics laboratory for the FRED Division.

The legislature was aware that Alaska wild stocks of salmon stray from stream to stream, but were willing to risk the consequences in order to restore the strength of the salmon resource. To avoid genetic intermingling, hatchery operators tried to place hatcheries where there were no natural runs of salmon. Any eggs incubated at a stream site came from the local brood stock, or from a stock in the local area.

An unidentified legislator at a 1974 Senate Resources hearing of HB 830, the bill which established private nonprofit hatcheries, said he had lunched with 15 federal fisheries biologists who expressed concerns about the intermingling of wild and hatchery stocks (genetic problems). The biologists felt the problems would be small if only barren streams were used for hatchery facilities. The hearing participant also stated that federal and state biologists couldn't seem to agree among themselves about how serious genetic intermingling could be.⁵ By then, the state had already placed some hatcheries on producing streams. Bob Roys, director of the FRED Division testified at the same hearing that there would be no problem with intermingling if barren streams are used. They currently had wild stocks from different streams intermingling together and it was not a major concern.⁶ He said he'd "rather have the problem of too many fish than not enough." The ADF&G controls where eggs are sold and transferred to avoid the intermingling of stocks.

Did the legislature consider limiting hatchery production because of: 1) adverse impacts on wild stocks; or 2) adverse impacts on salmon market prices?

We found no discussion in the legislative record that hatchery production should be restrained to a predetermined level, for either biological or economic reasons. While the legislature was presumably prepared to take whatever corrective measures were necessary in the face of persuasive evidence that the hatchery program was causing serious biological problems, there appears to have been no discussion of establishing a ceiling on the production of fish from hatcheries.

⁵Fish which survive well in a hatchery environment have different characteristics from fish which survive well in the wild. Hatchery fish need to adapt well to the stress of being raised in crowded incubators and rearing pens, and they must adapt to eating manmade food for the first stages of their life. These characteristics are not necessary, nor desirable in wild stock.

⁶In a recent interview, Bob Roys stated that genetic intermingling was mentioned in legislative hearings, however, no one had adequately defined wild and hatchery stocks. When 80 percent of the gene pool is harvested, the species is altered. Thus our wild stocks are altered by man and may not be considered wild.

There also appears to have been no contemplation of imposing a ceiling on the production of hatchery fish to support market prices. According to Terry Gardiner, salmon stocks were so depressed in the 1970s that there was no thought given to the possibility of oversupply.

Jack Milnes from the Southern Southeast Regional Aquaculture Association presented a possible scenario for enhancing the salmon runs in Southeast Alaska at a 1977 House Resources Committee hearing for HB 264. He discussed returning salmon to the previous level of 38,000,000 from the current 8,000,000. He goes on to say "At current prices of \$6.00 per adult chum salmon, the increased value for the 30,000,000 adults would be \$180,000,000. Everybody hopes the price will hold or inflate in time." Bob Palmer stated that the legislature knew the price of salmon would come down because of foreign production, so they felt inspired to produce even more fish to make up for the lower price. Clem Tillion told us that the legislature did not anticipate dependence on hatchery salmon by Alaska's commercial fishermen, and if adverse impacts on salmon market price were suspected by any legislators, it was not a widespread feeling, for they did not take steps to be able to limit production if that occurred.

Did the legislature consider the question of property rights to ocean-ranched salmon?

Consensus is that the legislature had always intended that the fish from PNP hatcheries belong to the common property fishery until such time as they return to the hatchery, and then they belong to the hatchery for broodstock and cost recovery. Testimony by Senator Dick Eliason at a 1975 Senate Resources Committee hearing on SB 180 indicates that the initial concept of a private hatchery system considered profit-making corporate ownership. However, a profit-making corporation might advance a claim to exclusive ownership of everything it produced. Thus, it was felt that private, nonprofit ownership of hatcheries would be more consistent with the concept of publicly owned hatchery fish. This opinion is echoed by former Representative Terry Gardiner.

At a March 7, 1977 House Resources Committee hearing, Jack Milnes, executive director of Southern Southeast Regional Aquaculture Association testified; "I wish to recognize the fact that these are common property fish, that they belong to the state of Alaska and to the people of Alaska and therefore they should be protected by the representatives of the people of the state of Alaska." At a 1979 Senate Resources Committee hearing on HB 48, Don Clockson, an attorney with Alaska Legal Services discussed the question of ownership of hatchery fish. In his testimony, he asked "When are fish no longer common property fish?" He felt that constitutionally, they were considered to be common property at all times. Consequently, it appears there was never any question that hatchery fish were common property of the people of the state while in Alaska waters, and they may or may not be the property of the PNP hatchery operator at the hatchery, but that he is allowed to harvest a sufficient number for broodstock and cost recovery.

Did the legislature consider what "substantial public benefits" (contribution to the public fishery) hatcheries were supposed to make (percentages)?

We found no record of a discussion or definition of the actual contribution to the public fishery expected from PNP hatcheries. Presumably there was an expectation that cost recovery and broodstock requirements would not divert a significant number of fish from the open access harvest.

During a 1974 Senate Resources Committee hearing on HB 830, an unidentified hearing participant stated that it was assumed 50 to 70 percent of PNP hatchery fish would be available for harvest by commercial, sport and subsistence fishermen, and that 50 to 30 percent would go to the hatchery operator for brood stock and cost recovery. In a recent interview, Terry Gardiner recalled that the legislature was content to allow the contribution to the common property fishery to be determined on regional and fishery basis by ADF&G commercial fisheries management.

Did the legislature consider a conflict of interest by the state when managing for cost recovery to hatcheries with state loans?

No such possibility was contemplated by the legislature in the early days of the program. As stated by Phil Daniels in a 1974 Senate Resources Committee hearing on HB 830, fishermen were initially asking the state for permission to put their own money into building up the resource. The initial concept was that PNP hatcheries would not require state funds, but would be built and operated with money from the fishermen, with additional funds from private foundations, and possibly federal grant monies. As the program evolved, state funds were used. In a recent interview, Dr. Bill McNeil stated that as he recalled, the legislature had lots of oil money to spend in the early days of the hatchery program, and it was not concerned about payback. The legislature was attempting to establish a resource base which would help sustain the state in the future.

However, as the state increased its financial stake in the PNP hatcheries, concern about the repayment of loans also increased. For example, SB 830 (Ch 111 SLA 1974) authorized the sale of salmon and salmon eggs by hatcheries for debt retirement. During a March 7, 1977 House Resources Committee hearing on HB 264, Committee Chairman Terry Gardiner suggested that the legislature eliminate voluntary enhancement tax assessments on fishermen and require

⁷According to Herman Savikko, ADF&G commercial fisheries division, escapement to the hatchery, and therefore, contribution to the common property fishery, is determined on an individual hatchery basis. Fishery biologists who manage regional commercial fisheries do so with information from hatchery operators about how much escapement of hatchery stock is needed, just as they know how much escapement is needed for wild stocks from different streams and watersheds.

mandatory assessments because it would give the state more security about receiving loan payments.

In a recent interview, Clem Tillion stated that the state avoided the conflict of interest by separating management and loan functions. Fishery management was undertaken by the Department of Fish and Game, and the loans were managed by the Department of Commerce and Economic Development. The ADF&G did not want control of the loan program. According to Bob Roys, many times the management of the fishery went in the reverse direction, and resulted in PNP hatcheries not receiving enough fish for cost recovery purposes.

In 1981, the House Resources Committee presented HCR 16. This resolution (Attachment G) requested that the governor, the Board of Fisheries and ADF&G manage the fishery such that hatcheries would receive their broodstock even if the fishery were depressed. The resolution discusses, and falls just short of asking for, management for cost recovery. The resolution died without a hearing in the Senate Resources Committee.

Did the legislature consider under what conditions a PNP hatchery permit might be revoked?

We could find no evidence of any legislative discussion on the revocation of PNP permits. The consensus of our interviewees is also that there was no legislative discussion of the subject. Former Representative Terry Gardiner recently stated that ADF&G was not in favor of PNP hatcheries, and that the legislature was very careful of their wording when requiring that PNP permits be issued for fear that ADF&G would sabotage the intent. However, nothing specific was mentioned about the conditions under which a PNP permit might be withdrawn. It was an administrative matter. According to Bob Roys, the legislature left the matter of withdrawing PNP permits up to the commissioner of the Department of Fish and Game. Conditions of a permit were set by regulation, and no real ADF&G policy evolved. Very few PNP permits have been revoked to date.

Did the legislature consider PNP hatcheries would have to borrow state funds to pay operating costs?

At the outset of the PNP hatchery program, the legislature did not contemplate the use of state funds. The original idea was for PNPs to be built and operated with money from fishermen's associations and grants from private foundations and the federal government. However, as the program evolved, it became evident that the development and operation of hatcheries was more expensive than initially thought. The need for state funds, first for construction, and then later for hatchery operations, was answered with state loan programs developed for those purposes.

In a recent interview, Terry Gardiner stated that the funding situation evolved over time. The first bill was one page and stated that PNP hatcheries

were legal. As time passed, the scale of the program changed. PNP hatcheries had no collateral to borrow from banks, and the enhancement tax assessments were not enough to cover the escalating capital and operating costs. During a March 7, 1977, House Resources Committee hearing on HB 264, Terry Gardiner presented an amendment to the bill which would change AS 16.10.510 (1) (under "Powers and duties of the commissioner") acknowledging the need for PNP hatcheries to borrow funds for operation from the Fisheries Enhancement Revolving Loan Fund. The new language stated "(1) make loans to permit holders under sections 400 - 470 of this chapter, including those holders issued permits before the effective date of this Act for the planning, construction and operation of hatchery facilities;"

Did the legislature consider direct employment in hatcheries as a goal of PNP hatchery development?

The primary goal of the PNP hatchery program was to produce fish for the commercial, sport and subsistence fisheries and create jobs in those industries. Economic development through direct employment in hatcheries may have been a secondary goal, especially in independent "mom and pop" operations. In a recent interview, Terry Gardiner stated that the answer to this question depended on who you were. This was not a goal if you were a fisherman. Some legislators may have considered direct hatchery employment as a goal, but it was not a primary goal. During a Senate Resources Committee hearing in 1974, the question was asked what will PNP operators get out of the program that will make them want to open a hatchery? The answer was "...jobs."

In Chapter 59 SLA 1979, "An Act Relating to Salmon Enhancement," under Section 1. Findings and purpose, subsection (9)(b) states "It is the purpose of AS 16.10.375 - 16.10.620 to provide for continuing efficient aquaculture development in the coastal and interior regions of the state and in a manner which equally affects and benefits all persons similarly situated and to encourage development of small, private, nonprofit hatcheries that may provide important benefits to the state through increased employment, educational training, and research opportunities."

Did the legislature indicate that one goal of hatchery development was to even out yearly catches of salmon?

The objective of Alaska's salmon hatchery program was to increase the total number of harvestable fish, not to produce fish in any kind of cyclical pattern that sought a consistent level of fish from year to year.

I hope this information is helpful to you. If you have further questions, feel free to contact this office.

Attachments

ATTACHMENT A
Alaska Legislation Dealing with Fisheries Enhancement

ALASKA LEGISLATION DEALING WITH FISHERIES ENHANCEMENT
(Legislation which became law is in italics)

- 1959 - *Ch 94 SLA 1959 (HB 201): Required the building of hatcheries or fishways as mitigation for damage to streams.*
- 1968 - *Ch 227 SLA 1968 (HB 357): Authorized the state to issue \$3,000,000 in general obligation bonds for construction of hatchery facilities (after approval through popular election).*
- 1970 - HB 778 (HB 777 - appropriation bill to fund HB 778): Established a long-range fisheries research, rehabilitation and development program. Died in House Resources.
 - HB 828 (HB 829 - appropriation bill to fund HB 828): Reworked HB 778 and 777. Controversy developed over whether to create a long-term fund to fund the program, or whether to have it justified each year for legislative appropriation. Died in Senate Resources.
- 1971 - *Ch 113 SLA 1971 (SB 107): Established the Division of Fisheries Rehabilitation, Enhancement and Development in the Department of Fish and Game. Approved no long-term funding mechanism.*
- 1972 - SB 16: Established a Fisheries Rehabilitation, Enhancement and Development Investment Fund/Working Fund (\$100,000,000). Died in Senate Resources.
- 1973 - *Ch 79 SLA 1973 (HB 126): Established the regulation of entry into Alaska's commercial fisheries.*
- 1974 - *Ch 111 SLA 1974 (HB 830): Established the private nonprofit hatchery program and the corresponding permitting system.*
 - *Ch 130 SLA 1974 (HB 673): Established a Renewable Resources Permanent Fund and Development Fund for capital and operating expenditures for the rehabilitation, enhancement and development of renewable resource programs. (Repealed in 1984.)*
 - *Ch 133 SLA 1974 (HB 475): Authorized the state to issue \$10,500,000 in general obligation bonds, mostly for capital improvements to state hatchery facilities (after approval through popular election).*
- 1975 - *Ch 128 SLA 1975 (SB 181): Related to loans for the construction of hatchery facilities. (Forerunner to the fisheries enhancement loan program).*
 - *Ch 97 SLA 1975 (SB 180): Established that the Department of Fish and Game will provide technical and advisory assistance to private nonprofit hatchery permit holders and applicants.*

ALASKA LEGISLATION DEALING WITH FISHERIES ENHANCEMENT

Page 2

- 1976 - Ch 161 SLA 1976 (SB 688): Established Regional Associations and required a regional salmon enhancement plan.
- Ch 190 SLA 1976 (SB 689): Established the Fisheries Enhancement Loan Program. Also authorized regional aquaculture associations to assess fishery enhancement taxes on the sale of salmon in established areas.
- Ch 214 SLA 1976 (HB 615): Authorized the state to issue \$29,205,000 in general obligation bonds for capital improvements to state hatchery facilities (after approval through popular election).
- 1977 - Ch 154 SLA 1977 (HB 264): Related to fisheries enhancement loans, regional salmon plans, fisheries enhancement revolving loan fund, and creating Regional Salmon Enhancement Authorities.
- Legislative Resolve 71 (HCR 8): Stated Department of Fish and Game's policies for managing hatchery and wild salmon stocks.
- HB 252: Established a Fisheries Enhancement Revolving Loan Fund. Died in House Finance.
- SB 39: Companion bill to HB 264, which became Ch 154. Died in Senate Finance.
- SJR 49: Expressed support for the "National Aquaculture Organic Act of 1978."
- 1978 - Ch 140 SLA 1978 (SB 618): Authorized the state to issue \$26,965,000 in general obligation bonds for capital improvements to state hatchery facilities (after approval through popular election).
- Ch 159 SLA 1978 (HB 763): Established the Commercial Fishing and Agriculture Bank to provide sources of credit for development of Alaska agriculture and fishing businesses.
- HB 638: Established a termination date for receipt of application for private nonprofit hatchery permits. (Would have effectively stopped any future PNP hatcheries.) Died in House Resources.
- HB 66S: Established hatcheries in the Anchorage area. Died in House Resources.
- HB 710: Related to the issue of general obligation bonds. Companion bill to SB 618 which became Ch 140. Died in House Finance.

ALASKA LEGISLATION DEALING WITH FISHERIES ENHANCEMENT

Page 3

- HB 808: Related to the certification of independent fishery biologists to inspect Alaska hatcheries. Died in House Resources.
- HB 821: Special appropriation for a chum hatchery near Kotzebue Sound. Died in House Finance.
- 1979 - *Ch 59 SLA 1979 (HB 359): Better defined royalty assessments and the powers of the Board of Fisheries relating to PNP permits. Establishes Regional Associations as service areas.*
- *Ch 64 SLA 1979 (HB 290): Established special harvest area entry permits.*
- HB 48: Established special harvest area entry permits. Died in House Resources. Re-emerged as HB 290 in rules and became Ch 64.
- 1980 - *Ch 14 SLA 1980 (HB 948): Special appropriation of \$900,000 for the Department of Transportation and Public Facilities to complete construction of Snettisham hatchery.*
- *Ch 91 SLA 1980 (HB 691): Authorized the state to issue \$7,718,800 in general obligation bonds for capital improvements to state hatchery facilities (after approval through popular election).*
- *Ch 154 SLA 1980 (HB 969): Refined and defined salmon enhancement taxes. (Inspired by a lawsuit against mandatory assessments of salmon enhancement taxes.)*
- SB 344: Related to the issuance of general obligation bonds for hatchery improvements. Companion bill to HB 691, which became Ch 91.
- HB 777: Expanded fisheries enhancement loans to include lake fertilization and habitat improvement. Died in House Finance.
- HB 924: Supplemental appropriation of \$30,000 to operate the division of Fisheries Rehabilitation, Enhancement and Development. Died in House Finance.
- HB 971: Extended repayment time (from 25 to 30 years) and length of time to establish ten percent equity position (from six to ten years) for fisheries enhancement loans. Died in House Finance.
- 1981 - *Ch 106 SLA 1981 (HB 198): Established the Alaska Seafood Marketing Institute for the promotion and marketing of Alaska seafood.*
- HCR 16: Requested the Department of Fish and Game to manage for hatchery broodstock recovery. Died in Senate Resources.

ALASKA LEGISLATION DEALING WITH FISHERIES ENHANCEMENT

Page 4

- SB 268: Special appropriation of \$115,000 for a hatchery near Bethel. Died in Senate Resources.
- SB 269: Special appropriation of \$50,600 for a hatchery in the Yukon Kuskokwim area. Died in Senate Resources.
- HB 389: Companion bill to SB 269. Died in House Finance.
- HB 390: Companion bill to SB 268. Died in House Finance.
- HB 471: Special appropriation of \$25,000,000 to the Fisheries Enhancement Revolving Loan Fund. Died in House Finance.
- HB 479: Redefined the jurisdiction of regional salmon enhancement plans. Died in House Resources.
- HB 480: Forbid hatcheries without state permits and profit-making hatcheries. Died in House Resources.
- 1982 - *Ch 32 SLA 1982 (HB 472): Increased the maximum amount for a private nonprofit hatchery loan from \$6,000,000 to \$10,000,000.*
- HB 664: Allowed the conversion of hatchery construction loan to long-term loan and other changes. Died in House Resources.
- 1983 - SB 156: Allowed sale, lease or grant of state hatcheries to regional associations or other approved hatchery operators. Vetoed by the governor.
- HB 393: Allowed qualified private, nonprofit hatchery permit holders to operate (lease) state hatcheries. Companion bill to SB 156. Died in House Resources.
- 1984 - Nothing introduced.
- 1985 - *Legislative Resolve 22 (HJR 38): Requested continued fishery enhancement activities in the Kenai National Wildlife Refuge.*
- *Ch 79 SLA 1985 (SB 78). Made changes to the fisheries enhancement revolving loan fund and established a special account to fund foreclosure expenditures.*
- 1986 - Nothing introduced.
- 1987 - HB 38: Established limits on the dollar amount of state loans outstanding to private nonprofit hatchery owners and regional associations. Withdrawn by the sponsor.

ALASKA LEGISLATION DEALING WITH FISHERIES ENHANCEMENT

Page 5

- 1988 - *Ch 14 SLA 1988 (SB 410): Allowed the operation of state hatcheries by contract.*
- *Ch 152 SLA 1988 (SB 494): Exempted broodstock and cost recovery fish from salmon enhancement tax. Also repealed AS 16.10.600 - 620 on Salmon Enhancement Authorities.*
- 1989 - *Ch 33 SLA 1989 (SB 62): Allowed the levy of an additional one percent salmon enhancement tax under certain circumstances.*
- *House Resolve 7 (HR 11): Encouraged Exxon to fund salmon enhancement to mitigate the Exxon Valdez oil spill.*
- *Senate Resolve 11 (SR 16): Companion resolve to House Resolve 7.*
- *SB 84: Clarified language in Ch 152 SLA 1988 regarding salmon enhancement tax exemption. Died in House Resources.*
- *SB 290: Gave salmon hatcheries the first priority to receive water released by state-owned hydroelectric projects. Died in Senate Rules.*
- *HB 291: Companion bill to SB 290. Died in House Resources.*
- 1990 - *Ch 36 SLA 90 (HB 85): Established changes in accounting procedures for the fisheries enhancement revolving loan fund.*

ATTACHMENT B
1975 Letter from Representative Oral Freeman
to Governor Jay Hammond and Response
RE: Alaska's Hatchery Program

December 1, 1975

Honorable Jay Hammond
Governor of Alaska
Juneau, Alaska

This letter is prompted by recent News reports of your having appointed a "Fisheries Task Force" to study ways of reviving our depressed Fishing industry. Since I may, or may not, have an opportunity for input into that committee and my belief that the makeup of the committee precludes recommendation of one action I consider necessary for a start toward resolution of our Fisheries problems, I'd like to make the following comments to you directly.

First, I'd like to assure you that I lay no claim to any expertise on fishing or fisheries problems. I've been an Alaskan resident for the past thirty years. The first five years of my residency I was a commercial fisherman. The main thing I learned during that five years was how little I knew about fishing.

I was an early and ardent supporter of Statehood for Alaska. One reason was because of my conviction that Alaskans could do a better job of controlling and managing our fisheries than was being done by the U.S. Fish and Wildlife Service.

During the first years following Statehood I made excuses for the management policies of the Alaska Dept. of Fish and Game because, I reasoned, the things they should be doing cost money and the new State didn't have that much money. With the advent of the nine hundred million dollar lease sale in the north I hoped the Dept. would come to life and start making progress with the problem of our declining salmon fishery.

Nothing happened.

Again I made the excuse that it takes a little time to get going in a new direction.

Although I had begun to harbor some serious doubts, my real disillusionment finally came about in the 1973 session of the legislature.

At that time I was a member of the House Finance Committee. The late Representative Hillstrand was at that time Chairman of House Finance.

ACE 5437490

Mr. Hillstrand, recognizing the need for some kind of constructive action, appointed a special sub-committee from members of the Finance Committee, charged with concerning themselves with the problems of Fisheries Rehabilitation, Enhancement and Development. In other words the so-called F.R.E.D. programs.

I was a member of that sub-committee.

Being members of the Finance Committee, obviously our greatest contribution would be in proposing funds for worthwhile projects within the F.R.E.D. Division.

As you well know, membership on the Finance Committee requires long hours of work. The sub-committee did its regular work during the day then came back at night, many nights, and met with the Commissioner of Fish and Game and ten or fifteen members of his staff.

All of this effort was non-productive. We were unable to help. Unable to help for the simple reason that as far as the top management of the Dept. of Fish and Game was concerned--they simply do not believe in Fisheries Rehabilitation, Enhancement, and Development.

I know this may sound a bit harsh, and I want to point out this is my personal opinion. But, a majority of my colleagues on the committee came to the same conclusion.

I'll never forget one particular phrase used by the Commissioner of Fish and Game during the meetings, and that was "the most economical way to produce fish is to properly manage the wild stock".

No one in his right mind would argue with that. The point is that we were not there to discuss the value of proper management. We were there to try to assist with the F.R.E.D. program. As far as I can remember, we received no hints, no clues of any kind, how we, as members of the Finance Committee, could help or assist them with the F.R.E.D. programs.

It would seem to me that sixteen years of following a strict "Management" philosophy in our Fisheries has proved a dismal failure.

I'll admit there are other contributing factors, some of them beyond the State's control. One of course is that the Federal Government has allowed foreign fleets to lay off our shores and harvest Alaska's fish. American foreign policy, which quite often seems to me to be more "foreign" than "American" has and still is using our Fisheries as a pawn in the diplomatic game with little or no regard for Alaskan interest. I

think it is reasonable to assume that sometime in the near future we will have a two hundred mile limit, and possibly other improvements. But even with this, simple "management of the wild stock" will not be enough. If we are to rehabilitate our fisheries we are going to have to give mother nature a hand. We are going to need a change in philosophy and direction. We must get out of the old "management only" groove. We must have more than just "grudging" support for innovative approaches. It is my honest opinion that this will never come about with the prevailing philosophy of the present management of the Department.

Please believe me when I say that I have no "ulterior" motive, no desire to question the honesty, integrity, or devotion to duty of the Commissioner of Fish and Game. I simply believe that the direction and philosophy to which the management is so dedicated is wrong. Further, I don't believe it is going to change.

Fisheries Rehabilitation, Enhancement, and Development programs are working in other states, in Canada, and in Japan. They'll work for Alaska if given a fair chance. I don't believe they're getting that chance.

I may be unfair, but, it seems to me the top people in Fish and Game never miss an opportunity to downplay or belittle F.R.E.D. programs or proposals. Let me quote some excerpts from a recent article: "In its attempt to rejuvenate its failing salmon runs, Alaska is plunging headlong into a hatchery program that is causing concern to Fisheries Scientists". Or take this one from the same article: "...the committee warned that lack of genetic planning in the artificial propagation program could result in unfavorable changes in the genetic composition of some wild salmon and trout stocks. Haphazard attempts to enhance salmon stocks by transplanting eggs, juveniles or adults from one area to another should be avoided until critical evaluations are made".

These quotes are from an article in "Alaska's Seas and Coasts", published last April, but, to me, the strange thing is that I heard the Commissioner of Fish and Game make the same argument three years ago when we tried to talk about F.R.E.D. programs.

Governor, I'm sure the proper "genetics" of salmon are important. However, I'll wager that if our fishermen have to make a choice between salmon with the wrong "genetics" or no salmon at all they'll not worry that much about the salmon's parents or where he came from.

If you'll check the record I'll predict that you'll find that nearly every rehabilitation project now in existence was pushed and promoted, not by the top management of the Dept. of Fish and Game but by some individual legislator. I'm saying that almost without exception, every rehabilitation program outside the laboratory had to be forcibly pushed down the throat of the Department's top men.

It is my belief that there is no problem facing the State of Alaska that commands more interest and sympathy from the State Legislature than that of Fisheries. The Legislators want to do something to solve the problem. The trouble is that they don't know what to do. Obviously the responsibility for planning, guidance, and direction, as well as suggestions, should come from the "experts" in the Dept. of Fish and Game. This is not being done. Wanting to do what needs to be done and being unable to get any help from the people whose responsibility it is to furnish that "expertise" is terribly frustrating. I'm well aware that this situation in our Fisheries is something you inherited from the former Governor, likewise he from the former Governor, etc., etc. For the last sixteen years nothing has changed, the same approach, the same disastrous results, a steady decline in our fishing industry. Something has to be done and you, and only you, have the power to remove or replace a person in such a policy-making position. As you well know this last fishing season was a disaster in the District I represent. A lot of good people who depend on our fisheries for a livelihood, people who are not only my constituents but my good friends, are going to become economic "basketcases" if the people who bear the ultimate responsibility don't get off their backsides and make an all out effort to turn this situation around. I sincerely believe that you, as the state's Chief Executive, are in a position to get us started in the right direction.

I submit that the prevailing philosophy is not going to change as long as he is in control, that if we continue to concentrate on "management" and "management" only, soon there will be nothing left to "MANAGE".

I'm suggesting that the present Commissioner of Fish and Game be thanked for his years of devoted duty and removed from a policy-making position--that he be replaced with some qualified person with a new and different approach. I'm suggesting that such a replacement be hired solely on qualifications without regard as to what part of the world he, or she, might come from. Governor, it is my honest opinion that until this is done all the "Task Forces" you could possibly appoint will bring about no improvements in our Fisheries.

Respectfully,

Representative Oral Freeman
Election District 1
Ketchikan, Alaska

(Retyped copy of Rep. Freeman's letter, by permission)

ACE 5437493



STATE OF ALASKA
OFFICE OF THE GOVERNOR
JUNEAU

December 8, 1975

The Honorable Oral Freeman
Alaska State House of
Representatives
2743 3rd Avenue
Ketchikan, Alaska 99901

Dear Representative Freeman:

Thank you for your letter of December 1, expressing your concerns over the present state of our salmon resources and your recommendation that the present Commissioner of the Department of Fish and Game be replaced. Be assured that I am familiar with the issues you raise and share your concerns for the future of our fishery resources.

Because of my belief in the potentials offered by an aggressive fisheries rehabilitation and enhancement effort, I have assigned the review and coordination of such a program to my Chief of Staff, Mr. Bob Palmer. As you know, Mr. Palmer was in large measure responsible for initiating such a program during his tenure in the State Senate. It is my understanding that some significant changes in this program have taken place as a result. Rather than detail these changes, I suggest that you meet with Mr. Palmer after your arrival in Juneau for the legislative session. I am sure you will be pleased with the progress we have made.

As you know, all commissioners serve at the pleasure of the Governor. However, the legislation splitting the Board of Fish and Game into separate boards, which was passed by the Legislature last session, also speaks to the removal of the commissioner. It provides a mechanism by which either board can send a resolution to the Governor requesting the removal of the commissioner. Such a mechanism certainly meshes with my philosophy that the management of our fish and game resources should be removed at least a half step from the political arena. In addition, this mechanism implies a degree of legislative intent in this regard. Consequently, I would be most reluctant to replace the commissioner without a resolution from either board.

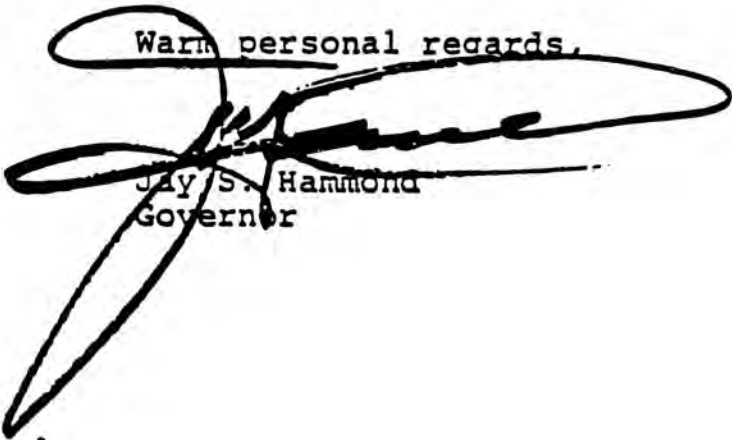
ACE 5437494

December 8, 1975

In closing, I would like to clarify any misunderstanding about the charges given to the Fisheries Economic Impact Task Force which I recently appointed. Basically, their charges deal with the economic stress placed on our fishermen as a result of poor seasons, rather than to "revive our depressed fishing industry". Certainly, these two issues are closely related and both are being actively worked on by members of this Administration.

Oral, I greatly appreciate your apprising me of your concerns, and I am hopeful that we will have the opportunity to discuss them in greater detail while you are in Juneau for the legislative session.

Warm personal regards,



Jay S. Hammond
Governor

ACE 5437495

ATTACHMENT C
Excerpt from October 4, 1978 Meeting of the
Aquaculture Policy Study Group Minutes

RECONVENE 11:30 a.m.

Upon reconvening, John Sund proposed the following goal statement for the study group:

A healthy salmon industry, paying its own way, providing employment, return on investment, and pleasure in recreation (sport fishing), by the year 2000.

PROPOSED
GOAL
STATEMENT

Referring to "paying its own way," Mr Sund advised that prior to 1968, the salmon industry was the greatest state revenue producer. Since that time, the greatest revenue has come from the oil industry. He further advised that the Group should discuss whether "paying its own way" should include regulation of the industry.

Concerning "providing employment," Mr. Sund advised that such employment involves one of the functions of government which is to provide that which people do not provide for themselves.

Mr. Sund stated that he hoped that by analyzing aquaculture, the group could come up with reasons why and how it could function concerning what should be done for the future, including statutory changes if necessary, creation of new entities, and/or destruction of outdated entities.

Dr. Burkette advised that he believed the group should approach aquaculture problems from the direction of a resource industry and couch its goal statement in those terms. Chairman Gardiner then asked group members if they wished to view the salmon industry from a resource or a people oriented outlook, adding that he tends to look from a people point of view while the Department takes the resource viewpoint. Dr. Burkett stated that the Department views aquaculture from the philosophy of a healthy resource; nothing else is involved. Armin Koernig advised that in the early days of Alaska, no attention was paid to the resource itself but rather to the economic income of the industry. He felt the committee should attempt to effect a well balanced resource that is a social/economic industry as well. Bob Simpson advised that National Marine Fisheries prefers to see salmon runs enhanced rather than enhancing the industry.

IS AQUA-
CULTURE
RESOURCE
OR PEOPLE
ORIENTED

BOTH
RESOURCE
AND SOCIAL
ECONOMIC
INDUSTRY

Jack Milnes read Article VIII of the Alaska State Constitution, concerning natural resource policy, advising that the Constitution makes clear that use of the resource be directed toward the people.

CONSTITUTION
ON RESOURCE

Suggestion was made by Barbara Sorensen that language be included within the goal statement to cover processing within the industry, advising that processing has not heretofore been addressed by state policy.

SHOULD
PROCESSING
BE INCLUDED
IN GOAL
STATEMENT

Further suggestion was made that provision for subsistence fishing be included within the statement, and Mr. Sund advised he had no objection to the inclusion of subsistence. He further stated that he believed the group needed a statement set within a time frame in order to produce a definite goal against which the group can measure accomplishments.

GOAL STATE-
MENT TO
INCLUDE
SUBSISTENCE

Dr. Burkett objected to the proposed statement asking when it was decided the group should have such a statement, what the advantages to having one are, and who decided to effect such a statement. Chairman Gardiner advised that the decision had been made at the previous meeting of the group when Dr. Burkett and Mr. Sund were directed to come up with a goal statement. Mr. Sund formulated the wording and put it before the group. Dr. Burkett advised that he assumed the goal statement was going to be tabled as a possible area of pursuit. Dr. Kaill advised that he thought the purpose of the group was statutory clarification, and Armin Koernig attested to the need for a goal statement from which the group could work forward.

OBJECTION
TO GOAL
STATEMENT

A brief discussion followed concerning whether or not there was need for a goal statement, after which the committee recessed for lunch.

LUNCH RECESS 12:05 p.m.

RECONVENE 1:40 p.m.

Discussion resumed concerning the need for a group goal statement, and Dr. Kaill proposed language providing for "optimum yield for the state salmon fisheries," advising that such a goal doesn't really mean anything until the group gets down to its real objectives.

KAILL,
GOAL
LANGUAGE

Sandy Somerville advised that he believed a goal statement to be useful to the extent it would acknowledge that there is both a social and economic system at work here as well as a biological function. It would acknowledge conflicting economic, social, and biological needs, although the resources and needs would vary from region to region. Value judgments would be made by each region to determine how it will proceed in developing its resource, remembering that these economic, social, and biological needs are at odds, and each region must determine what is most important and what comes first. The group must design a process for reconciling competing goals.

SOMERVILLE,
SOCIAL,
ECONOMIC
BIOLOGICAL
CONFLICT

GROUP MUST
ESTABLISH
PROCESS FOR
RECONCILING
COMPETING
GOALS

Mr. Sund read a section from the letter of intent formulating the study group, advising that the directive covers a lot of ground. He further stated that he believed the group could very easily agree on a goal, but he would prefer to have goal areas broken down and measurable against time.

Mr. Somerville suggested that assignments be made for developing goals in economic, social, and biological areas, advising that he felt the Alaska Department of Fish and Game would be in conflict with some of the guidelines the group might establish, adding that the group would have to get a consensus in each separate area. Mr. Sund advised that he would try to include all these areas in his statement citing as an example of Department action the Bristol Bay closure; a biological decision made without regard to economic or social results. He added that he did believe it necessary to set some statement down on paper in order to determine a realistic method for attaining the goal. Mr. Somerville stated that the question would remain as to where the checks rest, who makes the decision to intervene in action taken in the industry, who invests authority to integrate regional plans and reconcile competing interests.

Chairman Gardiner attested to the problem of different types of fishermen fishing the same area within differing time frames, advising that the Department has no method for evaluating its decisions. There should be some guidelines such as those governing Canadian and American catches.

PROBLEM
DIFFERENT
GEAR
FISHING
SAME
AREA

Mr. Somerville advised that regional plans should make very clear statements of goals in a region where economic, social, and biological needs conflict. They would also define management goals, and goals for economic sharing of the income. The group must acknowledge that it understands the competition between these needs. Chairman Gardiner advised that he felt favorably toward Mr. Somerville's suggestion.

Jack Milnes advised that the goal statement is already in the Constitution of the State, stating that what the group must do is determine how to interpret the Constitution, adding that he was not addressing aquaculture but salmon restoration. Legislature has already been used in this area but it has not sufficiently defined functions. The group needs to start with some specific interpretations of what it is going to do.

Dr. Burkett raised a question concerning the area encompassed by the group, advising that some of the previously discussed problem areas are the responsibility of the Regional Planning Teams. He further advised that in the course of operation, goals can change and flexibility is needed, adding that concerning the people and many areas involved, he believed goal determination should be set at the regional level.

SHOULD
GOALS
BE SET BY
REG. PLANNI
TEAMS

Mr. Sund spoke to problems with Regional Planning Teams arising from the fact that they are composed of half volunteer participants (fishermen, etc.) and half paid participants (employees of the Alaska Department of Fish and Game), advising that he didn't believe the power to function could be given these people without funding. Apparently funding is provided through Fish and Game which poses a problem in that getting funding out of Fish and Game has proven to be a "disaster." He advised that if the state is going to push responsibility on the Regional Teams, it is going to cost approximately \$100,000 to \$200,000 per year, per region (approximately \$1,000,000 statewide).

FUNDING FO
REG. PLANN
TEAMS

Chairman Gardiner advised that Regional Planning Teams would be discussed at a later time and directed group attention back to the pending agenda.

Dr. Kaill furnished group members his Overview of Policy and Procedures Manual (copy attached to these minutes), advising that such policies have tried to deal with genetic problems of natural versus hatchery salmon.

POLICY &
PROCEDURES
MANUAL
OVERVIEW

ATTACHMENT D
FRED Division Operating, Capital and
Bond Authorizations FY 68 - FY 92

Legislative Appropriations and Bond Authorizations for Alaska's Hatchery Program, FY 68 - FY 92

Fiscal Year	Operating Appropriations	Capital Appropriations	Bond Authorizations
1968			3,000,000
1969			
1970			
1971			
1972	1,023,400		
1973	1,130,300	50,000	
1974	1,418,200	1,698,400	
1975	2,089,300	1,633,800	10,500,000
1976	3,188,800	387,600	
1977	4,368,500	1,691,500	29,205,000
1978	4,695,000	1,089,300	
1979	9,063,900	1,315,500	26,965,000
1980	8,094,200	178,000	
1981	9,611,200	7,298,000	7,718,800
1982	10,378,400	5,928,000	
1983	12,286,900	845,000	
1984	12,932,000	1,138,600	
1985	14,808,800	5,871,400	
1986	15,619,300	2,714,000	
1987	15,225,800	1,377,800	
1988	14,557,700	386,000	
1989	15,330,900	335,000	
1990	15,600,600	1,211,700	
1991	17,487,900	1,185,000	
1992	18,925,400	5,000,000	
TOTAL	\$207,836,500	\$41,334,600	\$77,388,800

Note: This table does not include supplemental appropriations, reappropriations, special appropriations for special projects, or appropriations to agencies other than the Division of Fisheries Rehabilitation, Enhancement and Development in the Department of Fish and Game.

Source: Session Laws of Alaska, 1967 - 1991.

Prepared by the Legislative Research Agency, July 1991 (91.296A).

ATTACHMENT E
Cumulative State Loans and Enhancement Funds
Returned to Associations and Annual Fish Sales
for 20 PNP Hatcheries as of December 31, 1990
taken from
FRED 1990 Annual Report to the
Alaska State Legislature

Table 12.1. Cumulative state loans and enhancement funds returned to associations (through December 31, 1990), and annual fish sales for 20 private nonprofits (PNP) hatcheries (through Dec. 31, 1990).

Region/Corporation (number of permits)	State Loans		Cumulative Enhancement Funds Generated through Assessments, Returned to Associations via Contract	Estimated Revenue From 1990 Sales of Fish Returning to Special Harvest Areas
	For Capital Construction	For Operations		
SOUTHERN SOUTHEAST				
Southern Southeast Regional Aquaculture Association-SSRAA (3)	\$9,093,000.00	\$2,848,942.00	\$13,820,467.21 (note 1)	\$1,180,692.00
Alaska Aquaculture, Inc.-AAI (1)	\$1,091,985.00	\$2,303,208.00	N/A	\$21,499.30
Meyers Chuck Aquaculture Association-MCAA (1)	\$10,000.00	\$0.00	N/A	N/A
NORTHERN SOUTHEAST				
Northern Southeast Regional Aquaculture Association-NSRAA (3)	\$2,724,265.00	\$1,638,496.00	\$7,895,083.89 (note 1)	\$1,253,052.38
Armstrong-Keta, Inc.- AKI (1)	\$1,733,645.00	\$2,015,500.00	N/A	\$350,934.30
Burro Creek Farms, Inc.-BCF (1)	\$51,500.00	\$332,875.00	N/A	\$606.00
Douglas Island Pink and Chum Inc.-DIPAC (3)	\$9,171,000.00	\$3,821,000.00	N/A	\$68,366.00
Kake Nonprofit Fisheries Corp.-KNFC (1)	\$1,500,724.00	\$1,632,060.00	N/A	\$101,328.93
Sheldon Jackson College-SJC (1)	\$362,254.00	\$61,370.00	N/A	\$0.00
Tlingit and Haida Fisheries Development Corp.-THFDC (0)	\$1,464,000.00	\$89,860.00	N/A	N/A
PRINCE WILLIAM SOUND				
Prince William Sound Aquaculture Corp.-PWSAC (3)	\$19,475,419.00	\$1,085,500.00	\$8,019,732.53 (note 2)	\$8,005,445.08
Valdez Fisheries Development Assoc.-VFDA (1)	\$3,193,830.00	\$3,250,543.00	N/A	\$2,614,413.59
COOK INLET				
Cook Inlet Regional Aquaculture Assoc.-CIAA (2)	\$1,438,881.00	\$683,369.00	\$9,301,544.64 (note 2)	\$47,703.19
KODIAK				
Kodiak Regional Aquaculture Assoc.-KRAA (1)	\$0.00	\$0.00	\$3,182,883.56 (note 2)	\$0.00
STATEWIDE TOTALS	\$51,310,503.00	\$19,762,723.00	\$42,219,711.83	\$13,644,040.77

note 1: 3% mandatory assessment tax collected from commercial fishermen.

note 2: 2% mandatory assessment tax collected from commercial fishermen.

ATTACHMENT F
Legislative Resolve 71 SLA 1977
HCR 8
RE: Protection of Wild Stocks

Original sponsor: Haugen

Offered: 4/7/77
For Today's Calendar

1 IN THE HOUSE

BY THE RULES COMMITTEE

2 CS FOR HOUSE CONCURRENT RESOLUTION NO. 8 am

3 IN THE LEGISLATURE OF THE STATE OF ALASKA

4 TENTH LEGISLATURE - FIRST SESSION

5 Relating to the study of hatchery and wild
6 salmon stock harvest and the comparative
7 economics of salmon hatchery construction
8 and operation.

9 BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF ALASKA:

10 WHEREAS the nonprofit salmon hatchery program was established by the
11 Legislature in 1974; and

12 WHEREAS the express legislative intent was to ". . . authorize the pri-
13 vate ownership of salmon hatcheries by qualified nonprofit corporations for
14 the purpose of contributing, by artificial means, to the rehabilitation of
15 the state's depleted and depressed salmon fishery. . ."; and

16 WHEREAS the program is to be administered in a manner ". . . without
17 adversely affecting natural stocks of fish in the state. . ." and in a manner
18 ". . . which allows reasonable segregation of returning hatchery-reared salmon
19 from naturally occurring stocks"; and

20 WHEREAS the nonprofit salmon hatchery program was subsequently amended
21 in 1976 to allow for the creation of regional associations for the purpose of
22 salmon fishery enhancement and gives qualified associations preference to
23 hatchery permits from the Department of Fish and Game; and

24 WHEREAS the state can make loans to regional hatchery associations in
25 the amount of \$3,000,000 maximum per loan to regional associations and
26 \$300,000 maximum per loan to other hatchery permit holders; and

27 WHEREAS the voters of Alaska approved the construction of state-owned
28 hatchery and rearing facilities in the amount of \$24,565,000 in the 1976
29 general election; and

1 WHEREAS there has not been a comprehensive analysis of the relative cost
2 to the state of the state-owned hatcheries and the private nonprofit hatch-
3 eries; and

4 WHEREAS these state-owned facilities will be located in Southeastern
5 Alaska, Bristol Bay, Cook Inlet, Kodiak, Prince William Sound, and the Alaska
6 Interior; and

7 WHEREAS the locations of these state-owned hatchery facilities are in
8 the general proximity of present and potential future private nonprofit
9 salmon hatchery facilities; and

10 WHEREAS both the state and private hatchery facilities will release
11 salmon into the common property fishery; and

12 WHEREAS private hatchery fish will be subject to the common property
13 fishery along with the naturally occurring salmon runs in Alaska; and

14 WHEREAS it is the stated policy of the Alaska Department of Fish and
15 Game that "if complexities arise in managing mixed stocks, including both
16 hatchery fish and wild fish, it will be state policy to manage the collective
17 resource in a manner that favors protection of the wild stocks."; and

18 WHEREAS the proper management of this multi-stock fishery is of vital
19 importance to the people of Alaska in light of the importance of the salmon
20 fishery to the economic welfare of a significant portion of the state's
21 population;

22 BE IT RESOLVED by the Alaska State Legislature that the State of Alaska
23 is committed to a fisheries management policy that encourages and promotes
24 the coexistence of healthy hatchery and wild stocks of salmon, and to imple-
25 ment this policy the Department of Fish and Game, through the regional
26 planning teams, shall initiate planning to meet the potential conflicts which
27 may arise from the harvest of hatchery and wild salmon stocks so that the
28 wild stocks are adequately protected; and be it

29 FURTHER RESOLVED that the Alaska Fisheries Council study the comparable

1 salmon hatchery cost to the state for both capital and operational costs for
2 state-owned hatcheries and private nonprofit hatcheries; and be it

3 FURTHER RESOLVED that the Department of Fish and Game and the Alaska
4 Fisheries Council report their findings and recommendations to the Second
5 session, Tenth Legislature.

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

#

ATTACHMENT G
HCR 16, 1981
RE: Management for Broodstock

Introduced: 4/3/81
Referred: Resources

1 IN THE HOUSE

BY THE RESOURCES COMMITTEE

2 HOUSE CONCURRENT RESOLUTION NO. 16

3 IN THE LEGISLATURE OF THE STATE OF ALASKA

4 TWELFTH LEGISLATURE - FIRST SESSION

5 Relating to broodstocks for fisher-
6 ies rehabilitation and enhancement.

7 BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF ALASKA:

8 WHEREAS the people of the state have approved \$78,000,000 in bond
9 issues for the construction of hatcheries in the state; and

10 WHEREAS the Department of Fish and Game, division of fisheries rehabili-
11 tation, enhancement and development, with an annual budget of \$10,000,000,
12 has been established for the sole purpose of fishery rehabilitation enhance-
13 ment, and development; and

14 WHEREAS the fisheries enhancement loan program has been established to
15 support an active, private, nonprofit hatchery program; and

16 WHEREAS private associations have expended thousands of volunteer hours
17 and have invested millions of dollars of state loans in hatchery programs;
18 and

19 WHEREAS the loan money must be paid back to the state through revenues
20 derived from the capture and sale of returning fish; and

21 WHEREAS hatchery programs and the rehabilitation and enhancement of
22 state fisheries require adequate supplies of broodstock eggs; and

23 WHEREAS fisheries management agencies, specifically the division of
24 commercial fish and the Board of Fisheries, have not been given clear direc-
25 tion regarding the allocation of fishery stocks to provide the necessary
26 broodstock eggs for the hatchery programs and for rehabilitation, enhance-
27 ment, and development of the fisheries; and

28 WHEREAS many of the fish stocks are in a depressed condition and have
29 been depressed for some time; and

1 WHEREAS a fishery rehabilitation and enhancement program cannot be
2 effective unless, in many cases, the initial broodstock eggs are taken from
3 an already depressed fish stock; and

4 WHEREAS, due to the difficulty in obtaining adequate broodstock eggs,
5 many state and private facilities, worth millions of dollars are empty; and

6 WHEREAS fisheries enhancement loan repayments are dependent on the
7 capture and sale of returning fish and the lack of broodstock eggs to in-
8 crease the number of returning fish will cause loans to be in default;

9 BE IT RESOLVED that the Alaska State Legislature respectfully requests
10 the governor, through the Department of Fish and Game, and the Board of
11 Fisheries to provide for broodstock for fisheries rehabilitation and enhance-
12 ment projects from already depressed fish stocks.

ATTACHMENT H
References

REFERENCES

- Alaska Department of Fish and Game. 1986. "Alaska Statutes and Regulations for Private Nonprofit Salmon Hatcheries." State of Alaska. Juneau, Alaska.
- Alaska Department of Fish and Game, Division of Fisheries Rehabilitation, Enhancement and Development. 1972 - 1990. "FRED Annual Reports To The State Legislature." State of Alaska. Juneau, Alaska.
- Alaska State Legislature. 1959 - 1991. "Session Laws of Alaska." Juneau, Alaska.
- Alaska State Legislature. 1959 - 1991. "House Journals." Juneau, Alaska.
- Alaska State Legislature. 1959 - 1991. "Senate Journals." Juneau, Alaska.
- Alaska State Legislature. 1959 - 1991. "History of House Bills." Juneau, Alaska.
- Alaska State Legislature. 1959 - 1991. "History of Senate Bills." Juneau, Alaska.
- Aquaculture Policy Study Group of the Alaska Legislature. 1978 - 1979. "Minutes of the Aquaculture Policy Study Group Meetings." Alaska State Legislature. Juneau, Alaska.
- Gay, Joel. "Growing Fish: The Future of Alaska's Hatcheries." *Pacific Fishing*. Volume XII, No. 3. March 1991. Pages 60 - 68.
- Hunt, William R. June 1976. "History of the Marine Hatcheries of Alaska." Sea Grant Report 76-10. University of Alaska. Fairbanks, Alaska.
- Morehouse, Thomas A., and George W. Rogers. May 1980. "Limited Entry in the Alaska and British Columbia Salmon Fisheries." Institute of Social and Economic Research. University of Alaska. Juneau and Anchorage, Alaska. for National Marine Fisheries Services, Northwest and Alaska Fisheries Center, Seattle, Washington.
- Pierce, Brad. February 1987. "Aquaculture in Alaska." House Research Agency, 86-D. Alaska State Legislature. Juneau, Alaska.
- Roppel, Patricia. 1985. "Alaska's Salmon Hatcheries: 1891 - 1959."

CHAPTER III. PRODUCTION POLICIES AND TRENDS IN ALASKA AND WORLDWIDE

See the attached memorandum regarding "Overview of World Commercial Salmon Production" by Linda J. Snow of Legislative Research Agency.

Alaska State Legislature

Legislative Research Agency



130 Seward Street, Suite 218
Juneau, Alaska 99801-2196

Phone: (907) 465-3991
Fax: (907) 463-3351

February 7, 1992

MEMORANDUM

TO: Senator Richard Eliason, Chairman
Senate Special Committee on International and Domestic Fisheries

FROM: Linda J. Snow *LJ Snow*
Legislative Analyst

RE: Overview of World Commercial Salmon Production
Research Request 92.058 [REVISED]

You asked for information about world commercial salmon production (harvest). In particular, you asked for an overview of world production of farmed salmon, wild salmon and ranched salmon, and information about trends and policies of the major salmon-producing countries.

SUMMARY

World salmon production over the last decade has been characterized by a decline in wild salmon stocks and an increase in hatchery-bred (ranched) and farmed salmon production.¹ Farmed salmon production nearly doubled between 1988 and 1990, increasing from about 310 million pounds to over 600 million pounds. Commercial salmon catch increased only slightly during that time. In 1990, farmed salmon made up about 27 percent of world salmon production. The increased supply of salmon on the world market lowered the price of the fish. Lower salmon prices and rising operating costs have brought economic hardship to salmon-farming operations worldwide, although many farms remain competitive. Recent trends indicate a slight reduction of farmed salmon production. Lower prices have also adversely impacted commercial salmon-fishing operations worldwide.

¹In this memorandum, the term "ranched" salmon refers to salmon which are hatched in a hatchery facility and released into the ocean, regardless of whether they are harvested by the common property fishery or harvested as private property.

OVERVIEW OF WORLD COMMERCIAL SALMON PRODUCTION

This section begins with an assessment of the sources of data available about worldwide commercial salmon production. It is followed by a brief statistical overview of wild, ranched and farmed salmon production worldwide.

Data Sources

Commercial salmon production reporting takes place in many countries around the world. However, there is no uniformity in the recordkeeping and statistical reporting among the various countries. Some countries report live weight of fish, while others report cleaned weight. Some estimate production by sampling commercial landings, while others compile comprehensive catch statistics from all vessels. Different units of measure may be used in reporting (i.e., numbers of fish, pounds of fish, metric tons of fish), and rounding errors may occur in converting from one unit of measure to another. Reports are prepared for different time periods (i.e., calendar year vs. fiscal year). Some sources report preliminary estimates which may or may not be revised. Sometimes statistics gathered within the same agency are not consistent because reporting requirements and techniques have changed from year to year. Thus, we have not only found it difficult to obtain comparable international data, we have also found inconsistent data reported by different government entities for the same national salmon production.

To make the best use of available worldwide salmon production data, we used two criteria in our selection of data for this report. First, we obtained data from the primary source, or as close to the primary source as possible. Second, we used the same source for the data when possible to be consistent. We obtained the data in Table A from the Department of Fish and Game, Division of Fisheries Rehabilitation, Enhancement and Development (FRED) and Division of Commercial Fisheries, the primary source. We obtained the data in Table B from the *Bill Atkinson's News Report*, a respected industry news letter which discusses developments in world fish markets. Table B is a compilation of data from the United Nations Food and Agricultural Organization (FAO), and from *Salmon 2000*, produced by the Alaska Seafood Marketing Institute. Tables 1 and 2 (attached) were taken from *Salmon 2000*, produced by the Alaska Seafood Marketing Institute. Tables 1 and 2 are composites of several tables in that document. Inconsistencies may be visible between the tables used in this report; however, the basic trends in salmon production are apparent from the data.

Statistical Overview

Salmon production includes the harvest of wild and hatchery-bred (ranched) fish and the harvest of farmed fish. All species of Atlantic and Pacific salmon are ranched, and Atlantic salmon and the coho and chinook varieties of Pacific

salmon are farmed. Many countries which ranch salmon do not distinguish between ranches and wild fish in their statistics of commercial harvests.

Alaska's government hatchery salmon program tags a large percentage of hatchery-bred fish before their release into the ocean. Thus, when recovering tags from commercially caught salmon, a reasonably accurate estimate of the number of hatchery-bred fish caught in the commercial fishery can be made.

Table A gives number of pounds of commercial salmon harvested in Alaska by species and by hatchery and wild fish, from 1980 through 1990. The hatchery contribution to the commercial harvest has become increasingly important, amounting to nearly 23 percent of the commercial catch in 1990. Although the contribution of hatchery harvest for each species has grown, the contribution of hatchery-bred pink salmon is the most significant at over 45 percent of the 1990 commercial pink salmon harvest.

Table B presents the world commercial salmon harvest for the years 1985 through 1990. The table lists commercial salmon catch by species for United States, Canada and Japan, as well as worldwide farmed production. United States statistics include the Alaska harvest. The farmed salmon category includes production from all countries which farm salmon. The "other" category includes salmon commercially caught by countries not listed separately, such as Korea, U.S.S.R., and Poland. Although commercial salmon catch fluctuated between 1985 and 1990, it appears that the increase in worldwide salmon production during that time is due to an increase in farmed salmon production. According to this data source, farmed salmon harvest increased from about 159 million pounds in 1985 to over 600 million pounds in 1990.

Tables 1 and 2 (attached) present some detailed country information for commercial salmon production. This information was taken from *Salmon 2000*, by the Alaska Seafood Marketing Institute. Table 1 presents worldwide harvest of wild and ranches salmon for 1980 through 1990. Note that only three years worth of Soviet commercial salmon catch are reported.

Table 2 presents worldwide farmed salmon production for 1980 through 1990. According to the source, farmed salmon production has increased dramatically from 15.7 million pounds in 1980 to 621.0 million pounds in 1990. Norway is the world's largest farmed salmon producer, harvesting 330.0 million pounds in 1990, over half the worldwide production.

TABLE A
Hatchery and Wild Salmon Commercial Harvest in Alaska, 1980 - 1990
(In thousands of pounds)

	Chinook	Sockeye	Coho	Pink	Chum	Total
1980 Commercial Harvest						
Wild Fish	11,478.3	186,842.7	21,845.2	209,492.9	70,852.2	500,511.3
Hatchery Fish	521.7	157.3	154.8	7,507.1	147.8	8,488.7
Total Harvest	12,000.0	187,000.0	22,000.0	217,000.0	71,000.0	509,000.0
Hatchery Contribution	4.35%	0.08%	0.70%	3.46%	0.21%	1.67%
1981 Commercial Harvest						
Wild Fish	14,963.2	224,678.0	25,630.8	228,186.8	98,850.9	592,309.8
Hatchery Fish	36.8	322.0	369.2	15,813.2	149.1	16,690.2
Total Harvest	15,000.0	225,000.0	26,000.0	244,000.0	99,000.0	609,000.0
Hatchery Contribution	0.25%	0.14%	1.42%	6.48%	0.15%	2.74%
1982 Commercial Harvest						
Wild Fish	15,981.1	188,822.9	45,345.1	198,509.5	89,179.8	537,838.3
Hatchery Fish	18.9	177.1	655.0	20,490.5	820.2	22,161.7
Total Harvest	16,000.0	189,000.0	46,000.0	219,000.0	90,000.0	560,000.0
Hatchery Contribution	0.12%	0.09%	1.42%	9.36%	0.91%	3.96%
1983 Commercial Harvest						
Wild Fish	14,962.7	304,080.1	25,423.0	176,128.7	77,351.9	597,946.5
Hatchery Fish	37.3	919.9	577.0	16,871.3	1,648.1	20,053.5
Total Harvest	15,000.0	305,000.0	26,000.0	193,000.0	79,000.0	618,000.0
Hatchery Contribution	0.25%	0.30%	2.22%	8.74%	2.09%	3.24%
1984 Commercial Harvest						
Wild Fish	11,852.1	220,523.7	42,846.7	260,732.8	92,040.0	627,995.2
Hatchery Fish	147.9	1,476.3	1,153.3	15,267.2	11,960.0	30,004.8
Total Harvest	12,000.0	222,000.0	44,000.0	276,000.0	104,000.0	658,000.0
Hatchery Contribution	1.23%	0.67%	2.62%	5.53%	11.50%	4.56%
1985 Commercial Harvest						
Wild Fish	12,646.6	218,305.3	45,033.4	260,585.5	74,452.1	611,022.9
Hatchery Fish	353.4	2,694.7	1,966.6	43,414.5	8,547.9	56,977.1
Total Harvest	13,000.0	221,000.0	47,000.0	304,000.0	83,000.0	668,000.0
Hatchery Contribution	2.72%	1.22%	4.18%	14.28%	10.30%	8.53%
1986 Commercial Harvest						
Wild Fish	10,637.6	191,159.2	42,973.1	231,847.2	86,419.8	563,036.9
Hatchery Fish	362.4	4,840.8	3,026.9	27,152.8	11,580.2	46,963.1
Total Harvest	11,000.0	196,000.0	46,000.0	259,000.0	98,000.0	610,000.0
Hatchery Contribution	3.29%	2.47%	6.58%	10.48%	11.82%	7.70%
1987 Commercial Harvest						
Wild Fish	11,434.7	209,697.0	21,462.3	89,918.2	66,559.3	399,071.4
Hatchery Fish	565.3	5,303.0	1,537.7	69,081.8	11,440.7	87,928.8
Total Harvest	12,000.0	215,000.0	23,000.0	159,000.0	78,000.0	487,000.0
Hatchery Contribution	4.71%	2.47%	6.69%	43.45%	14.67%	18.06%
1988 Commercial Harvest						
Wild Fish	9,276.3	177,420.0	31,737.1	131,921.2	103,906.5	454,261.0
Hatchery Fish	723.7	7,580.0	1,262.9	44,078.8	17,093.5	70,739.0
Total Harvest	10,000.0	185,000.0	33,000.0	176,000.0	121,000.0	525,000.0
Hatchery Contribution	7.24%	4.10%	3.83%	25.04%	14.13%	13.47%
1989 Commercial Harvest						
Wild Fish	9,296.7	253,818.3	27,840.0	246,819.3	50,790.5	588,564.9
Hatchery Fish	703.3	8,181.7	2,160.0	104,180.7	7,209.5	122,435.1
Total Harvest	10,000.0	262,000.0	30,000.0	351,000.0	58,000.0	711,000.0
Hatchery Contribution	7.03%	3.12%	7.20%	29.68%	12.43%	17.22%
1990 Commercial Harvest						
Wild Fish	9,041.7	291,493.6	28,537.8	145,284.9	46,855.9	521,214.0
Hatchery Fish	958.3	17,506.4	4,462.2	119,715.1	11,144.1	153,786.0
Total Harvest	10,000.0	309,000.0	33,000.0	265,000.0	58,000.0	675,000.0
Hatchery Contribution	9.58%	5.67%	13.52%	45.18%	19.21%	22.78%

Note: Data includes "cost recovery" harvest, but does not include "broodstock" harvest.

Sources: Alaska Department of Fish and Game, Division of Fisheries Rehabilitation, Enhancement and Development, and Division of Commercial Fisheries.

Prepared by the Legislative Research Agency, February 1992 (92.058A).

TABLE B
World Salmon Commercial Harvest, 1985 – 1990
(in millions of pounds)

Species	1985	1986	1987	1988	1989	1990
United States						
Sockeye	235.9	211.6	227.1	189.6	271.2	321.9
Pink	319.7	269.0	169.8	167.5	363.8	264.6
Chum	92.6	86.0	86.0	134.5	63.9	70.5
Coho	52.9	59.5	39.7	46.3	41.9	44.1
Chinook	26.5	30.9	39.7	46.3	37.5	22.0
Total United States	727.5	657.0	562.2	584.2	780.4	723.1
Canada						
Sockeye	70.5	66.1	33.1	26.5	75.0	81.6
Pink	83.8	63.9	59.5	70.5	68.3	57.3
Chum	52.9	55.1	22.0	66.1	19.8	37.5
Coho	19.8	26.5	17.6	15.4	19.8	24.3
Chinook	13.2	8.8	11.0	13.2	11.0	11.0
Total Canada	240.3	220.5	143.3	191.8	194.0	211.6
Japan						
Fall Chum	330.7	310.4	282.7	308.2	350.3	363.8
High Seas Fishery	224.9	164.5	124.7	85.7	114.5	78.9
Total Japan	555.6	474.9	407.4	393.9	464.8	442.7
Farmed						
Atlantic	133.4	147.5	248.0	358.0	464.1	474.0
Pacific (Coho & Chinook)	25.6	39.0	62.2	89.9	104.7	127.9
Total Farmed	159.0	186.5	310.2	448.0	568.8	601.9
Other	265.3	0.0	0.0	110.0	80.5	76.3
TOTAL	1,947.6	1,538.9	1,423.1	1,727.9	2,088.6	2,055.6

Sources: Taken from Bill Atkinson's News Report. Original sources listed as United Nations Food and Agricultural Organization (U.S., Canada and farmed data) and Alaska Seafood Marketing Institute, Salmon 2000 (world totals).

Note: The original table was in metric tons.

Prepared by the Legislative Research Agency, February 1992 (92.058B).

POLICIES AND TRENDS OF MAJOR SALMON PRODUCING COUNTRIES AND REGIONS

The countries and regions which commercially harvest the largest quantities of wild and hatchery-bred ranched salmon are the United States (Oregon, Washington and Alaska), Canada (British Columbia), Japan and the U.S.S.R. Other areas have experimented with salmon ranching, but as yet produce few fish. Major salmon-farming industries are located in Norway, Scotland, Chile, U.S. and Japan. Iceland, the Faroe Islands, Ireland, Australia, New Zealand and France also farm salmon but are not considered major producers. The following overview presents a brief description of current trends in salmon production in the major producing countries and regions.

United States

Alaska's commercial salmon catch accounts for about 90 percent of U.S. commercial salmon harvest. Washington, Oregon and California have commercial chinook and coho fisheries, and Washington and Oregon state governments engage in salmon ranching. Private companies farm salmon commercially in Washington, Maine, Oregon, Minnesota and Idaho. Most U.S.-produced farmed salmon comes from farms in Washington and Maine. Experimental salmon farms are operating in Hawaii and California, but no substantial commercial harvest of the salmon has yet occurred.

In 1990, the Alaska commercial catch of salmon was 675 million pounds. Of that catch, about 23 percent was hatchery-bred salmon. Hatchery pink salmon made up over 45 percent of Alaska's commercial pink catch in 1990, while hatchery sockeye salmon made up only slightly over 5 percent of Alaska's commercial catch. Alaska has no salmon-farming operations.

Commercial salmon catch in Washington has dropped from 68.6 million pounds in 1985 to 36.1 million pounds in 1990. The Washington state government operates about 50 salmon hatcheries, which produce nearly 60 percent of the state's commercial salmon catch (about 21.7 million pounds in 1990). The hatcheries produce mostly chinook and coho salmon, but some chum, pinks and sockeye are hatchery-bred as well. Although the program is expanding slightly, very few new hatchery facilities are being developed. The Washington state government attempts to manages its fisheries to protect the wild stocks, and the hatcheries are meant to enhance and not replace the natural runs. Washington has some profitable private salmon farms, but several had financial trouble last year when algae blooms killed many fish.

Oregon's commercial salmon catch fell dramatically in 1990. The five-year average commercial salmon harvest (1986 - 1990) was 11.9 million pounds. The 1990 harvest was only 5.2 million pounds. Oregon produces 69 percent of its commercial coho catch in 34 state-owned hatcheries and one privately owned hatchery. Ranched fish make up about 25 percent of the coastal chinook commercial catch, and 85 percent of the Columbia River kings caught commercially are from hatcheries. Oregon also hatches and releases some chum

and pink salmon. The state hatchery program has undergone slight expansion recently, funded by federal money. The Oregon Department of Fish and Wildlife attempts to manage the state fishery to minimize negative impact on wild stocks, and hatchery fish supplement the natural runs.

Canada

British Columbia (B.C.) is the only Canadian province with a substantial commercial salmon fishery. The 1990 catch of 191.4 million pounds was slightly higher than the five-year average (1986 - 1990) catch of 187.7 pounds. In recent years, B.C. hatcheries have produced about 12 to 16 percent of the salmon commercially caught off Canada's west coast (between 25 and 34 million pounds in 1990). No new government hatcheries have been built in the past five years. The Canadian government spends about \$40 million (Canadian dollars) per year for B.C. hatchery operation. British Columbia hatcheries concentrate on chinook and coho salmon; they produce very few pink salmon. Between 20 and 30 percent of the chinook and coho catch is hatchery-bred, and 12 to 16 percent of the sockeye and chum catch is from hatcheries. The government management policy favors wild stocks, and hatcheries are for enhancement, not replacement, of the natural runs.

All Canadian salmon farms are privately owned and operated. Canadian farms produced 51 million pounds of salmon in 1990, nearly one-quarter the amount of commercially caught Canadian salmon on the market. New Brunswick, Newfoundland, Nova Scotia and Quebec all engage in Atlantic salmon farming. There are about 89 farms, most of which are located in New Brunswick. In Canada's Atlantic region, expansion has slowed because the government has limited the number of licenses for farms. British Columbia began farming in 1972, and in 1984, private Norwegian companies began investing in Canadian farms. Norwegian investment now amounts to about one-third the value of all B.C. salmon farms. Recent financial trouble due to lower prices for farmed salmon and increased operations costs has contributed to several bankruptcies of farms in B.C. However, Canadian farmed salmon is increasingly filling the U.S. market niche vacated by Norwegian farmed salmon, which is high priced due to the recent implementation of U.S. import duties. Thus, the economic future of Canadian farmed salmon looks good. British Columbia farms produce mostly chinook and Atlantic salmon, but production of farmed coho is developing. The B.C. government began to take a hand in the regulation of farms and research and development of farming technology in 1989 to help foster rapid development. Canadian farms anticipate production of 145 million pounds by the year 2000.

Japan

Commercial catch of salmon by Japanese fishermen has historically come from two fisheries, the high seas drift net fishery, and the coastal set net fishery. Japan has worked to be self-sufficient in supplying its country's demand for salmon. As the high seas fishery became increasingly unprofitable due to

political and environmental pressures, the Japanese government decided to supplement the coastal fishery with hatchery production. The coastal set net fishery now supplies about half the Japanese salmon demand.

Japan has a very ambitious and successful hatchery program. The national government operates its own hatcheries, and subsidizes private ones. In 1980, 58 percent of the commercial fall chum catch off the coast of Japan was hatchery-bred fish. Today, about 85 percent of the coastal catch (about 309 million pounds in 1990) is bred in hatcheries. Japanese hatcheries produce chum, pink, cherry and sockeye salmon. The number of salmon hatcheries in Japan is still increasing. In the Hokkaido area, only about 1 percent of the salmon is wild; the rest are hatchery chums. In the Honshu area, about 80 percent of the chum catch is hatchery reared. There are no longer any native chinook or sockeye salmon in Japanese waters, and few native pink and cherry salmon.

As the high seas catch declines, salmon imports have risen to meet Japanese demand for salmon. The Japanese are experimenting with fish farming to further supply their markets and decrease national reliance on imports. Private firms are developing floating coho farms and experimenting with chinook and Atlantic salmon farms. Farmed salmon production in Japan has increased to 57.2 million pounds in 1990. Farmed coho that cannot be sold fresh are salted rather than frozen.

U.S.S.R.

Information about historic commercial salmon catch by the U.S.S.R. is difficult to obtain. The first Soviet hatcheries were built on Sakhalin Island, with one or two on the Amur River. The Japanese developed hatcheries on the southern part of Sakhalin Island while they occupied that area in the early 1900s. The Soviets inherited those hatcheries when Japan ceded south Sakhalin to the U.S.S.R. after World War II. The Soviets are currently expanding hatchery operations to the Kamchatka Peninsula. They intend to increase hatchery production to bring commercial catch from about 375 million pounds to 661 million pounds. Soviet fishery policy does not mandate protection of wild salmon stocks. Movement of stocks and the possibility of genetic intermingling does not seem to concern the Soviet government.

Soviets are experimenting with salmon farms, although little production has resulted. Perestroika has caused some reorganization of the Soviet fishing industry, and Soviet companies have entered into international joint ventures which will allow them access to new salmon fishing areas in the north Pacific. Recent political developments in the Soviet Union may slow advancements in the fish propagation field in that country in the immediate future.

Norway

Norway's historic wild run of Atlantic salmon has been severely depleted from over fishing. The country began farming Atlantic salmon in the 1960s, and production has increased rapidly since then. In 1990 there were approximately 790 privately owned farms in Norway, providing half the world supply of farmed salmon, and 14 percent of the world supply of salmon. Norway exports about 85 percent of its farmed salmon. The Norwegian government has supported the salmon farming industry through loans, research and technical assistance and regulation. Government policy has limited the size of private farms, and the number of farms a company may operate, and thus has encouraged exportation of salmon-farming technology.

The phenomenal growth of farmed salmon production in Norway and other countries has altered the economics of the world salmon market. As the supply of fresh salmon on the world market increased, the price fell, and some farms became unable to meet their production costs. The Norwegian government is now encouraging a slowdown in farmed salmon production and has placed a cap of approximately 286 million pounds for 1991, down from 330 million pounds in 1990. In recent years, Norwegian firms have been accused of flooding the market with farmed salmon. A quasi-governmental industry organization has begun buying excess production and freezing it for future sales (about 88 million pounds in 1990). Private Norwegian farming companies are now investing heavily in salmon farms in Scotland, Canada, the U.S. and Chile. The U.S. has recently imposed an import tariff (anti-dumping and countervailing duties) on Norwegian farmed salmon, which ranges from about 15 percent to 32 percent, depending on the exporting company. The duty has decreased U.S. imports of Norwegian farmed salmon to about ten percent of U.S. fresh Atlantic salmon imports, compared to 61 percent of U.S. imports in 1989. Canadian and Chilean farmed salmon imports to the U.S. now supply the markets lost to Norwegian fish.

Scotland

Scottish production of farmed Atlantic salmon has been steadily increasing since the early 1980s. Scotland has about 290 farms in sheltered areas along the coast which produced 77.0 million pounds in 1990, second only to the production of Norwegian farms. Half the production is exported. Currently, Scottish farms are experiencing financial difficulties as costs are up and salmon prices have fallen. Seven farming companies in Scotland went bankrupt last year. This year there is a decrease in smolt production. Farms have also seen increasing losses from disease recently. Only two of three fish are surviving until harvest, a 10 percent decline in survival from recent years. The British government has been supportive with financing and is currently helping with a re-evaluation of the market for Scottish farmed salmon.

Chile

Chile began salmon farming on a small scale in the 1970s. There was a slow expansion of farming until 1988, when production took a large jump. Approximately 320 private Chilean farms produced 41.8 million pounds of salmon in 1990. Fish farming is Chile's fastest growing economic activity. First coho were farmed; now Atlantic salmon, chinook salmon and salmon trout are being farmed. Chileans are currently developing sockeye and cherry salmon farms. Chile has no native salmon, but the habitat is similar to that of the Norwegian coast and is perfect for their propagation. Chilean firms are experimenting with ocean ranching of salmon, which so far has not proven successful.

Chilean farms produce high quality salmon. Because Chile is a major world fish meal producer, feed costs are low, allowing farmers to lower stock densities in pens, resulting in healthier fish. The major drawback to Chilean farmed salmon success is the distance to major markets. Transportation costs increase the retail price of Chilean fish by as much as \$.75 per pound. However, through superior quality, Chile has obtained strong markets and can compete even in the face of declining prices. Chilean salmon producers have gained markets in the U.S. because of import duties on Norwegian farmed salmon. About 97 percent of Chilean farmed salmon is frozen for market. The Japanese are investing heavily in Chilean salmon farms. Chilean farms are privately owned and they operate with little government regulation or economic intervention. The farmers work together to set prices and quality restrictions.

Other Salmon-Producing Regions

Other regions which artificially propagate salmon are Korea, Iceland, the Faroe Islands, Ireland, Australia, New Zealand, France, Sweden, Finland, Spain and Italy. Korea does some salmon ranching, as does Iceland and New Zealand. The Faroe Islands, Ireland, Iceland, Australia and New Zealand have small and successful salmon-farming operations. The other regions are in the process of developing salmon-farming technology.

I hope this information is helpful to you. If you need further assistance, please don't hesitate to call this agency.

Attachments

REFERENCES

- Alaska Seafood Marketing Institute. March 1991. *Salmon 2000*.
- Bill Atkinson's News Report*. Various issues.
- Canadian Department of Fisheries and Oceans. Economic and Commercial Analysis Report No. 21. *The Japanese Seafood Market: Salmon*.
- National Marine Fisheries Service. U.S. Department of Commerce. *Aquaculture and Capture Fisheries: Impacts in U.S. Seafood Markets*. April 1988.
- National Marine Fisheries Service. U.S. Department of Commerce. "World Salmon Aquaculture." #IFR-90/30. F/IA23:BM. 1990.
- Pacific Fishing Magazine*. August 1989 - September 1991. Specifically "Japan Update" and "World Watch."
- Salmon Market Newsletter. January, July and November, 1989. International Institute of Fisheries Economic and Trade. Corvallis, Oregon.
- Seafood Trend Newsletter*. Various Issues.
- Summary Report on International Forum on Salmon and Trout. March 1989.

PERSONAL COMMUNICATIONS

Aberley, Bill. Alaska Center for International Business. University of Alaska, Anchorage. Telephone conversation. September 1991.

Atkinson, Clint. Private fisheries consultant. Bill Atkinson's News Report. Telephone conversation. September 1991.

Barry, Doug. Alaska Center for International Business. University of Alaska, Anchorage. Telephone conversation. September 1991.

Christianson, Chris. Director, Fish Propagation Program. Oregon Department of Fish and Wildlife. Telephone conversation. September 1991.

Elton, Kim. Alaska Seafood Marketing Institute. Telephone conversation. September 1991.

Foster, Bob. Resource Manager. Salmon Culture Division. Washington Department of Fisheries. Telephone conversation. September 1991.

Herrmann, Mark, Ph.D. Department of Economics. University of Alaska, Fairbanks. Telephone conversation. September 1991.

Mylchreest, Russell. Economist. Program Planning and Economics Branch. Canadian Department of Fisheries and Oceans. Telephone conversation. September 1991.

**World Wild and Ranched Salmon Harvest
from Major Fishing Countries and World
Farmed Salmon Productions**

TABLE 1
World Wild and Ranched Salmon Harvest
From Major Fishing Countries
(millions of pounds)

Year	Canada	Japan	U.S.S.R	Alaska	Other U.S.A.	Total*
1980	118.0	284.0		512.0	48.0	962.0
1981	173.0	344.0		611.0	61.0	1,189.0
1982	144.0	314.0		562.0	67.0	1,087.0
1983	164.0	367.0		621.0	31.0	1,183.0
1984	110.0	359.0		660.0	34.0	1,163.0
1985	236.0	460.0		669.0	78.0	1,443.0
1986	228.0	389.0	176.0	606.0	72.0	1,471.0
1987	143.0	397.0		490.0	73.0	1,103.0
1988	191.0	373.0		527.0	80.0	1,171.0
1989	185.0	478.0	173.8	714.0	73.0	1,623.8
1990	191.4	484.0	286.0	678.7	44.4	1,684.5

*Totals may not be accurate due to missing years of U.S.S.R. catch data.

Note: The numbers may not always appear exactly as in the source document.
 These differences are due to rounding and discrepancies between
 original sources.

Sources: Salmon 2000, Alaska Seafood Marketing Institute, March 1991, unless
 otherwise indicated. Canadian data from page 37, Japanese data from
 page 38, U.S.S.R. data from page 17, Alaska and Other U.S.A. data
 from page 35, 1990 Canadian and Japanese data from page 17. 1990
 Alaska and Other U.S.A. data from Bill Atkinson's New Report.

Prepared by the Legislative Research Agency, February 1992 (92.058C).

TABLE 2
World Farmed Salmon Production
(millions of pounds)

Year	Norway	Scotland	Chile	Canada	U.S.	Japan	Other	Total
1980	9.1	1.3	0.0	0.4	0.9	4.0	0.0	15.7
1981	18.5	2.9	0.0	0.5	1.9	2.5	0.0	26.3
1982	22.6	4.7	0.4	0.9	1.5	4.7	0.0	34.8
1983	37.4	5.6	0.2	0.7	0.8	3.9	0.0	48.6
1984	49.0	8.6	0.2	0.7	2.7	11.0	1.8	74.0
1985	63.0	15.0	1.1	0.9	4.0	14.1	3.9	102.0
1986	100.5	22.7	2.5	2.2	3.0	17.6	7.5	156.0
1987	123.6	27.9	2.6	6.0	5.5	26.8	17.6	210.0
1988	184.0	39.5	6.8	20.0	8.1	36.0	24.6	319.0
1989	252.7	68.2	18.0	38.8	12.3	40.9	48.1	479.0
1990	330.0	77.0	41.8	51.2	16.9	57.2	46.9	621.0

Note: The numbers may not always appear exactly as in the source document. These differences are due to rounding and discrepancies between original sources.

Source: Salmon 2000, Alaska Seafood Marketing Institute, March 1991. Body of the table is the bottom table on page 14, and the totals are from the top table on page 14 with some adjustments to avoid having negative numbers in the Other column.

Prepared by the Legislative Research Agency, February 1992 (92.058D).

CHAPTER IV. FISHERIES MANAGEMENT ISSUES

The success of the state's enhancement program has made managing Alaska's salmon fisheries more complicated. Much of this research project was initiated by a request from the Board of Fisheries to provide clearer legal and policy direction on the issues of

- managing fisheries for a wild stock priority;
- providing sufficient hatchery returns for broodstock; and
- providing cost recovery fisheries for hatchery operators.

These three issues encompass a number of legal questions and are addressed in Chapter V, Legal Issues. In this chapter a variety of other management issues are discussed.

MIXED-STOCK FISHERIES

A fundamental issue facing fisheries managers is how to control fishing effort in mixed-stock fisheries composed of both hatchery and wild stocks. The predominant management concern is that the weakest stocks will be overfished. In cases in which hatchery productivity is significantly greater than natural stock productivity, wild stocks face the risk of being depleted. In cases where hatchery stocks are smaller, these stocks run the risk of being lost among the wild stocks. Smaller stocks are more likely to be in danger of depletion in mixed-stock fisheries because there is a tendency to optimally harvest the larger stocks before quality declines in terminal fisheries.

The Department of Fish and Game has the constitutional responsibility to conserve and manage wild stocks of salmon for sustained yield. In a wild stock fishery, the conservation responsibility entails maintaining minimum spawning escapement levels for wild stocks. However, when hatcheries are established in wild stock salmon producing areas, the department has additional conservation responsibilities:

- maintaining the genetic diversity of wild stocks as stated in the ADF&G genetic policy;
- maintaining fish health and prohibiting the spread of fish disease; and
- providing sufficient returns of fish to the hatchery to provide for broodstock and cost recovery.

Strict regulations govern the selection of broodstock and the transporting and remote release of hatchery produced fry and smolt, requiring a comprehensive genetic monitoring and permitting process (see Biological Issues chapter).

Because salmon runs occur in a short period of time, field managers rely on early test fisheries or initial fishery performance as the indicators of run strength. When runs of hatchery or wild stocks are weak, commercial fishing effort must be reduced or re-directed. *The ability to determine the strength of various stocks requires some capability to distinguish wild fish from hatchery fish, which increases management costs.*

With large scale hatchery enhancement, ADF&G's Division of Commercial Fisheries is concerned that the additional costs of managing mixed stock commercial fisheries composed of wild and hatchery stocks are not always

accounted for in the planning and operation of hatchery facilities, and fisheries managers are often not given adequate funds to properly manage what can become a very complicated fishery.

It should be noted that the problems posed by mixed-stock fisheries are not new. Almost all Alaska salmon fisheries, composed entirely of wild stocks, had some degree of mixed stocks prior to the development of hatcheries. Prince William Sound, however, is the focus of the Division of Commercial Fisheries' current concern, largely because of the scale of the hatchery operations in the Sound, with hatchery stocks now responsible for over 80 percent of the total pink salmon production.

Managing the fisheries in Prince William Sound has also been made significantly more difficult as a result of the 1989 *Exxon Valdez* oil spill. Certain pink salmon stocks were greatly impacted by the oil spill and require intensive stock-specific management measures in order to protect and rebuild these populations. Additionally, most of the information gathered as a result of the recent influx of oil spill damage assessment funds is still confidential, and not available to the general public.

QUALITY

State law requires that fish returning to hatcheries and sold for public consumption be of comparable quality to fish harvested by commercial fishermen in the area. Prince William Sound is the major focal point for the issue of managing hatchery and wild stocks to optimize quality and marketability.

During the planning process for the Prince William Sound hatcheries, the Basic Management Plans that addressed the harvest of hatchery fish were developed cooperatively by the department and hatchery operators. *Returning adults were to be primarily harvested in terminal areas, thereby minimizing harvest conflicts with wild stocks.* Additional harvest management costs were not considered under this strategy. Initially, fish quality was not an issue as terminally caught fish were of high quality. However, as the program grew, processing capacities became fully utilized, sometimes forcing delays in harvesting terminal fish. Such delays resulted in poorer quality fish, and thus, the demand to harvest fish farther away from terminal areas. The 1989 oil spill also contributed to the concern over quality. The spill delayed harvest of the large 1989 pink salmon run, which resulted in an extremely poor quality pack and a public perception of oil contamination of the fish harvested.

Early in 1991, the Prince William Sound Aquaculture Corporation (PWSAC) expressed concern about the processing capacity in the Sound given the large forecasted pink return. PWSAC officials began exploring the possibility of bringing foreign processors into the Sound, but their request was denied when state officials and domestic processors insisted that existing processing capacity would be sufficient. A delay in the return of the majority of the run in 1991, large pink salmon runs statewide and overall low prices created a major problem for fishermen, hatchery operators, and fishery managers. To maximize the quality of the harvest, processors and fishermen asked to harvest returning adult pink salmon at the entrance areas to Prince William Sound. Fishery managers were reluctant to do so since at these locations, the wild stocks damaged by the *Exxon Valdez* spill are mixed with non-impacted wild stocks as well as the large returns of hatchery fish. ADF&G feared that harvesting in mixed-stock areas, while maximizing quality, would also jeopardize wild stocks through the risk of being overharvested. As a result, fishing was delayed, and

when it was finally opened, the season turned into a disaster with insufficient processing capacity and large quantities of salmon either being destroyed, or processed and given away.

During discussions at recent meetings of Governor Hickel's Salmon Strategy Task Force (see Marketing chapter), it became apparent that there is no definitive information on how close to their spawning areas salmon can be harvested without sacrificing quality. Some people believe that the concern for quality of terminal-area salmon is created by processors as part of a price-setting strategy. ADF&G has suggested a research project be funded to analyze salmon quality at various distances from their spawning areas in an effort to determine how best to manage fishing effort to produce a top-quality and marketable product.

TAGGING NEEDS

Since hatchery-produced fish often complicate fisheries management, a way to simplify management is to determine the mix of hatchery and wild stocks in a mixed-stock fishery. For most mixed-stock fisheries composed of hatchery fish, an adequate program of tagging, recovery and analysis is required.

The tagging method most commonly used now is the coded-wire tag (CWT). The CWT is typically a 1.0 mm long by 0.25 mm diameter stainless steel wire which has been etched with notches that represent a code of information. The CWT can be injected into the nasal cartilage in salmon smolts. Tags from returning fish are recovered by fishermen and field biologists and sent to a lab in Juneau for analysis. The Juneau lab has extremely poor working conditions, and ADF&G for years has attempted to improve lab conditions and expand its capabilities. In spite of these conditions however, the lab produces quality data.

Scale analysis is another technique that has been used for years to reliably identify the country of origin for salmon in the north Pacific. However, the use of scale analysis has so far not been able to provide the detailed level of information necessary for management of specific fisheries.

Otolith marking is seen as the most viable mass marking technique on the horizon. Otolith bone development provides a daily record of the internal and external forces affecting fish growth beginning at the eyed-egg stage. This growth occurs in rings somewhat similar to the circuli of a fish scale or the rings of a tree. Growth of the otolith is in alternating rings of high and low concentrations of protein calcium carbonate. The optical density of these rings is easily manipulated to make an obvious visible change in structure. One way to do this is by thermal marking - causing a rapid drop or elevation in water temperature. The benefit of otolith marking is that virtually *all* hatchery fish can be marked at the same time.

FRED Division is also actively pursuing genetic stock identification (GSI) research and applications using both protein electrophoresis and deoxyribonucleic acid (DNA) analysis. This approach can be used for a variety of purposes, including measuring the contributions of unmarked but genetically identifiable hatchery fish to commercial fisheries. Biologists are already doing extensive work using this technique on salmon from the Yukon River.

Although otolith marking and GSI hold promise for the future, coded-wire tags will probably always have a place in the state's marking program. The CWT Lab currently supplies information for hatchery and natural stock evaluation, as well as for evaluation of U.S./Canada salmon interceptions. The CWT Lab is a vital link in the in-season management of fisheries in Southeast and Prince William Sound. Using coded-wire tag data, fishery managers are able to take in-season advantage of the hatchery add-on clause of the U.S./Canada Pacific Salmon Treaty. In 1991 the CWT tag lab processed over 76,000 heads, using a large number of seasonal staff because of the short salmon season and the need for in-season hatchery contribution estimates.

The extent of any particular tagging program is determined by funding. The general assumption is that the people who tag the fish pay for the tagging. In the case of hatchery operators, that usually means the state or the PNP operator. However, *the greater expense lies with the recovery and analysis of tags by the state, and the issue of who pays for that portion has never been resolved.* Commercial fisheries managers would like to see more tagging to enable increased management precision. The Board of Fisheries would like to see additional tagging in order to provide information for allocation disputes. Hatchery operators have been reluctant to pay for the recovery and analysis program. This issue has been debated for the past decade and is still unresolved.

At the time of the *Exxon Valdez* oil spill, the hatchery/wild stock assessment program in Prince William Sound was not fully developed nor was the funding for such a program in the Commercial Fisheries Division's base budget. As a result, the program was unable to assess the oil spill damage or provide the stock-specific information needed to protect and restore damaged pink salmon stocks. Fortunately, Natural Resource Damage Assessment funds provided ADF&G with sufficient resources to assess the population level response of Prince William Sound pink salmon to the oil spill. However, once oil spill funds expire, additional state money will be needed if a stock-specific harvest management program is to be implemented and maintained.

FRED Division is informing hatchery operators that new increments of hatchery production will be permitted with a requirement that the operator pay for tagging and analysis. Whether or not to require that of existing production is being debated. Some people, including some members of the Board of Fisheries, advocate for a requirement that all hatchery production be categorically tagged and analyzed. However, existing operations have permits that do not require tagging. These operations were planned, permitted and funded without accounting for tagging their costs. It is likely that imposing a tagging requirement on permitted facilities would be subject to legal challenge.

Another issue, however, is whether an all encompassing tagging requirement is necessary. In some cases, a multi-year tagging study to show migration patterns and run timing would be sufficient. In other cases, where tagging is intended for in-season management, a large tagging program would need to be maintained. Not all hatchery production results in complicated, mixed-stock fisheries that would necessitate extensive tagging, and would even be used. Although CWT data has been supplied to Prince William Sound fisheries managers on a daily and weekly basis for the past two years, it has yet to be used for in-season management.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Development of a state policy on managing mixed-stock fisheries composed of hatchery and wild stocks.
- Requiring hatchery production to have tagging, recovery and analysis programs. This could range from a blanket requirement for all production to site-specific requirements.
- Development of a policy regarding funding for tagging, recovery, processing and analysis.
- Funding a study to analyze salmon quality at various distances from terminal streams to determine the effect of fishery management effort on product quality and marketability.
- Direction to the Board of Fisheries on how to factor managing for quality into fisheries management plans.
- Funding research and development of new tagging and marking techniques suitable for mass marking.
- Clarifying the roles and uses of tagging--for biological information, allocation, or management purposes.
- Expanding tagging and stock identification studies of wild fish stocks for the purpose of comparing wild and hatchery stocks.

CHAPTER V. LEGAL ISSUES RAISED BY BOARD OF FISHERIES

In a May 6, 1991 letter to Senate President Richard Eliason, Fisheries Board Chairman Michael R. Martin stated the following:

In managing fisheries that involve hatchery raised salmon, the Board of Fisheries has encountered problems due to ambiguities in the current Alaska statutes. These problems commonly arise when the management of hatchery stocks conflicts with either the health of wild stocks or with the opportunity of fishermen to harvest wild stocks. Essentially, the statutes are not clear on the status of wild stock management.

State statutes are also not clear about the state's duty to provide fish for hatchery broodstock and cost recovery, and about hatcheries' obligations to contribute to the common property fisheries. We perceive that the development of state policy toward hatcheries may create a conflict of interest. On the one hand, the state manages fisheries as a common property resource for the benefit of all user groups. On the other hand, the state loans money to hatcheries with the expectation that the hatcheries will receive enough fish to be able to repay these loans.

While Chairman Martin went on to note other concerns,¹ *an overriding problem for the board appeared to be the perceived statutory ambiguities which lead to difficulty in resolving conflict between wild stock protection and broodstock/cost recovery.*

ALASKA STATUTES AND ADF&G REGULATIONS

The board was created "for purposes of the conservation and development of the fishery resources of the state . . ." (AS 16.05.221 (a)). In order to carry out that charge, the board may "adopt regulations it considers advisable in accordance with the Administrative Procedures Act (AS 44.62)." (AS 16.05.251(a)).²

¹/These included potential changes to the statutes relating to regional salmon plans (AS 16.10.375), regional associations (AS 16.10.380), and definition of various words and phrases used in Title 16.

²/AS 16.05.251 (b) lists the purposes for which the board may exercise this power, including

- . . . (2) establishing open and closed seasons and areas for the taking of fish;
- (3) setting quotas, bag limits, harvest levels, and sex and size limitations on the taking of fish;
- (4) establishing the means and methods employed in the pursuit, capture and transport of fish; . . .
- (6) classifying as commercial fish, sport fish, personal use fish, subsistence fish, or predators or other categories essential for regulatory purposes;

The board has adopted a number of regulations relating to private nonprofit hatcheries. Codified at 05 AAC 40.005 - 05 AAC 40.900, they include: delegating to the commissioner the authority to specify gear type and fishing periods for hatchery cost recovery; requiring hatchery permit holders who harvest salmon to comply with fish purchaser reporting requirements; allowing hatchery permit holders who harvest salmon for broodstock exemptions from the salmon "waste" statute and the regulations concerning "closed waters" and vessel area registration; designating special harvest areas; procedures for permit application, application review, public hearings, review and determination, and reconsideration; establishing regional comprehensive planning teams and procedures to be followed by them; prohibiting permit transfers; requiring hatchery management plans, inspections, and performance reviews; establishing criteria for the sale of surplus salmon eggs.

A number of these regulations contain references to wild stock protection.³ However, any regulation may be successfully challenged in court if it falls outside the statutory authority granted to the state agency that adopted it,⁴ or if it conflicts with other statutes,⁵ or the constitution.

The statutes governing the private nonprofit hatchery system are AS 16.10.375 - AS 16.10.470. They provide for: regional salmon plans; regional associations; criteria for the issuance of hatchery permits; public hearings prior to permit issuance; permit conditions; criteria for permit alteration, suspension or revocation; board regulation authority; department assistance and cooperation for permit applicants and holders; salmon egg sources; salmon egg sales; hatchery inspection; and an annual report to the department by permittees.

There are only two direct references in statute to the protection of wild stocks from harm due to hatchery operations. The first, AS 16.10.400(g) ("Permits for salmon hatcheries"), provides:

During the development of a comprehensive plan for a region, no permit may be issued for a hatchery unless the commissioner determines that such an action would

(7) watershed and habitat improvement, and management, conservation, protection, use, disposal, propagation and stocking of fish;

(8) investigating and determine the extent and effect of disease, predation, and competition among fish in the state, exercising control measures considered necessary to the resources of the state;

(9) prohibiting and regulating live capture, possession, transport, or release of native or exotic fish or their eggs; . . .

(12) regulating commercial, sport, subsistence, and personal use fishing as needed for the conservation, development, and utilization of fisheries...

AS 16.05.251(b).

³/See e.g., 5 AAC 40.005 (c) (segregation of hatchery fish from natural runs), 5 AAC 40.170 (2) (regional planning team review of hatchery permit application to determine extent of wild stock protection),

⁴/See, Beran v. State, 705 P.2d 1280 (Alaska App. 1985)

⁵/Id.

result in substantial public benefits and would not jeopardize natural stocks. (emphasis added)

The second, AS 16.10.420(10) ("Conditions of a permit"), states:

The department shall require, in a permit issued to hatchery operator, that . . . a hatchery be located in an area where a reasonable segregation from natural stocks occurs, but, when feasible, in an area where returning hatchery fish will pass through traditional salmon fisheries.

The board is concerned that these statutes require the department to make a judgment concerning the potential harm to wild stocks only prior to the issuance of a hatchery permit; the inference being that once a judgment is made and a hatchery permit is issued, there is no statutory "protection" for wild stocks that are jeopardized by hatchery-related dangers arising after a permit is issued.⁶ This raises the possibility that a management regime which protects wild stocks to the detriment of hatchery operations would conflict with existing statutes that indicate the state should manage hatchery fish for broodstock and cost recovery.

An additional concern, not raised in Chairman Martin's letter, is whether the state constitution requires that hatchery fish be managed for broodstock and cost recovery.

RECENT LEGAL OPINIONS

Hatchery Fish and "Sustained Yield"

Article VIII, section 4, of the Alaska Constitution states:

Fish, forests, wildlife, grasslands, and all other replenishable resources belonging to the State shall be utilized, developed, and maintained on the sustained yield principle, subject to preferences among beneficial users.

The Alaska Supreme Court has stated that wild salmon, while they are in the natural waters of the State, "belong" to the State. Metlakatla Indian Community, Annette Island Reserve v. Egan, 362 P.2d 901, 914-915 (Alaska 1961). Because wild salmon belonged to the State while in our waters, they are subject to Article VIII, Section 4, of the Constitution, and thus must be managed on the sustained yield principle. Whether hatchery-reared salmon share the same status is less clear, and has been the subject of disagreement among attorneys who have recently written on that issue. The issue is important in the context of Chairman Martin's concerns because if hatchery fish must be managed on the sustained yield principle, that implies the Board of Fish *must* manage fisheries to provide hatcheries with broodstock, and possibly cost-recovery fish, even if the board does not believe that to be in state's best interest.

In an August 1990 letter to Alaska Department of Fish & Game Commissioner Don Collinsworth, Assistant Attorney General Steve White concluded that the Department of Fish & Game and the Board of Fish had the legal authority, and were in fact directed by law, to manage fisheries so that salmon hatcheries receive broodstock and cost recovery fish for their operations. He based these conclusions in part on the assumption that the

⁶/See Martin letter, p. 2.

law, to manage fisheries so that salmon hatcheries receive broodstock and cost recovery fish for their operations. He based these conclusions in part on the assumption that the above quoted section of the Alaska Constitution mandates that hatchery fish be managed in the same manner as wild stocks. Two other attorneys, George Utermohle of the Legislative Affairs Agency's Legal Services Division, and Juneau attorney Michael Stanley, later called that assumption into question. Sometime after that, Anchorage attorney A. William Saupe analyzed the three prior opinions and concluded that Mr. White's initial assumption was correct.⁷ What follows is a summary, extracted from the four opinions, of the arguments on both sides of the question of whether sustained yield management requirement of art. VIII, sec. 4 of the Alaska Constitution applies to hatchery-raised fish.

First is the issue of "ownership." On its face, sec. 4 of art. VIII applies only to resources "belonging" to the state. Are hatchery-raised fish in that category? Stanley and Utermohle argue that they may not be.

Stanley points out that the framers of the Alaska Constitution did make distinctions between resources "occurring in their natural state" and those that are "subject to intensive culture," at least for the purpose of exempting the latter from the requirements of art. VIII, sec. 3 (the "common use clause").⁸ Because humans play a substantial role in the growth and development of hatchery fish, Stanley reasons that they may not be the "natural resources" the drafters of article VIII had in mind.

George Utermohle points to the fact that the legislature, when it created the private nonprofit hatchery system, used the following language (AS 16.10.440(a)) to provide for the common use of hatchery fish:

Fish released into the natural waters of the state by a hatchery operated under AS 16.10.400 - 16.10.470 are available to the people for common use and are subject to regulation under applicable law in the same way as fish occurring in their natural state until they return to the specific location designated by the department for harvest by the hatchery operator.

Utermohle finds the above language significant in a number of respects: first, while the statute provides for the common use of hatchery fish, it is silent as to state ownership and makes no mention of sustained yield; second, the fact that hatchery fish are to be treated "in the same way" as fish occurring in their natural state "until they return to the specific location. . ." suggests that the legislature did not consider them a common property resource belonging to state, but merely felt they should be treated as if they were until they returned to the hatchery for harvest; finally, Utermohle suggests that the provision for harvest by the hatchery operator indicates "some lingering private property interest in the hatchery fish by the hatchery," another indicator that these fish may not "belong" to the state for purposes of the sustained yield section of art. VIII.

In his lengthy memorandum to PWSAC President John McMullen, attorney A. William Saupe disagreed with the arguments made by Stanley and Utermohle that the sustained yield clause may not apply to hatchery fish.

⁷/Copies of the four legal opinions are attached to this memorandum.

⁸/Art. VIII, sec. 3 provides: "Common Use. Wherever occurring in their natural state, fish, wildlife, and waters are reserved to the people for their common use."

Initially, Saupe relies on legislative history to refute the "ownership" argument. He quotes this passage from a Legislative Research Agency memorandum by Linda J. Snow (July 31, 1991) to Senator Eliason:

Consensus is that the legislature had always intended that the fish from PNP hatcheries belong to the common property fishery until such time as they return to the hatchery, and then they belong to the hatchery for broodstock and cost recovery. Testimony by Senator Dick Eliason at a 1975 Senate Resources Committee hearing on SB 180 indicates that the initial concept of a private hatchery system considered profit-making corporate ownership. However, a profit-making corporation might advance a claim to exclusive ownership of everything it produced. Thus, it was felt that private, nonprofit ownership of hatcheries would be more consistent with the concept of publicly-owned hatchery fish. This opinion is echoed by former Representative Terry Gardiner.

At a March 7, 1977 House Resources Committee hearing, Jack Milnes, Executive Director of Southern Southeast Regional Aquaculture Association testified: "I wish to recognize the fact that these are common property fish, that they belong to the state of Alaska and to the people of Alaska and therefore they should be protected by the representatives of the people of the state of Alaska." At a 1979 Senate Resources Committee hearing on HB 48, Don Clocksin, attorney with Alaska Legal Services, discussed the question of ownership of hatchery fish. In his testimony, he asked "When are fish no longer common property fish?" He felt that constitutionally, they were to be considered common property fish at all times. Consequently, it appears there was never any question that hatchery fish were common property of the people of the state while in Alaska waters, and they may or may not be the property of the PNP hatchery operator at the hatchery, but that they be allowed to harvest a sufficient number for broodstock and cost recovery.

(Emphasis his).

Saupe also relies on certain portions of the commentary of the Committee on Resources of the Alaska Constitutional Convention. The first concerns the common use clause:

Game fish, wildlife, fisheries, and water are recognized as belonging to the state so long as in a natural state. These resources are subject to a private right only when they have been acquired or utilized as provided by law. (emphasis his).

Saupe asserts that this passage indicates the framers' belief that fish reserved for common use "belonged" to the state. Because hatchery fish are reserved for common use by AS 16.10.440 (a), Saupe reasons that they must be owned by the state and be subject to the sustained yield principle.

The second commentary is the sustained yield clause itself:

Sustained yield is recognized as a principle applicable to the administration of plant and animal life subject to the immediate authority of the state. (emphasis his).

Because hatchery fish are subject to the authority of the state by AS 16.10.440(a), Saupe reasons, they are subject to the sustained yield clause.

This conclusion, he asserts, "also comports with common sense" because

[i]f they did not belong to the State, it could not reserve hatchery fish for use by others without paying for them. Moreover, if the mere expectation that a hatchery will later be allowed to harvest some unidentified fraction of the returning fish constitutes an ownership interest in all of its fish, then every other limited entry permit holder could be said to have the same "lingering property interest," leading to the false conclusion that none of the fish in Alaska's waters ever belong to the State or are subject to the sustained yield principle of management.

A more reasonable interpretation of these related statutory and constitutional provisions is that, once released, hatchery fish become like wild stocks in every legal respect. They belong to the state, are reserved to the people for common use and must be managed for sustained yield. . .

Saupe, pp. 10-11.

However, even if the state "owns" the hatchery fish, it does not automatically follow that the state must manage those fish on a sustained yield basis. As George Utermohle notes, the drafters of our constitution chose to make sustained yield requirement subject to "beneficial uses". The commentary on Article VIII, Natural Resources, at page 98, states:

This principle [sustained yield] is qualified in terms of "the highest beneficial public use" in recognition of its not being in the public interest to preserve certain parasitic or predatory organisms destructive of more beneficial plant and animal life.

And, during the debate on the sustained yield clause, Delegate Riley explained:

. . . we have in mind no narrow definition of "sustained yield," as is used for example, in forestry, but the broad premise that insofar as possible a principle of sustained yield shall be used with respect to administration of those resources which are susceptible of sustained yield, and where it is desirable. For example, predators would not be maintained on a sustained yield basis. (Alaska Constitutional Convention Proceedings, p. 2451.)

Utermohle argues that:

The delegates understood that the concept of preferences among beneficial uses would allow the state to make reasoned decisions to prefer certain renewable resources over other renewable resources to achieve a more beneficial public purpose. The authority to establish preference among beneficial uses may permit the state to harvest hatchery fish without providing for a sustained yield from the hatchery, provided that those who have vested rights in hatchery fish are compensated for those rights that are taken by the state.

The ability of the state to establish preferences among beneficial users is reflected in AS 16.10.430(b) which allows the commissioner of Fish and Game to terminate the operation of a hatchery in the best interests of the public, if the adverse effects of the operation of the hatchery are irreversible and cannot be mitigated. (Utermohle memo, pp. 3-4.)

Saupe, on the other hand, argues that AS 16.10.430(b) is not merely a reflection of the state's ability to establish preferences among beneficial uses but is in fact the only basis upon which a hatchery permit may be terminated. He also argues that the contribution made by PWSAC to the growth of the commercial fishing industry in Alaska demonstrates its beneficial use to the state, and that "short of the extreme situation envisioned by AS

14.10.430(b) it is hard to conceive how denial of a reasonable hatchery harvest in favor of other beneficial uses could achieve a greater public purpose." Saupe memo, p. 14.

It is unfortunate that our supreme court has never defined "sustained yield," much less taken up the question whether hatchery raised fish must be managed on that principle. Suffice to say that knowledgeable people disagree on this issue and it would probably take a constitutional amendment to guarantee an unassailable legal conclusion one way or the other.

No one would seriously argue that the preservation of wild stocks is not a "beneficial use" of the fishery resource, and there apparently is a concern that managing hatchery fish for broodstock and cost recovery may, in some instances, be harmful to that beneficial use. The difficulty with such a conclusion is that it probably raises more questions than it answers. How significant must the harm be? Can it be clearly substantiated? Is not the continued health and development of hatchery raised fish also a "beneficial use" of the resource?

As the above arguments, conclusions and questions demonstrate, there is no clear answer to the question whether there is a constitutional mandate that hatchery fish be managed on a sustained yield basis. That is not to say, however, that the legislature should not exercise its constitutional law making authority in this area. As Chairman Martin's letter makes clear, the Board of Fisheries is struggling with statutory ambiguities, and the board is obviously looking for legislative action.

Allocating for Broodstock and Cost Recovery

As noted earlier, assistant attorney general Steve White concluded that the board and the department are authorized and directed by law to allocate fishery resources for broodstock. He also concluded that the board has the authority, but is not required, to manage for cost recovery. White memo., p. 7. Going a step further, Mr. Saupe reached the conclusion that the board and the department must manage for both broodstock and cost recovery. Saupe memo., p. 16. In reaching their conclusions, White and Saupe both rely on the notion that hatchery fish must be managed on the principle of sustained yield, discussed above, and on the a number of statutes and court decisions which point to legislative approval for such activity.

As noted above, the board is to provide for "the conservation and development of of the fishery resources of the state." AS 16.05.221(a). The Alaska Supreme Court, in Kenai Peninsula Fishermens Coop Ass'n v. State, 628 P. 2d 897, 903 (Alaska 1981), defined "conservation" as "controlled utilization of a resource to prevent its exploitation, destruction or neglect." Steven White argues that, since managing for broodstock helps to perpetuate the fishery resource (i.e., prevents its "exploitation, destruction or neglect"), managing for broodstock is analogous to managing for escapement of wild fish. Therefore, the board has the power to adopt regulations that will provide for hatchery broodstock. White memo., p. 2.

Saupe argues that, in addition to the constitutional mandates, managing for broodstock is required by AS 16.10.443, which states:

Department assistance and cooperation. (a) Before and after permit issuance under AS 16.10.440 - 16.10.470, the department shall make every effort, within the limits of time and resources, to advise and assist applicants or permit holders, as appropriate, in the planning, construction, or operation of salmon hatcheries.

Saupe concludes that, because broodstock recovery is essential to hatchery operations, and the department is required to assist in hatchery operations, any regulation or action of the department that denies broodstock recovery would be invalid as inconsistent with the above-quoted statute. Saupe memo., p. 15.

Whether the board has the authority to manage for cost recovery is less clear than it is for broodstock. The board does have the authority to allocate fish to various user groups.⁹ However, private nonprofit hatcheries are not specifically designated in law as a user group. Nevertheless, Steve White has concluded that private nonprofit hatcheries could be considered a "subgroup" of commercial users. Because the Alaska Supreme Court has upheld the board's power to allocate among subgroups (e.g., drift gillnetters and set gillnetters),¹⁰ White concludes that the board could make a valid allocation to hatchery operators as a "subgroup."¹¹

Michael Stanley, on the other hand, argues that the statutory definition of "commercial fishing" leads to a different conclusion. AS 16.05.940(5) states:

the taking, fishing for, or possession of fish, shellfish, or other fishery resources with the intent of disposing of them for profit, or by sale, barter, trade, or in commercial channels . . .

Stanley asserts that hatchery operators do not sell cost recovery fish "for profit." He does acknowledge that cost recovery sales may be "in commercial channels," but argues that a reading of that phrase broad enough to include hatchery operators would also have to include other users, such as salmon derby operators. The inference he makes is that the legislature did not intend hatchery operators to be included in either definition, and therefore hatchery operators cannot be allocated to as a subgroup. Stanley also points to the statutory definition of "commercial fisherman," AS 16.10.940 (5), which states that they are "individuals," meaning natural persons and not corporations.

Saupe, on the other hand, argues that cost recovery is essential to sustain hatchery yields and to promote aquaculture, two requirements of the state constitution.¹² He also points to a number of statutes which he believes evince a legislative mandate for cost recovery. Principal among these is AS 16.10.450 (a), which provides:

⁹/See AS 16.05.251(e).

¹⁰/Meier v. State, 739 P.2d 172, 174 (Alaska 1987)

¹¹/White op., p. 3.

¹²/Along with the sustained yield requirement already discussed, Saupe relies on art. VIII, sec. 15, which states:

No Exclusive Right of Fishery. No exclusive right or special privilege of fishery shall be created or authorized in the natural waters of the State. This section does not restrict the power of the state to limit entry into any fishery for the purposes of resource conservation, to prevent economic distress among fishermen and those dependent upon them for a livelihood and to promote the efficient development of aquaculture in the State. (emphasis added).

Sale of salmon and salmon eggs by hatchery. (a) Except as otherwise provided in a contract for the operation of a hatchery under AS 16.10.480, a hatchery operator who sells salmon returning from the natural waters of the state, or sells salmon eggs to another hatchery operating under AS 16.10.400 - 16.10.470, after utilizing the funds for reasonable operating costs, including debt retirement, expanding its facilities, salmon rehabilitation projects, fisheries research, or costs of operating the qualified regional association for the area in which the hatchery is located, shall expend the remaining funds on other fisheries activities of the qualified regional association.

Also cited by Saupe as evidence of the legislature's mandate for cost recovery: AS 16.43.420 (Limited Entry Act provision allowing sale of fish caught under special harvest area entry permit); AS 16.10.430 (b) (allowing a holder of a terminated hatchery permit to harvest salmon during the termination period); AS 16.05.020 (requiring the commissioner of Fish & Game to "improve and extend" the fish resources of the state in the interest of the state's economy and general well-being).

Restricting Hatchery Output

The Saupe memorandum also discusses the authority of the board to restrict individual hatchery output. Based in part on Linda Snow's legislative history memorandum, and in part on a review of the board's authorizing statute, Saupe concluded that there is "little or no basis for regulation of hatchery output by the board." Saupe memo., p. 28. He asserts that AS 16.10.440 (b), which allows the board to amend the terms of a hatchery permit,¹³ speaks only to regulation of harvest, not production. Saupe memo., p. 30.

As to whether the board can set regional production limits, such as by capping the hatchery sockeye output in Prince William Sound to maintain historical levels relative to Bristol Bay sockeye production, Saupe is not as sure. However, he does suggest that the board's authority to regulate propagation and stocking¹⁴ is a "very slender thread from which to hang an unprecedented, statewide regulatory program of production allocations." He also asserts that serious practical and policy problems would arise when the board attempts to allocate between regions of the state.¹⁵

¹³/AS 16.10.440(b) allows the board to amend "the terms of the permit relating to the source and number of salmon eggs, the harvest of fish by hatchery operators, and the specific locations designated by the department for harvest."

¹⁴/AS 16.05.251(7)

¹⁵/Saupe memo., p. 31-32.

CONCLUSIONS

This chapter illustrates some of the ambiguities in Alaska law relating to the authority of the Board of Fisheries to manage hatchery fish and leads to several conclusions:

1. There is no specific statutory mandate directing the board to give wild stocks preferential management treatment relative to hatchery raised fish.
2. The Alaska Constitution may require that hatchery fish be managed to allow for broodstock and cost recovery by the hatcheries, but that requirement may be invalidated by a determination that the sustained yield of hatchery fish is not as "beneficial" a "use" of the fishery resource as that of protecting the health of the wild stocks.
3. Existing statutes appear to allow the board to allocate to hatcheries fish for broodstock, but are less clear as to the authority for cost recovery.
4. Existing statutes are not clear on the board's authority to restrict hatchery production on a local or regional basis.

OPTIONS FOR POSSIBLE CONSIDERATION

- *Placing a wild stock priority into state statutes; or alternatively, making the status of wild and hatchery stocks of equal priority, or leaving the statutes ambiguous.*
- *Clarifying in state statutes whether or not the Board of Fisheries is required to provide for hatchery broodstock or for cost-recovery fisheries.*
- *Clarifying the Board of Fisheries' authority to restrict hatchery production.*

Attachments
to Chapter II.

LETTER FROM
BD. OF FISHERIES

May 6, 1991

The Honorable Richard Eliason
President
Alaska State Senate
P.O. Box V
Juneau, AK 99811

Dear President Eliason:

This letter is in response to a request by the Senate Resources Committee and the Special Senate Fisheries Committee when Board of Fisheries members appeared before the committee in March. We appreciated the opportunity to sit down with the committee and discuss items which will improve the board's ability to serve the people of Alaska.

In managing fisheries that involve hatchery raised salmon, the Board of Fisheries has encountered problems due to ambiguities in the current Alaska statutes. These problems commonly arise when the management of hatchery stocks conflicts with either the health of wild stocks or with the opportunity of fishermen to harvest wild stocks. Essentially, the statutes are not clear on the status of wild stock management.

State statutes also are not clear about the state's duty to provide fish for hatchery broodstock and cost recovery, and about the hatcheries' obligations to contribute to the common property fisheries. We perceive that the development of state policy toward hatcheries may have created a conflict of interest. On one hand, the state manages fisheries as a common property resource for the benefit of all user groups. On the other hand, the state loans money to hatcheries with the expectation that the hatcheries will receive enough fish to be able to repay these loans.

The board has the following comments on the existing statutes:

1. AS 16.10.375 Regional Salmon Plan. Should new language require a review or synthesis of the regional plans to give a statewide perspective on hatchery production?

President Richard Eliason
May 6, 1991
Page Two

2. AS 16.10.380 Regional Associations. One of the great strengths of the regional associations is the representation of all user groups on their boards of director. However, the PNP's have no such requirement. Should all hatcheries and enhancement activities in a region be under the control of the regional associations?

Should state laws apply to all hatcheries and enhancement activities in Alaska and not just private non-profit hatcheries? Other activities that might be covered include state-owned hatcheries, regional hatcheries, and the U.S. Fish and Wildlife Service, the U.S. Forest Service, and the National Marine Fisheries Service. Should all these activities be included in the Regional Comprehensive Plan?

Should the role of the regional associations be to coordinate region wide production and allocation subject to biological review by the Regional Planning Team and allocative review by the Board of Fisheries?

Given an expanded role for the regional associations, should their means and levels of funding be re-examined by the legislature?

3. AS 16.10.400 Permits for Salmon Hatcheries. The legislature should re-examine (g) of this section: "During the development of a comprehensive plan for a region no permit may be issued for a hatchery unless the commissioner determines that such an action would result in substantial public benefits and would not jeopardize natural stocks."

The first ten words of this section, "During. . . region . . .", suggest that once the plan is completed, the prohibited actions could be allowed. Perhaps this wording should be deleted. Also, we believe that there should be more specific grounds and procedures for terminating hatchery permits after they have been issued.

President Richard Eliason
May 6, 1991
Page Three

Legislators should note that 5 AAC 40.860 provides generic standards for performance review of hatchery success in producing smolt from broodstock. There are no statutory standards, however, for performance review of hatchery contribution to common property fisheries. If a hatchery cannot demonstrate that it is providing "substantial public benefit", is the state required to continue to provide for returns to the hatchery for broodstock or cost recovery purposes?

In this subsection, "substantial public benefit" is not clearly defined. The board recommends that the legislature consider linking the number of eggs taken as broodstock or the number of smolt released by a hatchery to that hatchery's required contribution to the common property fisheries.

The board may contribute to clarifying "substantial public benefit" by requiring the marking of hatchery fish. While we believe that the board has the authority to require this, it would be helpful to have this authority specifically provided by statute. Should the cost of implementing a marking program be borne by the producers of hatchery fish or by the state?

The last five words of this subsection, ". . . would not jeopardize natural stocks", is one of only two places (the other is AS 16.10.420(10)) which declares that it is the legislature's intent that the conduct of the entire state hatchery system is conditional on the protection of natural stocks. Perhaps because our hatcheries have flourished over time, and given some of the intense debate occurring in Oregon, Washington and Canada on how hatchery stocks have impacted natural systems, it is especially timely for the legislature to review the treatment natural stocks receive.

4. The necessity of protecting Alaska's vigorous natural stock populations is recognized by Department of Fish and Game regulations and policies. The regulations are in 5 AAC 40. For example, some of the strongest language exists in 5 AAC 40.220(b)(1), "the proposed hatchery returns may not unreasonably or adversely affect management of natural stocks. . .". Additional language exists in 5 AAC 40.005(a), (c), and (e), 5 AAC 40.007(b), 5 AAC 40.170 (2), 5 AAC 40.220 (b)(1), (3) and (7), and 5 AAC 40.860 (b)(2) and (4). As this issue of natural stock protection is examined by the legislature, the board recommends that the legislature seek input from the Commissioner of the Department of Fish and Game.

President Richard Eliason
May 6, 1991
Page Four

5. The legislature may wish to further clarify their intent in additional and more concise definitions of terms used in Title 16. For example, the following terms should be clarified: "escapement", "brood stock", "cost recovery", "substantial public benefit", and "private non-profit."

Should escapement apply strictly to natural stocks returning to natural systems?

Should broodstock be defined as the number of eggs authorized by permit to meet the production levels of the hatchery and to contribute to the common property fisheries? Some wording to this effect would be valuable in light of AS 16.10.420 and AS 16.10.450 which allow for the sale of salmon and salmon eggs for cost recovery. Fish which return to the hatchery for broodstock should be differentiated from fish which return and may be taken for cost recovery.

Does the legislature wish to rank or prioritize escapement to natural systems compared to return of broodstock to hatcheries?

"Cost recovery" is another term which warrants some further clarification. However, a clear definition of broodstock, coupled with a definition of substantial public benefits in terms of what is contributed to common property fisheries from broodstock, would provide a de facto identification of fish available for cost recovery as long as identification of hatchery stocks can be achieved.

These concerns of the Board of Fisheries are presented for your consideration. Your interest, and past support, in these resource issues has been greatly appreciated.

Should you have further questions, please feel free to call me.

Sincerely,

Michael R. Martin
Chair
Alaska Board of Fisheries

cc: Board of Fisheries members
Carl Rosier, Commissioner, ADF&G

MEMORANDUM

State of Alaska
Department of Law

TO: Hon. Don W. Collinsworth
Commissioner
Department of Fish and Game

DATE August 1, 1990

FILE NO 663-90-0327

TEL NO 465-3600

SUBJECT ADF&G authority to manage
fisheries for hatchery
broodstock and cost
recovery

Stephen M. White

FROM: Stephen M. White
Assistant Attorney General
Natural Resources Section

You have asked whether the Department of Fish and Game has legal authority to manage fisheries so that salmon hatcheries receive broodstock and cost recovery fish for their operations. You also asked whether the department is required to manage fisheries for these results. Your staff has also asked us to compare the department's authority with that of the Board of Fisheries.

I. ANALYSIS

A. Factual and Legal Background

There are two types of salmon hatcheries in Alaska. These are private, nonprofit hatcheries and state-owned hatcheries.

The regulation of private, nonprofit hatcheries is provided for in AS 16.10.400 - 16.10.470. These hatcheries have received a significant amount of public funds, principally in the form of loans from the state's fisheries enhancement revolving loan fund established by AS 16.10.507. 1/ Until fish raised by private, nonprofit hatcheries return to a location where they can be harvested by the hatchery operators, these fish "are available to the people for common use and are subject to regulation under applicable law in the same way as fish occurring in their natural state." AS 16.10.440(a).

The only law that deals with state-owned hatcheries is the one that gives the commissioner of the Department of Fish and Game authority to design and construct public hatcheries. AS 16.05.050(3).

1/ According to the Department of Commerce and Economic Development, the current amount owed to the state by private, nonprofit hatcheries is approximately \$63.1 million.

B. Board of Fisheries' Authority to Manage for Hatchery Returns

1. Board's authority to manage for broodstock fish

The Board of Fisheries was created "for purposes of the conservation and development of the fishery resources of the state." AS 16.05.221(a) (emphasis added). The board has authority to "adopt regulations it considers advisable in accordance with the Administrative Procedure Act (AS 44.62) for . . . regulating commercial, sport, subsistence, and personal use fishing as needed for the conservation, development, and utilization of fisheries." AS 16.05.251(a)(12) (emphasis added).

The Alaska Supreme Court has defined "conservation" as "controlled utilization of a resource to prevent its exploitation, destruction, or neglect." Kenai Peninsula Fisherman's Coop. Ass'n v. State, 628 P.2d 897, 903 (Alaska 1981). We believe that the board's authority to conserve the fishery resource of the state, that is, to prevent its "exploitation, destruction, or neglect," is an expression of the constitutional requirement that fish be "utilized, developed, and maintained on the sustained yield principle." Alaska Const. art. VIII, § 4.

We understand that the term "broodstock" means the portion of returning fish that a hatchery uses to provide eggs for raising its next contribution to the common-property fishery. Because broodstock helps to perpetuate the fishery resource, we believe that managing for broodstock is analogous to managing for escapement of wild fish to achieve sustained yield. It follows, therefore, that the Board of Fisheries is empowered to adopt regulations that will provide brood stock to the hatcheries. Furthermore, because management for sustained yield is required by article VIII, section 4, of the Alaska Constitution, we believe that the law directs the board to manage for this result.

2. The Board's Authority to Manage for Cost Recovery Fish

We understand that "cost recovery fish" are the portion of returning fish that a private, nonprofit hatchery harvests and sells to help meet its financial obligations. We also understand that state-owned hatcheries do not presently harvest fish for cost

Hon. Don W. Collinsworth, Commissioner
Department of Fish and Game
AGO file: 663-90-0327

August 1, 1990
Page 3

recovery. Thus, the question of managing fish for cost recovery concerns only private, nonprofit hatcheries. 2/

As noted above, the Board of Fisheries has authority to adopt regulations for development as well as for conservation of the fisheries. AS 16.05.221(a); AS 16.05.251(a)(12). The Alaska Supreme Court has defined "development" as "management of a resource to make it available for use." Kenai Peninsula, 628 P.2d at 903.

We have previously advised that this authority empowers the board to allocate fish that are beyond those needed to assure sustained yield. This power is established by AS 16.05.251(d), which mandates that the board provide "a fair and reasonable opportunity for the taking of fishery resources" by fishery user groups and by AS 16.05.251(e), which requires that the board adopt criteria for making allocations among these groups. 1990 Inf. Op. Att'y Gen. (Jan. 12; 663-90-0227); 1989 Inf. Op. Att'y Gen. (Apr. 7; 663-89-0465).

The courts have endorsed various forms of allocation. These have included allocations between the various overall user groups identified in the fish and game code -- personal use, sport, and commercial fishers. For example, in the Kenai Peninsula case, the Alaska Supreme Court said that the board could establish priorities of use between recreational and commercial fishers. Kenai Peninsula, 628 P.2d at 903. In other cases, the courts have upheld regulations that allocate harvest between competing subgroups of a particular user group. For example, the court upheld the board's allocation of fish between drift gillnet fishers and set gillnet fishers, both of whom are commercial users. Meier v. State, 739 P.2d 172, 174 (Alaska 1987).

Private, nonprofit hatcheries are not identified in the law as an overall user group. Nevertheless, we know of no reason why they could not be considered a subgroup of commercial users and thus be targeted for allocations like any other distinct subgroup of commercial harvesters.

The law establishes seven criteria that the board may consider when making allocations. AS 16.05.251(e). See also 05 AAC 39.205, 05 AAC 75.017, and 05 AAC 77.007. We have

2/ If state-owned hatcheries, operated by the state or by private contractors, harvest cost-recovery fish, this would raise issues that are beyond the scope of this memorandum. In that event, we would be pleased to provide you with further analyses of those issues.

Hon. Don W. Collinsworth, Commissioner
Department of Fish and Game
AGO file: 663-90-0327

August 1, 1990
Page 4

previously noted that the board is not limited to just these factors. We cautioned, however, that if the board considers additional factors, it should insure that the resulting allocation satisfies constitutional requirements of substantive due process and of equal protection. 1990 Inf. Op. Att'y Gen. (Jan. 12; 663-90-0227). 3/

To satisfy substantive due process, an allocation cannot be arbitrary and it must further a legitimate governmental purpose. Mobile Oil Corp. v. Local Boundary Comm'n, 518 P.2d 92 (Alaska 1974). To satisfy equal protection, a distinction between competing users must be "based on a legitimate public purpose and . . . be reasonable, not arbitrary, and . . . rest upon some ground of difference having a fair and substantial relation to the object of the [allocation scheme]." State v. Ostrovsky, 667 P.2d 1184, 1193 (Alaska 1983) (citation omitted).

Earlier we noted that private, nonprofit hatcheries have received substantial loans from the state. We assume that cost recovery fish are a significant, if not essential, source of income for meeting these hatcheries' debt service. If the borrowers do not receive sufficient cost recovery fish, it may not only threaten their ability to contribute to the common-property fishery, but also their ability to repay state loans. Accordingly, we believe that preventing the economic failure of borrower hatcheries would certainly be a "legitimate government purpose."

We also believe that distinguishing between private, nonprofit hatcheries, who make a direct contribution to sustained yield, and other users who do not make such a contribution bears a "fair and substantial relationship" to the goals of sustaining common-property fisheries and replenishing the loan fund. Thus, we believe that an allocation to provide cost recovery fish would satisfy the requirements of substantive due process and equal protection.

We note, however, that none of the present criteria in AS 16.05.251(a) precisely describe the positive attributes of hatcheries. Factors (5) (economic importance) and (6) (regional importance) could, under narrow circumstances, justify an

3/ We also opined that allocations must satisfy the provisions of article VIII of the Alaska Constitution. Specifically, these are section 1 (maximum use), section 2 (maximum benefit), section 3 (common use), section 15 (no exclusive right of fishing), and section 17 (equal application). 1990 Inf. Op. Att'y Gen. (Jan. 12; 663-90-0227). We do not believe that an allocation for cost-recovery would violate any of these sections.

Hon. Don W. Collinsworth, Commissioner
Department of Fish and Game
AGO file: 663-90-0327

August 1, 1990
Page 5

allocation that provides for cost recovery. 4/ Although the board is not limited to using these criteria, they still affect the public and implement a legislative mandate. Thus, any unlisted criteria that the board wishes to use should be adopted by regulation. See Kenai Peninsula, 628 P.2d at 905, 906. In other words, if the board intends to allocate for cost recovery, it should adopt by regulation criteria that more closely describe the special attributes of private, nonprofit hatcheries.

The board's authority to allocate for cost recovery, then, is based upon characterizing private, nonprofit hatcheries as another type of commercial subgroup. But, there is nothing in the law that requires the board to allocate to a particular group or subgroup. Accordingly, we do not believe that the board is required by law to allocate cost recovery fish to this subgroup.

C. Department's Authority to Manage for Hatchery Returns

1. Department's authority to manage for broodstock

The commissioner of the Department of Fish and Game has limited tools for managing commercial fisheries independently of the board. This authority is contained in AS 16.05.060(a). It allows the commissioner to use emergency orders "when the circumstances require" to summarily open and close seasons or areas or to summarily change weekly closed periods.

The law does not define what circumstances will enable the commissioner to use his or her emergency order power. However, we have previously advised that in light of the commissioner's statutory charge to "manage, protect, maintain, improve, and extend the fish . . . resources of the state," emergency orders can be issued to protect sustained yield, based on conservation concerns. AS 16.05.020(2); 1989 Inf. Op. Att'y Gen. (Apr. 7; 663-89-0465).

Earlier we recognized an analogy between managing escapement of wild stocks for conservation/sustained yield and managing for hatchery broodstock in order to serve the same purposes. Thus, we believe that the department, acting through the commissioner's power to issue emergency orders, can independently

4/ For example, if (1) a certain fishery were an important segment of an economy, (2) a hatchery made a critical contribution to the perpetuation of this fishery, and (3) the hatchery could not survive to make this contribution without an allocation of cost-recovery fish, the board could conclude that the allocation would be very important to that economy.

manage fisheries to provide broodstock to hatcheries. In the same way that the Alaska Constitution directs the Board of Fisheries to manage for the return of broodstock, we believe that the law also directs the department to manage for the same result.

2. Department's authority to manage for cost recovery fish

The law is not clear on the question of whether the department, through the commissioner's emergency order power, is authorized to independently manage fisheries for cost recovery fish. It is also not clear whether it is required to do so.

On one hand, it can be argued that the commissioner's statutory charge in AS 16.05.020(2) to "maintain and improve" the resource authorizes actions that will enable private, nonprofit hatcheries to survive. Unless they are able to meet financial obligations, hatcheries will not be able to raise broodstock, and thereby not be able to contribute to the "maintenance and improvement" of the resource. It can also be argued that it is unlikely that the legislature would have created a program for financing the hatcheries and yet not intended for fisheries to be managed so that these hatcheries could pay back their loans and contribute to the fishery resource.

On the other hand, cost recovery fish, unlike broodstock fish, do not directly contribute to the perpetuation of the resource. They are sold to meet economic needs of a user subgroup. Thus, they can be likened to fish that exceed the amount needed for sustained yield and are thus available for allocation among various users.

In the past, we have opined that the commissioner probably cannot allocate fish through his or her emergency order power. Only the board can allocate fish among competing fisheries or user groups. 1990 Inf. Op. Att'y Gen. (Jan. 12; 663-90-0227); 1989 Inf. Op. Att'y Gen. (Apr. 7; 663-89-0465). According to this argument, the department could not independently manage fish for cost recovery because it is not authorized to allocate fish among users. 5/

5/ Although it is not clear whether the department, independent of the board, is authorized or required to allocate fish for cost recovery, we note that there are several ways that the department, in conjunction with the board, could manage for this purpose. First, under AS 16.05.270 the board could delegate to the department its own authority to allocate for certain fisheries. Next,
(continued...)

Hon. Don W. Collinsworth, Commissioner
Department of Fish and Game
AGO file: 663-90-0327

August 1, 1990
Page 7

The arguments on both sides of this question depend upon implication and analogy. The law does not clearly point to one answer or the other. Although we believe we could defend an emergency order that was issued to provide cost recovery fish, we hesitate to predict the outcome of any challenge. Accordingly, if the department wishes to independently manage for cost recovery fish, we recommend that it seek clear authority from the legislature to do so.

II. CONCLUSION

The Board of Fisheries and the Department of Fish and Game are authorized, and in fact are directed, to manage fisheries so that broodstock returns to hatcheries. The board can manage through its power to adopt regulations and the commissioner, when he or she acts independently of the board, can manage through the power to issue emergency orders. The authority of both is based upon statutory provisions for managing for conservation and on constitutional mandates for managing for sustained yield.

The board has the statutory authority to manage fisheries so that cost recovery fish return to a private, nonprofit hatchery. However, it is not clear that the present allocation criteria recognize the special attributes of hatcheries. If the board adopts such criteria, the board's regulatory authority to manage for cost recovery would be clear as well. On the other hand, there is no basis to conclude that the board is required to allocate fish for this purpose.

Absent the board's delegation of allocation authority to the department, it is not clear that the latter is authorized or required to independently manage for cost recovery, even by emergency order. Although we believe we could defend such an action, we could not predict the outcome of such suit. Therefore, we recommend that the department seek legislation that more clearly establishes this power.

We hope this answers your questions. Please do not hesitate to contact us if we can be of further help.

SMW:tg

5/ (...continued)

the board could by regulation direct the department to manage a particular fishery for this purpose. Examples of this are in 5 AAC 24.365 and 5 AAC 24.366. Finally, the board could by regulation establish an allocation framework that the department could implement through emergency orders.

8
Hon. Don W. Collinsworth, Commissioner
Department of Fish and Game
AGO file: 663-90-0327

August 1, 1990
Page 8

cc: Bonnie Harris, Assistant Attorney General
Anchorage

8

MICHAEL A. D. STANLEY

OFFICE 130 SEWARD STREET, SUITE 413
MAILING PO BOX 020449, JUNEAU, ALASKA 99802

ATTORNEY AT LAW

PHONE (907) 586-5077
FAX (907) 463-2111

DATE: February 28, 1991

TO: Kate Troll, Executive Director
Southeast Alaska Seiners

FROM: Michael A. D. Stanley *MS*

SUBJ: Department of Law Opinion Re Management Of Fisheries
For Hatchery Broodstock And Cost Recovery

You have asked me to review an opinion authored by Assistant Attorney General Stephen White, dated August 1, 1990, concerning the legal authority of the Board of Fisheries ("Board") and the Alaska Department of Fish and Game ("ADF&G") to manage fisheries for return of hatchery broodstock and cost recovery.

This memo is not intended as a lengthy analysis of Mr. White's conclusions or the issues presented, but is instead meant to identify questions raised by his opinion.

Briefly stated, White's conclusions are as follows:

1. The Board has the authority and, under article VIII, section 4 of the Alaska Constitution (the sustained yield clause), the obligation to manage fisheries to provide broodstock to hatcheries.
2. The Board has the authority to allocate fish to nonprofit hatcheries for cost recovery, as a subgroup of commercial users.
3. Like the Board, ADF&G has the authority and the obligation to use its management powers -- i.e., its emergency order authority -- to assure return of broodstock to hatcheries.
4. ADF&G does not have clear authority to use its emergency order authority to manage for cost recovery, which is a form of allocation among competing users, but could achieve such result
 - a. by working in conjunction with the Board (e.g., receiving a delegation of the Board's authority or implementing a Board regulation requiring such allocation), or
 - b. by seeking legislation that clearly establishes such power.

DISCUSSION

The difficulty I have with Mr. White's opinion is not so much what he says, but what he doesn't say; that is, assumptions or legal inferences that are implicitly made but not discussed. Once these are understood, it can be seen that his conclusions regarding the Board's and ADF&G's authority to manage for broodstock and cost recovery are subject to some question.

1. Are Hatchery Stocks Subject To Article VIII?

White's memo is premised on the assumption that hatchery fish are necessarily subject to the provisions of article VIII of the Alaska Constitution. This leads him, among other things, to conclude that the Board and ADF&G are required to manage fisheries for return of hatchery broodstock, just the same as they are required to manage for escapement of wild stocks. I believe there is reason to question this assumption.

Article VIII does not use a single term for what it covers, but all seem to have a similar meaning: "natural" resources, resources in their "natural state," and "replenishable resources belonging to the state." The question is, do these terms encompass man-made hatchery fish? Put another way, does the state "own" hatchery fish in the same way as it "owns" wild fish and game. If the answer to that question is no, then it may well be that hatchery fish are not subject to the requirements of article VIII at all.

I have not studied this "ownership" question for hatchery stocks at length, but I have run across items that suggest they might be different from wild stocks. For instance, in the commentary on what became section 3 of article VIII (the common use clause), the framers indicate that it "does not apply to the domestication of fur-bearing animals or other animals subject to intensive culture, to fish in private ponds, or to registered trap lines if authorized by law." Commentary on Article on State Lands and Natural Resources, January 16, 1956, Alaska Constitutional Convention Proceedings, Part 6, Appendix V, p. 98 (emphasis mine). Although the examples mentioned do not include hatchery fish, a common thread is creatures which man plays a substantial role in propagating.

Further, it could be argued that the legislature itself, when it passed the statutes authorizing private nonprofit hatcheries, did not view hatchery fish as subject to article VIII. As White points out, AS 16.10.440(a) provides that hatchery fish are "available for common use and are subject to regulation under applicable law in the same way as fish occurring in their natural state." However, this legislation would not have been necessary if hatchery fish were already believed to be subject to article VIII. The very fact that

AS 16.10.440 was enacted suggests that, in a constitutional sense, hatchery fish may be different from wild stocks.

Similarly, the sustained yield clause surely prohibits the Board or ADF&G from extinguishing a wild run. Yet, under certain circumstances hatchery permits may be revoked and production stopped. AS 16.10.430. Assuming hatchery fish were subject to section 4's command to sustain production, wouldn't terminating operation of a hatchery likewise be a constitutional violation? The answer may be that section 4 does not apply to hatchery fish.

The point simply is, White's conclusion that the Board and ADF&G are constitutionally mandated to manage for broodstock, just as they are required to manage for escapement of wild stocks, is subject to some question or, at the least, further analysis.

2. Are Nonprofit Hatcheries Engaged In Commercial Fishing?

In concluding that the Board can allocate fish to private nonprofit hatcheries for cost recovery, White states that "we know of no reason why they could not be considered a subgroup of commercial users and thus be targeted for allocations like any other distinct subgroup of commercial users." He conspicuously fails to refer to the definition of "commercial fishing" in articulating this premise. "Commercial fishing" is defined in AS 16.05.940(5) as

the taking, fishing for, or possession of fish, shellfish, or other fishery resources with the intent of disposing of them for profit, or by sale, barter, trade, or in commercial channels...

Nonprofit hatcheries do not take cost recovery fish "for profit." Are such fish nonetheless taken "with the intent" of disposing of them "by sale...or in commercial channels?" Although it could be argued that they are, that leads to a fairly expansive definition of commercial fishing. Salmon derbies possess fish with the intent of selling them; are they engaged in commercial fishing, too? Could the Board make an allocation to a fishing derby as subgroup of commercial users? At some point such an interpretation of "commercial fishing" becomes rather strained.

The definition of "commercial fisherman" in AS 16.10.940(4) may also provide guidance. That term is defined in terms of an "individual" -- i.e., a natural person -- and would not appear to include a nonprofit corporation.

Thus, there is a question whether nonprofit hatcheries are indeed engaged in "commercial fishing." If not, then White's conclusion that they may be the recipients of an allocation is undermined.

3. May Nonprofit Hatcheries Receive An Allocation?

The conclusion that the Board can allocate hatchery fish to a hatchery for cost recovery is, as White's memo states, "based upon characterizing private, nonprofit hatcheries as another type of commercial subgroup." I discussed above my doubts that hatcheries can really be said to be engaged in "commercial fishing."

There is another basis for questioning whether hatchery fish can be the subject of a specific allocation to a hatchery. AS 16.10.440(a) provides that hatchery fish are subject to regulation in the same manner as wild stocks "until they return to the specific location designated by the department for harvest by the hatchery operator." This suggests two things: (1) it is the department, not the Board, which is responsible for "allocating" hatchery fish to a hatchery through designation of special harvest areas, and (2) such allocation occurs only after those fish have traversed the common property fisheries and returned to the specific location designated for hatchery harvest. This statutory scheme is circumvented if the Board takes it upon itself to make an allocation to a hatchery prior to those fish returning to the designated area, while they are still in the common property fisheries.

Similarly, the statute which governs allocation of fisheries resources -- AS 16.05.251(e) -- does not really square with the idea of an allocation to a hatchery. The various factors which may be considered as allocation criteria are all tied to the term "fishery." But the definition of "fishery" in AS 16.05.940(12) does not include a hatchery. This suggests that a hatchery was never intended as the recipient of an allocation by the Board under AS 16.05.251(e).

Thus, the structure of applicable legislation suggests that hatchery operators may receive an allocation only through the procedures set forth in AS 16.10.440 (after leaving the common property fishery and in an area designated by ADF&G) and not from the Board pursuant to AS 16.05.251(e).

I must emphasize that the foregoing -- especially the discussion of the constitutional issue -- are not intended as definitive legal advice on whether the Board or ADF&G have the authority and/or the obligation to manage fisheries in order to assure the return of broodstock to nonprofit hatcheries or to provide for cost recovery. More analysis remains to be done. But I do think that this points up some significant problems with the Department of Law's opinion.

DIVISION OF LEGAL SERVICES

LEGISLATIVE AFFAIRS AGENCY STATE OF ALASKA

P.O. Box Y, Juneau, Alaska 99811
(907) 465-3867 or 465-2450
FAX (907) 465-2029

Deliveries to: 240 Main Street
Court Plaza, Room 500
Mail Stop 3101

MEMORANDUM

April 8, 1991

SUBJECT: Sustained Yield Management of Salmon Produced by Private Nonprofit Hatcheries (Work Order 7LS0990)

TO: Senator Dick Eliason

FROM: George Utermohle *GU*
Legislative Counsel

You have asked whether the state must manage salmon produced by private nonprofit hatcheries according to principles of sustained yield.

The Department of Law in its consideration of this issue has concluded that the sustained yield section of the Alaska Constitution (art. VIII, sec. 4) is applicable to private hatchery stocks of salmon and that the Board of Fisheries is required to manage private hatchery stocks of salmon according to sustained yield principles in order to provide broodstock to the hatcheries. Memorandum to Don W. Collinsworth file no. 663-90-0327, August 1, 1990. The Department of Law reached this conclusion by finding that the return of hatchery-bred salmon to the hatchery for use as broodstock, like the escapement of wild salmon to the spawning grounds, is necessary to achieve sustained yield of the salmon resource.

The sustained yield section can be reasonably construed as supporting the conclusion reached by the Department of Law, however the section is also open to other interpretations which would support different conclusions. Article VIII, sec. 4 states:

SUSTAINED YIELD. Fish, forests, wildlife, grasslands, and all other replenishable resources belonging to the State shall be utilized, developed, and maintained on the sustained yield principle, subject to preferences among beneficial uses.

Of particular significance is the fact that this section applies to fish "belonging to the State" and that utilization, development, and maintenance of fish on the sustained yield principle is "subject to preferences among beneficial uses."

Fish belonging to the state are clearly to be managed according to sustained yield principles. The general rule is that salmon while in state water are property of the state and are held in trust for the benefit of all people of the state. Metlakatla Indian Community, Annette Island Reserve v. Egan, 362 P.2d 901, 914-915 (Alaska 1961). Part of the state's trust responsibility includes the management of salmon according to sustained yield principles. However it is unclear whether the sustained yield requirement applies to salmon raised by a private nonprofit hatchery, because the ownership of hatchery salmon is uncertain.

Private nonprofit salmon hatcheries are authorized under AS 16.10.375 - 16.10.470. AS 16.10.375 - 16.10.470 that does not answer the question of who owns hatchery stocks of salmon, though a number of provisions do suggest that some property interest in hatchery salmon stocks may pass to the hatchery under the terms of the hatchery permit. There are at least four references to salmon eggs or fry being sold to or by a hatchery. AS 16.10.420(3), (7), and (8); 16.10.450. The ability to sell salmon eggs and fry implies an ability to transfer property rights in the eggs and fry.

AS 16.10.440, which provides for the common use of hatchery fish while the fish are in the natural water of the state, is silent as to whether hatchery fish belong to the state. AS 16.10.440(a) provides

Fish released into the natural waters of the state by a hatchery operated under AS 16.10.400 - 16.10.470 are available to the people for common use and are subject to regulation under applicable law in the same way as fish occurring in their natural state until they return to the specific location designated by the department for harvest by the hatchery operator.

The phrase "occurring in their natural state" used in AS 16.10.440(a) mirrors the language of the common use section of the state constitution (art. VIII, sec. 3) in order to assure that while in the water of the state hatchery fish are to be subject to common use. However providing that hatchery fish are available for common use neither implies state ownership of the hatchery fish nor entails a concomitant responsibility to manage hatchery fish for sustained yield, because the requirements for common use and sustained yield are separate provisions of the constitution.

AS 16.10.440(a) does not use the important phrase "belonging to the state" which would invoke the sustained yield section. According to AS 16.10.440(a), hatchery fish are to be treated "in the same way as fish occurring in their natural state until they return to the specific location. . ."; this language does not say that hatchery fish are a common property resource belonging to the state, but only that they are to be treated as though they were a common property resource until they return to the designated location, at which time the fish become subject to private use by the hatchery. This language suggests some form of lingering private property interest in

hatchery fish by the hatchery even after the hatchery releases the fish into the wild. If there is a latent private property interest in hatchery fish while they are in the wild, then those fish may not necessarily be fish belonging to the state. If the fish do not belong to the state then they are not subject to the requirements for sustained yield management under the state constitution. This could permit the state through the Board of Fisheries and the Department of Fish and Game to manage fisheries through which hatchery fish pass without regard to assuring a sustained yield escapement to the hatchery.

Even if the hatchery fish do belong to the state for the purposes of the sustained yield section, the requirement of the sustained yield section of the state constitution is not absolute, because the management of fish and other replenishable resources belonging to the state shall be utilized, developed, and maintained on the sustained yield principle, subject to preferences among beneficial uses. The delegates to the Alaska Constitutional Convention considered this qualifying language to be necessary because they found that the sustained yield principle becomes meaningless and ineffective, if it is not qualified by the concept of beneficial use. Alaska Constitutional Convention Proceedings, Delegate Riley, p. 3054-55. The delegates to the convention did not discuss in detail how they felt the concept of preferences among beneficial uses would be applied in the context of sustained yield management of replenishable resources, except to say that certain kinds of resources (e.g. predators and parasites) should not be maintained on a sustained yield basis. Alaska Constitutional Convention Proceedings, Delegate Riley, p. 2451; Commentary on Article on State Lands and Natural Resources, 6 Proceedings of the Alaska Constitutional Convention at 98. However the delegates did discuss the concept of beneficial uses in regard to water rights. Section 13 of article VIII, relating to water rights, contains the same "subject to preferences among beneficial uses" language that is contained in the sustained yield section. The delegates understood preference among beneficial uses to allow the state to choose among competing beneficial uses of water in order to achieve the greatest public good, even if it meant eliminating other existing, vested beneficial uses of water, provided that the owner of those rights are compensated for the loss of the rights. Commentary on Article on State Lands and Natural Resources, 6 Proceedings of the Alaska Constitutional Convention at 102. Thus the delegates understood that the concept of preferences among beneficial uses would also allow the state to make reasoned decisions to prefer certain renewable resources over other renewable resources to achieve a more beneficial public purpose. The authority to establish preferences among beneficial uses may permit the state to harvest hatchery fish without providing for a sustained yield from the hatchery, provided that those who have vested rights in hatchery fish are compensated for those rights that are taken by the state.

The ability of the state to establish preferences among beneficial uses is reflected in AS 16.10.430(b) which allows the commissioner of fish and game to terminate the

Senator Dick Eliason
April 8, 1991
Page 4

operation of a hatchery in the best interests of the public, if the adverse effects of the operation of the hatchery are irreversible and cannot be mitigated.

If I can provide further assistance, please advise.

GU:pl
91-235.plm

ASHBURN AND MASON

LAWYERS

A PROFESSIONAL CORPORATION
1130 WEST SIXTH AVENUE, SUITE 100
ANCHORAGE, ALASKA 99501

MARK E. ASHBURN
LEWIS F. GORDON
JULIAN L. MASON III
JOHN C. McCARCON
DONALD W. McCLINTOCK III
A. WILLIAM SAUPE
KIRSTEN TINGLUM

TELEPHONE
(907) 278-4331
TELECOPIER
(907) 277-8235

October 17, 1991

Mr. John McMullen, President
Prince William Sound Aquaculture Corporation
Box 1110
Cordova, AK 99574

PRINCE WILLIAM
SOUND AQUACULTURE

OCT 21 1991

RE: Proposed Hatchery Regulations
Our File No. 91-7618

Dear John:

Enclosed is the long memorandum that I promised on the cost recovery and production limitations issues that you raised. I would be happy to discuss these matters with PWSAC at any time that is convenient for you.

In addition to the questions addressed in the enclosed memorandum, you also asked whether the Board of Fisheries could change the Prince William Sound Allocation Policy this year, out of its normal sequence. My understanding is that the policy has been implemented in the form of regulations, which are codified at 5AAC 24.370. To my knowledge, there is no absolute bar that would prevent the Board from amending or repealing its regulations at any time, so long as it fulfills the statutory requirements for promulgating regulations. Those detailed requirements are included in the Administrative Procedures Act.

However, any new regulations must be consistent with existing statutes, within the scope of the authorizing statute, and reasonably necessary to carry out the purpose of the statute. As with any law or regulation, any amending regulations must also be "reasonable and not arbitrary." Kelly v. Zamarello, 486 P.2d 906 (Alaska 1971).

Given the substantial public testimony in favor of the allocation policy, and the exhaustive back-up documentation that supported the allocation regulations adopted last year, it seems highly unlikely that the Board could make significant amendments that would be "reasonable and not arbitrary." An extensive record would have to be developed showing a dramatic change in circumstances and public support in order to support a change in the policy.

Mr. John McMullen

Page 2

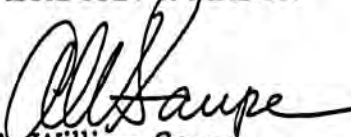
October 17, 1991

Even if such a record were to be made, any new regulations would have to preserve PWSAC's ability to continue a reasonable level of broodstock and cost recovery, for all of the reasons stated in my memorandum. For the same reasons, any new policy that attempted to limit PWSAC's salmon production would be vulnerable to legal challenge.

If you have further questions, please give us a call.

Very truly yours,

ASHBURN & MASON


A. William Saupe

AWS/nk

ASHBURN AND MASON

LAWYERS

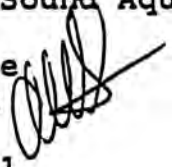
A PROFESSIONAL CORPORATION
1130 WEST SIXTH AVENUE, SUITE 100
ANCHORAGE, ALASKA 99501

MARK E. ASHBURN
LEWIS F. GORDON
JULIAN L. MASON III
JOHN C. McCARRON
DONALD W. McCLINTOCK III
A. WILLIAM SAUPE
KIRSTEN TINGLUM

TELEPHONE
(907) 276-4231
—
TELECOPIER
(907) 277-8235

MEMORANDUM

TO: John McMullen, President
Prince William Sound Aquaculture Corporation

FROM: A. William Saupe
Ashburn & Mason 

DATE: October 16, 1991

RE: Regulation of Private Hatcheries

I. Issues Presented

You have asked us to research several legal issues that go to heart of PWSAC's ability to conduct its business as it has for the past 14 years. First, you asked for the legal basis for of PWSAC's right to conduct broodstock and cost recovery harvests, and an analysis of the degree to which the Department of Fish and Game (the "Department") and the Board of Fisheries (the "Board") can regulate broodstock recovery and cost recovery by private non-profit hatcheries. In that connection, you requested an analysis of an Attorney General's Opinion by Stephen White (Op. No. 663-90-0327, August 1, 1990) and two other opinions on the same topic. One is a memorandum written to Senator Eliason by George Utermohle, Legislative Counsel, dated April 8, 1991, and the other is a

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

February 28, 1991 memorandum from Michael A. D. Stanley to Kate Troll, Executive Director of the Southeast Alaska Seiners.

You also asked for an evaluation of the extent of the Board's authority to regulate hatchery production levels on a regional or individual hatchery basis, with specific reference to AS 16.05.440(b), regarding salmon egg take.

The analysis and arguments that we would make follow.

II. Brief Conclusion

Based upon the relevant provisions of the Alaska Constitution, applicable statutes, and related legislative history, we would argue that PWSAC has a constitutional and statutory right to continue a reasonable level of broodstock and cost recovery harvest. Any regulation by the Board or Department that significantly restricted PWSAC's ability to continue its present broodstock and cost recovery practices would be inconsistent with an extensive statutory scheme that explicitly authorizes broodstock and cost recovery by private non-profit hatcheries and regional aquaculture associations. Any such restriction would also conflict with Article VIII, Section 4, of the Alaska Constitution (requiring fish resources belonging to the State to be "utilized,

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

developed, and maintained on the sustained yield principle"), Article VIII, Section 15 of the Alaska Constitution (prohibiting any exclusive right or special privilege of fishery, except insofar as limited entry may be imposed by the State "to promote the efficient development of aquaculture in the State").

On the related question of the Board's authority to restrict hatchery production (as distinct from its authority to regulate harvests), the Board is statutorily authorized to regulate such things as the "propagation and stocking of fish" (AS 16.05.251(7)), and the "source and number of salmon eggs" taken by a hatchery (AS 16.10.440(b)), which suggests that it might have some measure of control over individual hatchery output. However, the available legislative history strongly suggests that the legislature never intended to give the Board the power to limit hatchery production on either a local, regional or statewide basis. Nothing in the current law would permit regional production ceilings designed to restore historical market share percentages, which we understand to have been proposed.

If the Board does have power to regulate production, at some point it would come into conflict with the constitutional provisions mentioned above and the numerous other statutes, such as

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

the statutes creating the FRED Division, the Limited Entry Act, and the State Hatchery Loan Program, which together evidence a strong policy in favor of hatchery development as well as enhancement and extension of the State's fisheries. Because there are no court decisions interpreting the Board's power to regulate propagation or egg take, and because the Alaska Supreme Court has not elucidated either the meaning of the constitutional reference to "efficient development of aquaculture," or the meaning and application of the sustained yield concept, there is no sure way to know precisely where the collision might occur until a specific restriction is imposed and challenged in court.

It would seem reasonable to conclude, however, that in the absence of a strong factual showing that hatchery production posed a serious genetic or disease threat to wild salmon stocks or perhaps was causing severe economic distress, neither the Department nor the Board could legally restrict PWSAC's output below a level necessary to sustain hatchery yields, to efficiently develop aquaculture, to repay state loans and to recover its costs.

III. Discussion

A. The Board And The Department Are Required By The

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

Alaska Constitution And Numerous Statutes To Manage
For Broodstock Recovery

In its August 1990 opinion, the Attorney General's Office advanced the argument that the Board is obligated to manage Alaska's fisheries to provide for broodstock recovery by hatcheries. Analogizing broodstock fish to wild stock escapement, the Assistant Attorney General Stephen White reasoned that Article VIII, Section 4 of the Alaska Constitution mandates that conclusion. That section provides as follows:

Sustained Yield. Fish, forests, wildlife, grasslands, and all other replenishable resources belonging to the State shall be utilized, developed, and maintained on the sustained yield principle, subject to preferences among beneficial uses.

Alaska Const. Art. VIII, §4. White implicitly assumes that hatchery fish "belong to the State" and argues that without broodstock harvests, hatchery stocks obviously could not be sustained.

In an opinion on this subject requested by Senator Eliason, Legislative Counsel George Utermohle questioned White's conclusion that the sustained yield principle applies to hatchery

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

fish, on the grounds that they may not "belong to the State." He bases his argument entirely on AS 16.10.440(a), which provides:

Fish released into the natural waters of the state by a hatchery operated under AS 16.10.400 - 16.10.470 are available to the people for common use and are subject to regulation under applicable law in the same way as fish occurring in their natural state until they return to the specific location designated by the department for harvest by the hatchery operator.

AS 16.10.440(a).

Utermohle points out that the phrase "occurring in their natural state" used in this section mirrors the language of the common use clause of the constitution (Art. VIII, Sec. 3).¹ He then argues that merely providing that hatchery fish are available for common use "neither implies state ownership of the hatchery fish nor entails a concomitant responsibility to manage hatchery fish for sustained yield, because the requirements for common use and sustained yield are separate provisions of the constitution." Next, Utermohle asserts that AS 16.10.440(a) does not use the phrase "belonging to the state," which would invoke the sustained

¹Article VIII, Sec. 3 provides: "Common Use. Wherever occurring in their natural state, fish, wildlife, and waters are reserved to the people for common use."

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

yield clause. Instead, he argues that the statute requires only that hatchery fish be treated in the same way as fish occurring in their natural state until they return to the specific hatchery location. Utermohle Memo. p. 2.

From this phrasing in AS 16.10.440(a), Utermohle reasons that there may be "some form of lingering private property interest in the hatchery fish even after the hatchery releases the fish into the wild." Id. at 3. If the fish do not "belong to the State," Utermohle concludes that they are not subject to the sustained yield requirement and neither the Board nor the Department is required to manage hatchery fish to assure a sustained yield escapement to the hatcheries.

Utermohle's ownership argument does not stand up to closer analysis and is contradicted by the available legislative and constitutional history. Certainly PWSAC has understood since its creation in 1975 that once it releases its fish, it no longer owns or controls them. From the point of release forward, they are "fish occurring in their natural state" and, as Utermohle acknowledges, Article VIII, Section 3 of the constitution reserves them to the people for common use. This is consistent with the general rule, which he also cites, that salmon while in state water

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

are property of the state and held in trust for the benefit of all people of the state. Metlakatla Indian Community v. Egan, 362 P.2d 901, 914-915 (Alaska 1961).

That hatchery fish belong to the State is also consistent with the views of the legislature that created the nonprofit hatchery program. In her July 31, 1991 memorandum to Senator Eliason, Linda J. Snow, a Legislative Analyst, wrote as follows:

Consensus is that the legislature had always intended that the fish from PNP hatcheries belong to the common property fishery until such time as they return to the hatchery, and then they belong to the hatchery for broodstock and cost recovery. Testimony by Senator Dick Eliason at a 1975 Senate Resources Committee hearing on SB 180 indicates that the initial concept private hatchery system considered making corporate ownership. How profit-making corporation might claim to exclusive ownership of every produced. Thus, it was felt that nonprofit ownership of hatcheries was more consistent with the concept of publicly owned hatchery fish. This opinion is echoed by former Representative Terry Gardiner.

At a March 7, 1977 House Resources Committee hearing, Jack Milnes, executive director of Southern Southeast Regional Aquaculture Association testified: "I wish to recognize the fact that these are common property fish, that they belong to the state of Alaska and to the people of Alaska and therefore they should be protected by the representatives of the

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

people of the state of Alaska." At a 1979 Senate Resources Committee hearing on HB 48, Don Clockson, an attorney with Alaska Legal Services discussed the question of ownership of hatchery fish. In his testimony, he asked "When are fish no longer common property fish?" He felt that constitutionally, they were considered to be common property at all times. Consequently, it appears there was never any question that hatchery fish were common property of the people of the state while in Alaska waters, and they may or may not be the property of the PNP hatchery operator at the hatchery, but that he is allowed to harvest a sufficient number for broodstock and cost recovery.

Snow Memo. p. 14 (attached as Attachment A) (emphasis added). These statements effectively answer the "ownership" issue. When the legislature created private hatcheries, it intended that the fish would belong to the State, contrary to Utermohle's supposition.

The commentary of the Committee on Resources of the Alaska Constitutional Convention is also significant on this point. Referring specifically to the "common use" clause, which Utermohle seeks to distinguish from the sustained yield clause, the commentary states in relevant part as follows:

Game fish, wildlife, fisheries, and water are recognized as belonging to the state so long as in a natural state. These resources are subject to a private right only when they have been acquired or utilized as provided by law.

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

Alaska Constitutional Convention Proceedings, Part 6, p. 98 (emphasis added). Thus, the framers of the common use clause thought that the fish being reserved for common use "belonged" to the State. Hatchery fish are reserved for common use by AS 16.10.440(a) and the common use clause itself. Therefore, they must belong to the State and be subject to the sustained yield principle.

Also significant is the commentary to the sustained yield clause, which states in relevant part:

Sustained yield is recognized as a principle applicable to the administration of plant and animal life subject to the immediate authority of the state.

Id. (emphasis added). Because hatchery fish are subjected to the authority of the State by AS 16.10.440(a), among other provisions, it follows that they are subject to the sustained yield clause.

This conclusion also comports with common sense. If they did not belong to the State, it could not reserve hatchery fish for use by others without paying for them. Moreover, if the mere expectation that a hatchery will later be allowed to harvest some unidentified fraction of the returning fish constitutes an ownership interest in all of its fish, then every other limited entry permit holder could be said to have the same "lingering

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

property interest," leading to the false conclusion that none of the fish in Alaska's waters ever belong to the State or are subject to the sustained yield principle of management.

A more reasonable interpretation of these related statutory and constitutional provisions is that, once released, hatchery fish become like wild stocks in every legal respect. They belong to the State, are reserved to the people for common use and must be managed for sustained yield. Therefore, broodstock recovery must be permitted by the Board and the Department at a level sufficient to produce a sustained yield of hatchery stocks.

Even if this is true, Utermohle goes on to argue that the sustained yield principle in Article VIII, Section 4 is not absolute and is "subject to preferences among beneficial uses." He suggests that this phrase implies the power on the part of State regulators to deny hatchery harvests altogether, in order to achieve a "more beneficial public purpose." According to Utermohle, the ability of the State to establish preferences among beneficial uses is reflected in AS 16.10.430(b), which allows the Commissioner of Fish and Game to terminate the operation of a

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

hatchery if its adverse effects are irreversible and cannot be mitigated. Utermohle Memo., p. 4.²

A more plausible interpretation of AS 16.10.430(b) is that the listed conditions under which a hatchery operation may be terminated are the only bases upon which termination is permitted. In other words, unless there are irreversible adverse effects that cannot be mitigated, a licensed hatchery operation cannot be terminated, directly through a termination order, or indirectly through a denial of broodstock or cost recovery funds.

Utermohle's argument also overlooks, among other things, Article VIII, Section 15 of the constitution, which provides:

²AS 16.10.430(b) provides as follows: "If the commissioner finds that the operation of the hatchery is not in the best interests of the public, the commissioner may alter the conditions of the permit to mitigate the adverse effects of the operation, or, if the adverse effects are irreversible and cannot be mitigated sufficiently, initiate a termination of the operation under the permit over a reasonable period of time under the circumstances, not to exceed four years. During the period of time that the operation is being terminated, the permit holder may harvest salmon under the terms of the permit but may not release additional fish."

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

No exclusive right or special privilege of fishery shall be created or authorized in the natural waters of the State. This section does not restrict the power of the State to limit entry into any fishery for purposes of resource conservation, to prevent economic distress among fishermen and those dependent upon them for a livelihood and to promote the efficient development of aquaculture in the State.

This provision strongly suggests that the framers of our constitution considered the efficient development of aquaculture to be an important value to be protected. It also indicates read to mean that the efficient development of aquaculture is one of the purposes of limited entry, a principle that is central to fisheries management in Alaska.

Hatchery harvests for broodstock (and cost recovery) are absolutely essential to conservation of the resource and to the efficient development of aquaculture. If deprived of broodstock (or the funds generated by cost recovery), PWSAC could not continue in existence, much less develop efficiently. Furthermore, other beneficial uses, such as the harvest of PWSAC produced fish by commercial, sport and subsistence users, would be seriously harmed, not helped by a restriction on broodstock harvest. Over the past 14 years, PWSAC has harvested an average of less than 30% of the

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

salmon returning to its hatcheries. During the period from 1986 through 1990, PWSAC fish constituted 50 percent of the total commercial harvest. During that period PWSAC contributed an average of approximately \$15.4 million annually in value to the common property fishery, while costing the State little or nothing. PWSAC harvests have consistently sustained other user groups throughout the region, while causing no demonstrable harm to wild stocks. Short of the extreme situation envisioned by AS 16.10.430(b), it is hard to conceive how denial of a reasonable hatchery harvest in favor of other beneficial uses could achieve a greater public purpose.

Any regulation that severely limited or denied PWSAC's right to harvest a reasonable number of fish would violate both Section 4 (sustained yield) and infringe on the values reflected in Section 15 (limited entry and efficient development of aquaculture) of Article VIII and the Limited Entry Act, of which hatchery harvests are an integral part.

Utermohle's argument also overlooks an extensive web of statutory provisions that evidence an unwavering legislative intent to sustain and expand hatchery operations through hatchery harvests. A good example is the very provision that Utermohle

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

cites, AS 16.10.440(a), which provides that hatchery fish are available for common use "until they return to the specific location designated by the department for harvest by the hatchery operator." This indicates a legislative expectation and intent that hatchery harvests are necessary.

The obligation of the Department to affirmatively assist with broodstock recovery is embodied in AS 16.10.443, which states:

Department assistance and cooperative. (a)
Before and after permit issuance under AS 16.10.440 - 16.10.470, the department shall make every effort, within the limits of time and resources, to advise and assist applicants or permit holders, as appropriate, in the planning, construction, or operation of salmon hatcheries.

As explained above, broodstock recovery is essential to hatchery operations. Without it, they could not exist. The Department is obligated under AS 16.10.443 to assist in the operation of hatcheries. Any departmental regulation, action or order that denied broodstock recovery would be inconsistent with this obligation and would be invalid.

Other relevant statutory provisions that establish the obligation of the Department and the Board to manage for hatchery harvests are discussed below, in relation to cost recovery.

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

B. The Board And The Department Must Also
Manage For Cost Recovery Harvests

Assistant Attorney General White concluded that the Board and the Department "are authorized, and in fact directed, to manage fisheries so that broodstock returns to hatcheries." Both the reasons given by White and the additional reasons set forth above support this conclusion. On the related issue of whether the Board and the Department must manage for cost recovery, White is less certain. He believes that the arguments on both sides of the question "depend upon implication and analogy" and concludes that "the law does not clearly point to one answer or the other." White Memo., p. 7. However, we would argue that the Alaska Constitution and an extensive statutory scheme require the Board and the Department to manage for hatchery cost recovery.

As an initial matter, it is important to remember that the Board and the Department manage the fisheries primarily through regulations and orders. In order to be valid, a regulation must be within the scope of the authorizing statute and it must be "consistent with standards prescribed by other provisions of law." Beran v. State, 705 P.2d 1280 (Alaska App. 1985), citing AS 44.62.020. In Beran, the court struck down a Board regulation on

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

the basis that it was inconsistent with other provisions of law and therefore invalid. Id. at 1289. If the Board or the Department were to issue regulations that curtailed PWSAC's ability to conduct a cost recovery harvest, the regulations would be inconsistent with numerous provisions of law and could be successfully challenged in court.

The first section of this memorandum focused on the requirements of Article VIII of our constitution. The same constitutional provisions that protect broodstock recovery also protect cost recovery, because cost recovery is also absolutely essential to sustain hatchery yields (Section 4) and to promote the efficient development of aquaculture (Section 15). This discussion will not repeat those arguments, but will focus instead on the legislative mandate for cost recovery. Numerous statutes express the legislative intent that hatcheries must be permitted to conduct cost recovery harvests in order to generate funds for operation, debt retirement, and expansion.

The most obvious such provision is AS 16.10.450(a), which could hardly be clearer on this point. It states:

Sale of salmon and salmon eggs by hatchery.
(a) Except as otherwise provided in a contract for the operation of a hatchery under

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

AS 16.10.480, a hatchery operator who sells salmon returning from the natural waters of the state, or sells salmon eggs to another hatchery operating under AS 16.10.400 - 16.10.470, after utilizing the funds for reasonable operating costs, including debt retirement, expanding its facilities, salmon rehabilitation projects, fisheries research, or costs of operating the qualified regional association for the area in which the hatchery is located, shall expend the remaining funds on other fisheries activities of the qualified regional association.

AS 16.10.450(a).³

The Limited Entry Act, AS 16.43.400, et. seq., permits the Commercial Fisheries Entry Commission to issue "special harvest area entry permits" to holders of private, nonprofit hatchery permits issued by the Department. Section 420 of the Act, noted above in connection with the ownership issue, specifically authorizes cost recovery harvest by permit holders, such as PWSAC:

Disposition of fish. Fish caught under the authority of a special harvest area entry

³The intent of this provision is reiterated in AS 16.40.210, the recently enacted statute that bans mariculture. It provides in section (b)(2) that "this section does not restrict the ability of a nonprofit corporation that holds a salmon hatchery permit under 16.10.400 to sell salmon returning from the natural waters of the state, as authorized under 16.10.450, or surplus salmon eggs, as authorized under 16.10.420 and .450."

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

permit are the property of the permit holder.
The permit holder may sell the fish if the
proceeds are used in the manner described in
AS 16.10.450.

AS 16.43.420. PWSAC, of course, holds a special harvest area entry permit under AS 16.43.400, and its cost recovery funds are used for the purposes listed in AS 16.10.450. It thus has a statutory right to cost recovery that cannot be curtailed through regulation.⁴

PWSAC also conducts cost recovery harvests at Main Bay and Cannery Creek under authority of contracts entered pursuant to AS 16.10.480, enacted by the legislature in 1988. That section authorizes the Department to enter into hatchery management contracts for certain state-owned hatcheries, which allow harvest of adult salmon "in a quantity sufficient to allow the contractor to recover all or part of the contractor's costs of operating the hatchery." While this provision is permissive, rather than

⁴It could also be argued that cost recovery is guaranteed to permit holders such as PWSAC by the Limited Entry Act itself. In Johns v. CFEC, 758 P.2d 1256, 1263 (Alaska 1988) the court stated: "The Limited Entry Act has two purposes - enabling fishermen to receive adequate remuneration and conserving the fishery," citing, Art. VIII, Sec. 15, Alaska Const., AS 16.43.010; CFEC v. Apokedak, 606 P.2d 1255, 1265 (Alaska 1980). Without cost recovery, PWSAC would not receive adequate remuneration or be able to help conserve the fishery.

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

mandatory, it is further evidence of the legislature's expectation and intent to permit cost recovery harvests at state-owned but privately operated hatcheries.⁵

Another statutory provision that is quite clear on this point is AS 16.10.430(b), discussed above. This provision permits the Commissioner of Fish and Game to terminate a hatchery permit if he finds that continued operation is no longer in the public interest. Presumably, termination could be ordered if a hatchery failed to sustain itself economically, or more likely, if it produced diseased or genetically damaged fish that might threaten other stocks. See Snow Memo., pp. 12-13, 16. In any case, the relevant point is that termination is to be phased over time.

During the period of time that the operation is being terminated, the permit holder may harvest salmon under the terms of the permit but may not release additional fish.

AS 16.10.430(b). Logically, this provision can only contemplate cost recovery harvest. In the context of hatchery termination,

⁵Both the Main Bay and the Cannery Creek contracts provide that PWSAC shall have the right to conduct cost recovery harvests during the terms of the contracts.

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

broodstock harvest would not be necessary since no new fish could be released.

Under AS 16.05.020, the Commissioner of Fish and Game is required to "manage, protect, maintain, improve, and extend the fish, game... of the state in the interest of the economy and general well-being of the State." The FRED Division has been charged with the duty, "through rehabilitation, enhancement and development programs" to do everything "necessary to insure perpetual and increasing production and use of the food resources of Alaska's waters and continental shelf areas." AS 16.05.092. Also significant is AS 16.10.443, cited above, which requires the Department to do everything possible to assist with hatchery operations. Any regulation or order that prevented a reasonable level of cost recovery would hardly be consistent with these duties on the part of the Commissioner or with the myriad of other statutes that authorize cost recovery harvests by hatcheries. Under Beran v. State, supra, and numerous other cases, regulations are invalid if they are inconsistent with other provisions of law.

The statutory provisions discussed above lead to the conclusion that the legislature intended cost recovery harvest to be the primary method of funding private nonprofit hatcheries. The

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

Snow Memorandum on the legislative history of the hatchery program supports this conclusion:

At this time [1973-974], legislators were coming to the view that the private sector would be more efficient than the government in the operation of hatcheries. Also, nongovernmental hatcheries had much to recommend them from the perspective of public finance issues: the operation of private hatcheries could be funded from the harvest of returning fish and from tax assessments on the fishermen who had access to hatchery production, thus shifting the cost of the facilities from the shoulders of the general public to the people who derived benefits directly from them.

Snow Memo., p. 5. (emphasis added). Snow goes on to point out that in 1974 "there was great enthusiasm about the prospect of PNP hatcheries from fishermen's groups, education centers, Native corporations, and the legislature itself." Id.

An attorney for the Southeast Alaska Seiners, Michael D. Stanley, seems less enthusiastic about cost recovery. He has approached the issue from a different direction, acknowledging the Department's primary responsibility for control of hatchery harvests, but questioning whether the Board has the statutory authority to allocate fish to private hatcheries. See Memorandum from Michael Stanley to Kate Troll, Executive Director Southeast

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

Alaska Sealers, dated February 28, 1991. Stanley bases his argument on AS 16.05.440(a), cited above at page 5. He focuses on the statutory language subjecting hatchery fish to regulation in the same manner as wild stocks, "until they return to the specific location designated by the department for harvest by the hatchery operator." From this he concludes (1) it is the Department, not the Board, which is responsible for "allocating" hatchery fish to a hatchery through designation of special harvest areas, and (2) such allocation occurs only after those fish have traversed the common property fisheries and returned to the specific location designated for hatchery harvest. Stanley Memo., p. 4.

One flaw in this reasoning is that it confuses allocation of fish to be harvested with designation of a special harvest area and harvest timing. There is no logical reason that the Board cannot allocate a portion of the return to a hatchery and the Department designate the specific time and place for the harvest of that allocation. In fact, my understanding is that that is how the system has always worked.

This scheme also appears to be in harmony with subsection (b) of AS 16.10.440, which gives the Board the authority "to amend by regulation... the terms of the permit relating to the harvest of

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

fish by hatchery operators, and the specific locations designated by the department for harvest." This provision gives the Department primary responsibility to regulate cost recovery harvests, but also confers sufficient statutory authority on the Board to allocate fish to be harvested. The legislative history of AS 16.10.440, quoted at length below, indicates that the role of the Board extends to regulating the harvest of "those fish which are returning as a result of releases from natural systems and also from hatchery releases." House Journal, March 15, 1979, pp. 601-602.

Another difficulty with Stanley's theory that the Board does not have the power to allocate fish for hatchery harvest is that it seems to be inconsistent with two specific provisions of the Limited Entry Act, under which hatcheries are granted limited entry permits. AS 16.43.440 provides that: "use privileges granted under AS 16.43.400 - .440 are subject to the regulations of the Board of Fisheries." Also, AS 16.43.950 states that "... Holders of ... entry permits issued under this chapter are subject to all regulations adopted by the Board of Fisheries." These provisions

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

also could be read to authorize the Board to allocate fish to hatcheries.⁶

As a final point in response to the Stanley Memorandum, the Board's primary authorizing statute, AS 16.05.251(a), is quite broad and seems to give the Board ample authority to allocate fish for cost recovery and broodstock harvest. Examples of the types of regulations the Board may adopt are found in Section 251(a)(6) (classifying as commercial fish, sport fish, personal use fish, subsistence fish, or predators or other categories essential for regulatory purposes); Section 251(a)(12) (regulating commercial, sport, subsistence, and personal use fishing as needed for the conservation, development, and utilization of fisheries); Section 251 (a)(14) (establishing nonexclusive, exclusive, and superexclusive registration and use areas for regulating commercial fishing.) See also, AS 16.05.251(e) (Board shall establish criteria for allocation of fishery resources among personal use,

⁶As we have argued elsewhere, the power of the Board to allocate to hatcheries does not include the power to deny a reasonable allocation altogether.

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

sport and commercial fishing). These provisions are broad enough to allow the Board to allocate to hatcheries.

The idea that hatchery harvests do not qualify as "commercial fishing", and therefore not covered by these statutory sections, is directly contrary to the plain meaning of the definition found in the statute.

"Commercial fishing" means the taking, fishing for, or possession of fish... with the intent of disposing of them for profit, or by sale, barter, trade, or in commercial channels;

As 16.05.940(4). There can be no doubt that PWSAC takes and possesses fish with the intent of disposing of them by sale in commercial channels, and is thus engaged in commercial fishing within the meaning of AS 16.05.251. Commercial fishing is precisely what a cost recovery harvest is. PWSAC's conduct in this regard is indistinguishable from that of any other commercial fisherman. (Ironically, one of the objections that is raised by hatchery opponents is that it is inappropriate, for some reason, for hatcheries to "compete" in the commercial market with other fishermen trying to sell their fish to the same customers).

If PWSAC is engaged in commercial fishing, AS 16.05.251 and the case law cited in the White Memorandum (e.g., Meier v.

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

State Bd. of Fisheries, 739 P.2d 172 (Alaska App. 1987)) support the conclusion that the Board has ample power to make allocations for hatchery harvests. The Board not only has the authority, but it also has an obligation to do so. See, AS 16.05.251(d) (requiring the Board to provide a fair and reasonable opportunity for the taking of fishery resources by personal use, sport and commercial fishermen).

C. The Board's Power To Restrict Hatchery Output Is Unclear, But Must Be Limited By The Same Constitutional And Statutory Restrictions That Apply To Cost Recovery

Your second question concerns the extent of the Board's authority to regulate hatchery output, as opposed to allocation of harvests. The Snow Memorandum (Attachment A) addresses this issue. It directly responds to a question posed by Senator Eliason as to whether the legislature ever considered limiting hatchery production because of: (1) adverse impacts on wild stocks; or (2) adverse impacts on salmon market prices. Snow's answer is revealing. Her memorandum states as follows:

We found no discussion in the legislative record that hatchery production should be restrained to a predetermined level for either biological or economic reasons. While the legislature was presumably prepared to take whatever corrective measures were necessary in the face of persuasive evidence that the hatchery program

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

was causing serious biological problems, there appears to have been no discussion of establishing a ceiling on the production of fish from hatcheries.

There also appears to have been no contemplation of imposing a ceiling on the production of hatchery fish to support market prices. According to Terry Gardiner, salmon stocks were so depressed in the 1970's that there was no thought given to the possibility of oversupply.

* * * * *
Clem Tillion told us that the legislature did not anticipate dependence on hatchery salmon by Alaska's commercial fishermen, and if adverse impacts on salmon market price were suspected by any legislators, it was not a widespread feeling, for they did not take steps to be able to limit production if that occurred.

Snow Memo., pp. 13-14 (emphasis added).

Consistent with Snow's conclusions, a review of the Board's authorizing statute as well as the other statutes relating to hatcheries finds little or no basis for regulation of hatchery output by the Board.

You specifically asked whether AS 16.10.440(b), which provides, among other things, that the Board has the authority to regulate "the terms of [a hatchery] permit relating to the source and number of salmon eggs...",⁷ authorizes the Board to limit

⁷Section 440(b) goes on to say that the Board may not "adopt regulations or take any action regarding the issuance or denial of any permits required in AS 16.10.400 - 16.10.470." This suggests that the Board does not have the power to completely deny a cost

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

hatchery production levels. The legislative history of this provision indicates that it does not. The Resources Committee's letter of intent on HB 359, which included the language in question, states as follows:

There are three other major changes made by the bill:

(1) Section 2 of the bill amends AS 16.10.440(a)(b). The amendment clarifies the role of the Board of Fisheries. The role of the Board of Fisheries as envisioned by the original legislation was to regulate the harvest of salmon returning to the waters of the state. That role extends to regulating those fish which are returning as a result of releases from natural systems and also from hatchery releases. There are provisions in other portions of the non-profit hatchery Act which allow the designation of specific locations for the harvest of salmon by the hatchery operator for sale, and use of the money from that sale, for the specific purposes as stated in AS 16.10.450. The added language clarifies that the Board of Fisheries may adopt regulations relating to the harvest of the fish by hatchery operators at the specifically designated locations. The Board of Fisheries in the past year or two has enacted regulations relating to those harvests for several of the private non-profit hatcheries in the state.

recovery harvest permit.

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

House Journal, March 15, 1979, pp. 601-602 (emphasis added). The exclusive reference to regulation of harvest, and the absence of any mention of production controls, corroborates the conclusion reached by the Snow Memorandum that the legislature never intended to authorize the Board to limit hatchery production. The Board's traditional function has always been to allocate harvests.

The only other statutory provision that suggests otherwise is found at AS 16.05.251(7), which authorizes the Board to regulate the "propagation and stocking of fish," which tends to suggest the power to regulate production, not just harvest levels and allocations. The most plausible explanation of this language is that it was included to permit regulation of such activities as stocking lakes with trout or perhaps even raising fish in ponds. There is regrettably no legislative history available to aid in the interpretation of this language. Because it runs counter to the Board's traditional role and is inconsistent with the conclusions in the Snow Memorandum, it would be wrong to assign much importance to this provision.

Apart from the issue of whether the Board could regulate hatchery output on a local basis, you have asked also whether the Board has the authority to set regional production limits for the

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

purpose of adjusting relative market shares between different regions of the State. Can the Board, for example, legally cap hatchery sockeye output in Prince William Sound to keep it at the historical position it has held in relation to Bristol Bay sockeye production?

There is no short and simple legal answer to this question. The authority to regulate propagation and stocking is a very slender thread from which to hang an unprecedented, statewide regulatory program of production allocation, which has not been specifically authorized or even contemplated by the legislature. Certainly any such regulatory regime would raise serious questions as to its consistency with the Board's statutory duty to "conserve and develop" the State's fisheries. Such a policy might further conflict with a number of the other statutory provisions already discussed. It would also run up against the sustained yield concept (Section 4) and the maximum use (Section 1) and maximum benefit (Section 2) policies at the heart of Article VIII of our constitution.

Perhaps more significant than the legal impediments, which are considerable, there would be serious practical and policy problems with any attempt by the Board to allocate production

John McMullen, President
RE: Regulation of Private Hatcheries
October 17, 1991

between regions of the State. For example, which historical moment would serve as the reference point for assignment of regional quotas? Would it be before or after establishment of the hatchery program? Would new hatchery programs (such as the Main Bay sockeye facility) be automatically precluded if they would alter the historical balance of harvest levels between regions? How could hatcheries plan their budgets and production levels from year to year, given the inherent unpredictability of natural returns? Would a direct consequence of such a policy be to reward stagnant regions and to stifle initiative on the part of any region that is efficient, well-organized and capable of growth? Would the anticompetitive aspects of regional limits outweigh the asserted benefits? What are the asserted benefits? Do they go beyond mere regional jealousy and have some statewide economic rationale? While the answers to these questions are unknown, it may be very difficult for the Board to identify a defensible, rational basis for any such plan.

Chapter VI. PLANNING AND PERMITTING

A major element of the statewide salmon enhancement program is the planning and permitting process.

CURRENT PLANNING AND PERMITTING PROCESS

Legislation in 1976 authorized the commissioner of the Alaska Department of Fish and Game (ADF&G) to designate regions of the state for the purpose of enhancing salmon production. This statutory responsibility is implemented through Regional Planning Teams (RPTs), composed of department personnel from the fisheries divisions and representatives from the regional aquaculture associations. The RPTs also have ex-officio members from other agencies (e.g. U.S. Forest Service, U.S. Fish & Wildlife Service). See attached charts for an illustration of the planning and permitting process.

In regions where no regional aquaculture association has been formed, planning core groups representing ADF&G fisheries divisions, fishermen and other agencies and interest groups are established for the purpose of developing comprehensive salmon plans.

The mission of the RPTs is to plan for the long-term utilization of the salmon resource using an orderly process that examines the full potential of the region's salmon production capacity. Regional comprehensive salmon planning progresses in stages. Phase I sets the goals, objectives and strategies for the region by developing a 20 year, long-range plan. Phase II identifies potential projects and establishes criteria for evaluating the enhancement and rehabilitation potential of the salmon resource in that region through the development of 5-year action plans. Upon completion of these phases, the RPT annually reviews the status of the program and prepares updates to the Phase II plans. In Prince William Sound, the RPT has initiated development of a Phase III plan that incorporates Board of Fisheries-approved allocation and fisheries management plans with hatchery production plans. All plans are reviewed and approved by the ADF&G commissioner.

The RPTs not only develop the comprehensive salmon plans, but also review and comment to the ADF&G on:

- private nonprofit (PNP) hatchery permit applications;
- proposed alterations to PNP hatchery permits;
- PNP and ADF&G annual hatchery management plans; and
- annual reports by PNP hatchery operators.

Each hatchery enhancement project is reviewed, based on some relatively consistent criteria:

- Will the hatchery make a significant contribution to the common property fishery?
- Does the proposed project allow for continued protection of natural stocks?
- Is the proposed project compatible with the comprehensive plan?
- Does the proposed project make the most appropriate use of the site's potential?

Comprehensive salmon plans have been developed and approved for northern Southeast Alaska, southern Southeast Alaska, Yakutat, Prince William Sound/Copper River, Cook Inlet, Kodiak, and Bristol Bay. The comprehensive salmon planning process has recently

been initiated for the Alaska Peninsula/Aleutian Island/Area M region, the Chignik region, and for the Kotzebue Sound area in relation to the Sikusuilaq Springs Hatchery.

Regional Aquaculture Associations

In addition to regional planning, ADF&G was also directed to assist and encourage the formation of qualified regional associations for the purpose of planning and implementing fisheries enhancement and rehabilitation projects. An association must be representative of commercial fishermen and other user groups in the region. Once formed, an association typically receives a planning and organizational grant from the Department of Commerce and Economic Development.

Private Nonprofit Permit Application Process

The commissioner of ADF&G may issue a nontransferable permit to a nonprofit corporation for the construction and operation of a salmon hatchery after the permit application has been reviewed by the regional planning team.

The permit application process is rigorous and includes: 1) pre-application assistance from ADF&G, 2) a management feasibility analysis, 3) the permit application and fees, 4) determination of acceptance by the department for formal review, 5) regional planning team review, 6) a provision for requesting additional information, 7) completeness determination by the department, 8) the public hearing process, 9) review and determination by the commissioner (this includes six major criteria), and 10) a provision for reconsideration. The departmental review of all PNP hatchery permit applications includes review and comment by all fisheries divisions, the Habitat Division, the principal geneticist, and the principal pathologist. A public hearing and full review by state and federal agencies through the coastal zone review process is also required.

Conditions may be placed on a PNP permit, including a provision that donor stock eggs must be from the department or a source approved by the department. Other permit conditions include restrictions on placement of salmon eggs or resulting fry into the waters of the state; restrictions on the sale of eggs or resulting fry; the timing and conditions of releasing salmon; destruction of diseased salmon; departmental control over where salmon are harvested by hatchery operators; and siting requirements so that reasonable segregation from natural stocks occurs while still allowing, to the extent feasible, returning hatchery fish to pass through traditional salmon fisheries.

The commissioner may alter, suspend, or revoke a PNP permit if the operator fails to comply with the terms and conditions of the permit within a reasonable period after notification of noncompliance. The commissioner may also alter the permit or terminate the operation, if it is found that the hatchery is not in the best interest of the public.

Fish released by hatchery operators are available for common use as natural stocks, until they return to the location established by the department for hatchery harvest. The Board of Fisheries may, after a permit has been issued, amend by regulation the terms of the permit relating to the source and number of eggs, the harvest by hatchery operators, and the locations of hatchery special harvest areas [AS 16.10.440(b)]. This is the basis for the Board-regulated Fish Transport Permit process (see Biological Issues chapter), establishment of hatchery special harvest areas, and board-

approved terminal harvest area plans. *The statutes also appear to give the Board the authority to limit or control production at individual hatcheries based on egg-take for broodstock.* This authority has never been used, and there is a strong difference in opinion as to whether or not the Legislature actually intended the Board of Fisheries to regulate hatchery production, or instead, to regulate the take of eggs from wild stocks for hatchery production.

A hatchery operator must file an annual report with ADF&G by December 15 of each year. The report contains information on hatchery returns, numbers of eggs taken, and numbers of fry or smolt released.

A *Basic Management Plan* (BMP) is developed as part of the actual permit. The BMP includes a complete description of the facility and special harvest area, broodstock development schedules, and descriptions of broodstock and hatchery stock management. Marking programs for hatchery-produced fish can be required in the hatchery permit and BMP. Tagging is usually considered optional, unless during the permit or permit alteration process, fisheries managers specify the need for special in-season management capability.

When a permit is approved and operational, an *Annual Management Plan* (AMP) is developed for each year of operation. Specific plans for egg-takes, cost-recovery harvest, fry and smolt releases, and marking and recovery are included. AMPs are developed by the department in conjunction with the operator and are reviewed by all the fisheries divisions and the RPT before being approved by the commissioner.

Alaska Statutes 16.10.400-16.10.475 address this process, as well as regulations in 5 AAC 40.100-40.990.

Fish Transport Permits

The possession, transportation or release of live fish and their reproductive products (eggs) into the waters of the state requires a *Fish Transport Permit* (FTP) from ADF&G. The FTP permit application covers only one specific operation and is quite detailed, including:

- effective period,
- transport dates,
- maximum number of fish or eggs to be taken,
- incubation and rearing location,
- release location,
- purpose and benefits,
- evaluation methods,
- native stocks present,
- history of known transport of this stock,
- disease history,
- description of proposed egg-take methods,
- planned disease control measures, and
- water source for rearing and effluent discharge location.

The FTP application is intensively reviewed by the regional supervisors of the FRED, Commercial Fish and Sport Fish Divisions, the FRED pathologist and principal geneticist, as well as the FRED chief of technology and development and the FRED director. A signature page is attached to the actual permit which includes recommendations and comments. The permit is then approved or disapproved by the commissioner of ADF&G.

The potential for disease and genetic impacts are the primary considerations in the FTP review process.

Fish Resource Permits

ADF&G is currently developing a policy on *Fish Resource Permits* (FRP). The FRP was previously called a scientific/educational (sci/ed) permit. This policy is being developed as a result of a previous lack of standards for the scientific and educational projects. Alaska statutes have only brief references to these activities, but it is clear that the Legislature intended them to be allowed.

Under the proposed policy, Fish Resource Permits will be issued with the stipulations of no commercial activities, no human consumption, and no sale of the species. These permits are classified into collecting permits for scientific or educational purposes, holding permits for either exhibition or scientific research, and limited propagation permits for various scientific or educational purposes.

ADF&G's proposed policy clearly indicates what reviews and permits are required for each kind of project and should alleviate the prior problems caused by a lack of such standards.

PROBLEMS AND ISSUES

1. Lack of statewide goals and objectives for enhancement program.

The 1974 authorizing legislation provides the legislature's intent that private nonprofit corporations (PNPs) contribute to the rehabilitation of the state's depleted and depressed salmon fisheries. Except for some specific regions of the state and gear groups in those regions, this goal has been met. The numbers of Alaska's wild and hatchery fish are at an all time high. Other than the problems of marketing and price, most of the state's salmon fisheries are no longer depressed. Few people dreamed the state's enhancement program would be so successful in terms of quantity of fish. Large enhanced production, in combination with improved management of wild runs and favorable environmental conditions, have resulted in Alaska once again producing record amounts of salmon.

The state does not have a clearly defined policy for future management and development goals for hatcheries and other enhancement efforts that goes beyond increased production. It has been proved it is possible to grow large numbers of fish. Where should we go from here? For example, should our goal be to cap salmon production at a certain level, or cap production of specific species at a set level? Should the focus be on enhancement efforts in other areas of the state that have very small or depressed fisheries with a goal of economic development? Should the focus be shifted to other species such as crab enhancement or sheefish or arctic char? These are the kinds of policies and goals that are yet to be made on a statewide basis.

ADF&G's FRED Division is currently developing a strategic plan for the next decade. However, this plan needs to be developed in conjunction with a statewide planning effort so that FRED's goals and objectives are coordinated with the other elements of the state's enhancement program, including the PNPs. Additionally, adequate financial support is essential to meeting those goals and objectives.

2. Regional v. Statewide Planning.

State law directs salmon production planning to be done on a regional basis. Although the commissioner of ADF&G has overall authority for both PNP and department enhancement efforts, little comprehensive statewide planning is done, with only minimal interaction between regions of the state. Most planning focuses on *production* in a region and not whether the production is *desirable* relative to other regions. Additionally, within each region, state hatcheries have varying interaction with the private enhancement efforts.

Today, however, hatchery produced fish comprise a growing proportion of the statewide harvest. There are concerns that Alaska's production-oriented enhancement program may result in one region's program affecting markets, prices and management in other regions.

Fisheries managers argue that the state needs a statewide planning policy that will take into account the potential impacts of one region on another, as well as closely scrutinizing potential management problems and marketing feasibility.

Others agree with the idea in principle, but maintain that such an effort is impossible in a state where competing interests would find it difficult to agree on a system that diminishes local control over hatchery development and production goals. Shifting to a statewide review could create enormous tensions between the user groups of different regions.

The Board of Directors of the United Fishermen of Alaska (UFA) in January 1992, requested the FRED Division to involve all RPTs in a statewide review process of hatchery production. The request was based on the premise that "[s]ince hatchery production is now at a level that the impacts are no longer confined to one region, UFA believes that such a review is warranted now more than ever."

3. Funding and support for planning.

Fishermen, hatchery operators, and state fisheries managers agree that the RPT planning process provides an important forum for discussing and resolving difficult issues on an ongoing basis.

However, *state support for planning has declined since the early 1980s* when FRED had a budget of over \$500,000 for grants to aquaculture associations. Grants were gradually reduced and eliminated in 1987. Meanwhile, the number of regions requiring plans increased from six in 1987, to ten by the end of 1991. Initial, one-time-only planning grants of up to \$100,000 are still available for regional aquaculture associations from the Department of Commerce and Economic Development.

Despite the need for more rigorous planning because of increased enhanced production, FRED planning staff has declined from two to one and a half positions. These positions coordinate all enhancement efforts statewide, including state facilities, provide technical assistance to the PNPs, and plan new ventures.

Budget reductions have forced state planners to shift priorities from plan development and implementation to plan maintenance. As a result of decreased state support, Prince William Sound and Cook Inlet Aquaculture Associations have hired full time planners. Although hired by the regional associations, these planners consider

themselves staff to the local RPT. However, they are also involved in internal corporate planning, and arguably, this could be considered a conflict.

As a result of budget cuts, new planning efforts are minimal. New ventures are at a distinct disadvantage when compared to those started ten years ago. In the past, there was money for new hatchery projects, either through state general bond initiatives, grants or loans. More recently however, new hatchery initiatives have received little financial support.

FRED managers, gear group representatives and several aquaculture association managers strongly believe that present funding levels for planning are inadequate for FRED to properly oversee the functions of the 37 hatcheries in operation in Alaska. As a result, they believe that many more conflicts and issues will develop that should have been resolved early in the process. Perhaps just as importantly, FRED managers indicate that they are unable to consider the "big picture" issues such as long-term analyses and guidance for future developments.

RPT members also complain that the cutback in funds for planning has limited their contribution to a cursory discussion and approval of permit changes. If a hatchery requests a change in permit, they often have to wait six months or longer to be considered because funds are not available for some RPTs to meet more than twice a year.

4. Composition of Regional Planning Teams

*Although many people believe the regional planning team (RPT) process is a good one if adequately staffed and funded, there are others who believe that the entire structure of the RPT should be changed. A frequent complaint is that the composition of the RPT is heavily weighted towards the commercial sector of the fishing industry, without sufficient representation of subsistence and sport fishing users, community and regional governments, environmentalists, and the general public. These critics argue that in order to have a truly **balanced** decision, all the varied interests of the region need to be adequately represented. Some RPTs have tried to address this complaint by broadening the composition of the team to include all interested groups.*

Another, more fundamental concern is that ADF&G managers are usually out-numbered on the RPTs. As a result, the group can pressure department managers into approving projects that should probably be denied. Department personnel who raise future management concerns are under considerable pressure to be a *positive* presence in the RPT process, which in some cases, translates into withdrawing or modifying their objections without these concerns being adequately addressed. On the other hand, concern has also been expressed that department managers sometimes have a strong, anti-hatchery bias that can influence their management recommendations.

There is also the concern that the non-Fish and Game members of the RPT may not be sufficiently capable of evaluating and making decisions on issues that are increasingly technical in nature.

5. Allocation issues.

While issues such as location, harvest timing and cost recovery projections are scrutinized, the question of allocation is not considered by any of the parties involved with the RPT review process; AS 16.05.251 delegates that responsibility to the Board of Fisheries.

Without the ability to consider allocation issues as part of the permit review process, ADF&G may approve a hatchery permit that could create future allocation problems. By the time the Board of Fisheries begins to consider allocation problems resulting from hatchery production, millions of dollars may have been invested through state loans. The state may well feel a financial obligation to ensure the success of the facility.

In addition, allocation conflicts over hatchery-produced fish may eventually require tagging programs as part of their resolution. The question of tagging -- and who should pay for it -- is one that is more easily addressed early in the planning and permitting process.

Recent developments seem to indicate a change for the future. ***In 1988, the Board of Fisheries charged the Prince William Sound Aquaculture Corporation (PWSAC) with development of an allocation plan for enhanced stocks in Prince William Sound.*** After an intense planning effort and several drafts, PWSAC was able to come up with an allocation scheme that all user groups and the department could support. The allocation plan was approved by the Board of Fisheries in 1991 and was in effect this past fishing season. The regional planning team incorporated the allocation plan with its production and management plans into a comprehensive Phase III maintenance plan.

Using the success of PWSAC as a model, the Board of Fisheries has also directed the two Southeast regional aquaculture associations (NSRAA and SSRAA) to develop an allocation plan for hatchery stocks by March 1993. There is considerable debate among participants and observers as to whether this can be done. Unlike the Prince William Sound plan, which deals primarily with one species and a single user group, Southeast must address deep-seated conflicts between two aquaculture associations, three commercial user groups and several species of salmon, as well as factoring in the complexities of the U.S./Canada salmon treaty.

6. Management issues.

Another complaint is that regional comprehensive salmon plans often focus exclusively on production goals for a hatchery, but provide little specific information on fishery management. Statements such as "management agencies and fishermen should work together to find the best solutions currently available to reverse declines" are common.

Initially, hatchery permitting was a two-stage process. The preliminary application included identification of such things as site, species, and run-timing. It contained little detail, and was given a relatively cursory review by ADF&G to notify the permittee if there were any significant potential problems before the applicant went to the expense of a full permit application. In 1985, however, hatchery permits were placed under the Coastal Zone Management process. As part of permit reform, FRED planners were told that only a single application could be required.

To replace the preliminary application, FRED now requires an initial ***Management Feasibility Analysis*** (MFA) be completed before a final application is submitted. The MFA covers the basics of siting, species, timing, and magnitude of production, and is developed by the Commercial Fisheries and Sport Fisheries Divisions to avoid potential

management problems. Quite often, if red flags are raised during this review process, the original proposal ends up being modified.

Additionally, once an application is deemed acceptable by the department, the department's divisions are again given further opportunity to comment.

FRED planners believe that they have never permitted a hatchery or enhancement project that fisheries managers did not initially approve.

7. Uniform review.

State hatcheries and projects are not subject to the same permitting requirements as PNPs. Some fishermen believe that state projects cause the most allocation, management, and potential biological problems because of the lack of this additional layer of scrutiny. They would like to see permits required for state hatcheries and projects, as well as for PNP projects.

FRED Division believes adding this requirement is unnecessary. Although PNP-type permits are not required, state projects are reviewed through the Coastal Zone Management review process. In addition, the annual management plans for state facilities are submitted to the Regional Planning Teams for review. Some people believe these projects often receive more critical review than the PNP projects. Both state and PNP operations also require Fish Transport Permits (FTPs).

8. Criteria to show public benefit.

Four criteria must be considered by the RPT to determine if a permit application is in compliance with the regional comprehensive salmon plan:

- the contribution the proposed hatchery would make to the common property fishery;
- the provisions for protecting wild stocks from any adverse effects which may originate from the proposed hatchery;
- the compatibility of the proposed hatchery with the goals and objectives of the comprehensive salmon plan for the region; and
- whether the proposed hatchery would make the best use of the site's potential to benefit the common property fishery.

Critics say these criteria should be expanded to consider other public benefits and costs. Possible additions include marketability, a detailed cost-benefit analysis, and ongoing genetic and biological monitoring.

9. Operation performance reviews and permit revocation.

State managers and RPT gear group representatives are also concerned about ADF&G's authority over hatcheries that are out of compliance with state laws, regulations, and permit requirements.

Present regulations allow RPTs, at the direction of the ADF&G commissioner, to review a hatchery's compliance with statutes and regulations, and to recommend the suspension, alteration or revocation of a permit if certain performance standards are not met such as survival rates and contribution to the common property fishery. However, a recent attorney general's opinion required that one hatchery facing revocation of a permit must be given a hearing before an administrative officer under the Administrative Procedures Act. This can be a relatively lengthy process.

With the potential risk of impacts on the state's common property fisheries, managers and some RPT members believe a mechanism to allow for the timely revocation of a permit is necessary. They advocate for a change in the statute to allow the ADF&G commissioner to revoke, suspend or alter a permit for any violation of Title 16 without going through APA requirements.

10. Hatchery Siting Privileges

If a region has an organized aquaculture association, that association, under state statutes, has the preference rights to all potential hatchery sites in that region. Non-association PNPs (Mom and Pops) have expressed concern that giving priority use of potential sites to an association is not good public policy. The Mom and Pop operations believe that any unused hatchery sites should be available to both associations and non-association PNPs.

11. Canadian evaluation model

The Canadian government is considered to have a model evaluation program of its national salmon enhancement program. Under the auspices of the Internal Audit and Program Evaluation Branch of the Department of Fisheries and Oceans, this program is intended to provide a thorough and comprehensive review of the program, by facility.

The first evaluation project began in 1985 and concluded that there was not enough production and biological data available to carry out a proper program evaluation. The program audit branch then designed the optimum evaluation framework and determined what kind of data would be needed. These data included biological and production information, as well as an analysis of economic costs and benefits. With that data in hand, program auditors are now preparing to spend a year reviewing the entire program, with a final report due in March 1993. Federal funds are being used for this project, although university staff and consulting firms are conducting the actual evaluation.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Working with the public and user groups to develop statewide goals and objectives for the state's entire fisheries enhancement program.
- Directing FRED Division to develop a program to implement these goals and objectives.
- Declaring a moratorium on further hatchery development or increased production until the Legislature's economic cost-benefit studies are complete and a full assessment of the state's program can be made.

- Development of a statewide planning process.
- Development of a statewide production plan.
- Requiring FRED to develop a comprehensive annual report that not only compiles production figures from state and PNP facilities, projects, and current management regimes, but also includes future production and management plans.
- Evaluation of the composition and procedures of the RPT to determine if changes in the RPT structure are necessary.
- Expansion of state statutes to require all hatcheries, including state facilities, to comply with a single planning and permitting process, with the same requirements for monitoring and review.
- Widening the scope of RPT review, including recommendations for allocation of enhancement production.
- Providing adequate funding for planning.
- Reviewing the required Management Feasibility Analysis to determine if it needs to be a more comprehensive review.
- As part of permit review and solicitation of state loans, consideration of adding new criteria to show public benefit, including marketability, a detailed cost/benefit analysis instead of a financial feasibility analysis, a more specific indication of the "significant contribution" to be made to the common property fishery, and some kind of environmental assessment.
- Providing concrete direction for the timely performance review of PNP hatcheries and a more workable mechanism for closing or converting hatcheries not making a "significant" contribution to the common property fishery.
- Exempting the alteration, suspension or revocation of an enhancement permit for violations from the Administrative Procedures Act.
- Instituting a regular review process similar to the Canadian model.
- Clarifying Board of Fisheries authority to regulate hatchery production levels.
- Re-evaluation of the policy of giving regional aquaculture associations the preference rights to develop future hatchery sites in the region.

Planning Process

Regional Planning Team

Regional Comprehensive Plans

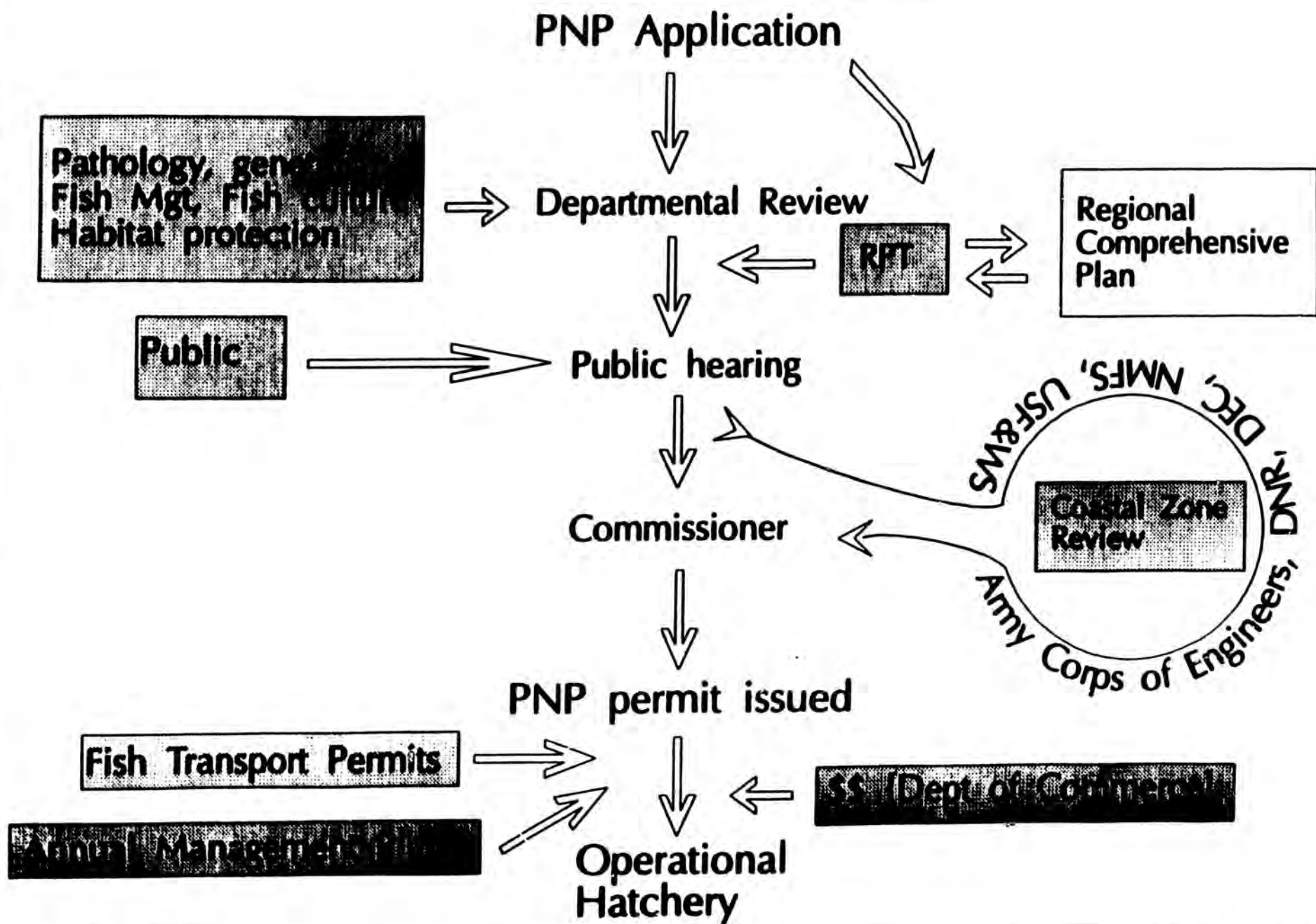
Historic harvests,
production/harvest
goals by area, species

Project
opportunities
to fill gaps

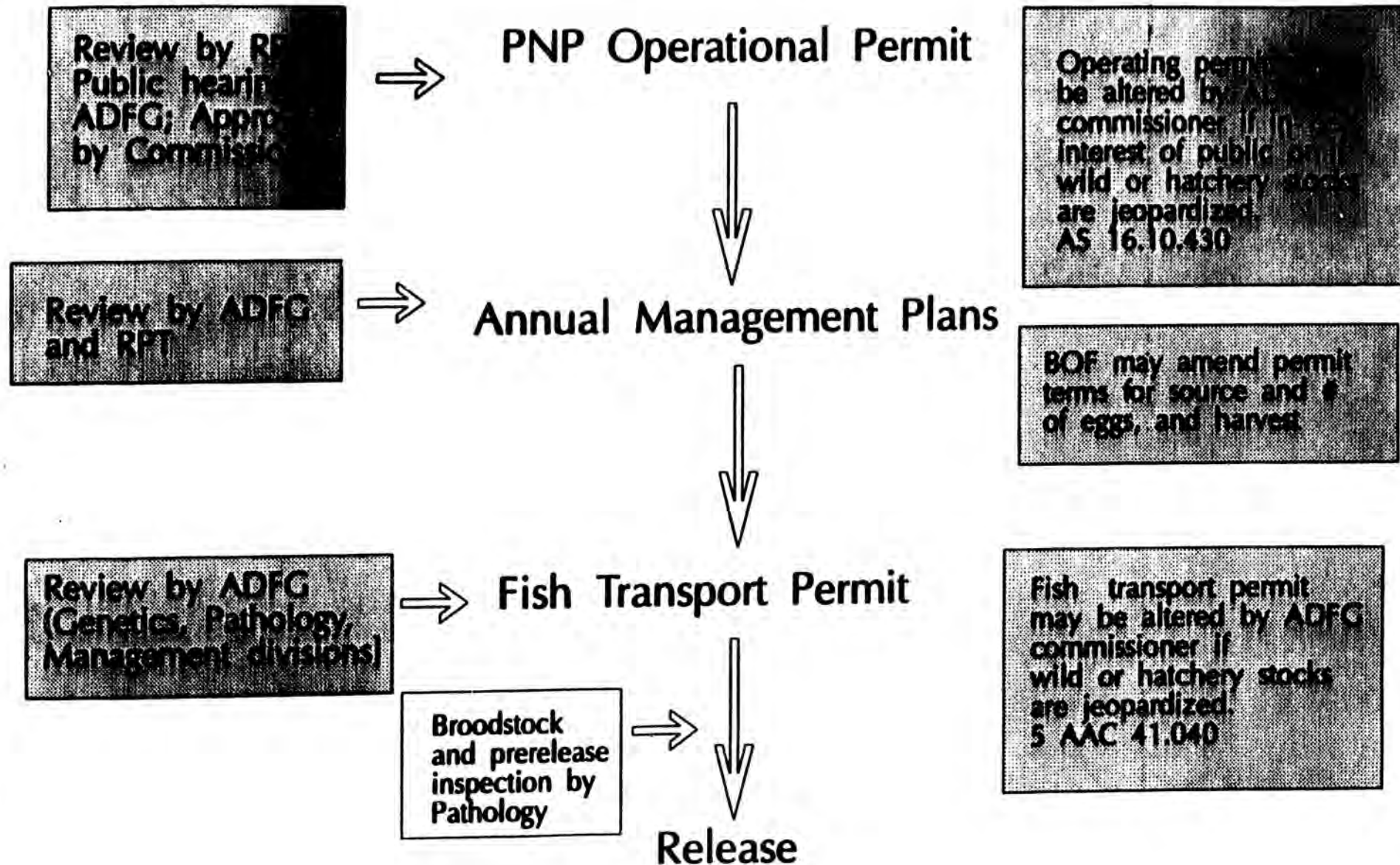


Attachment to
Chapter VI.

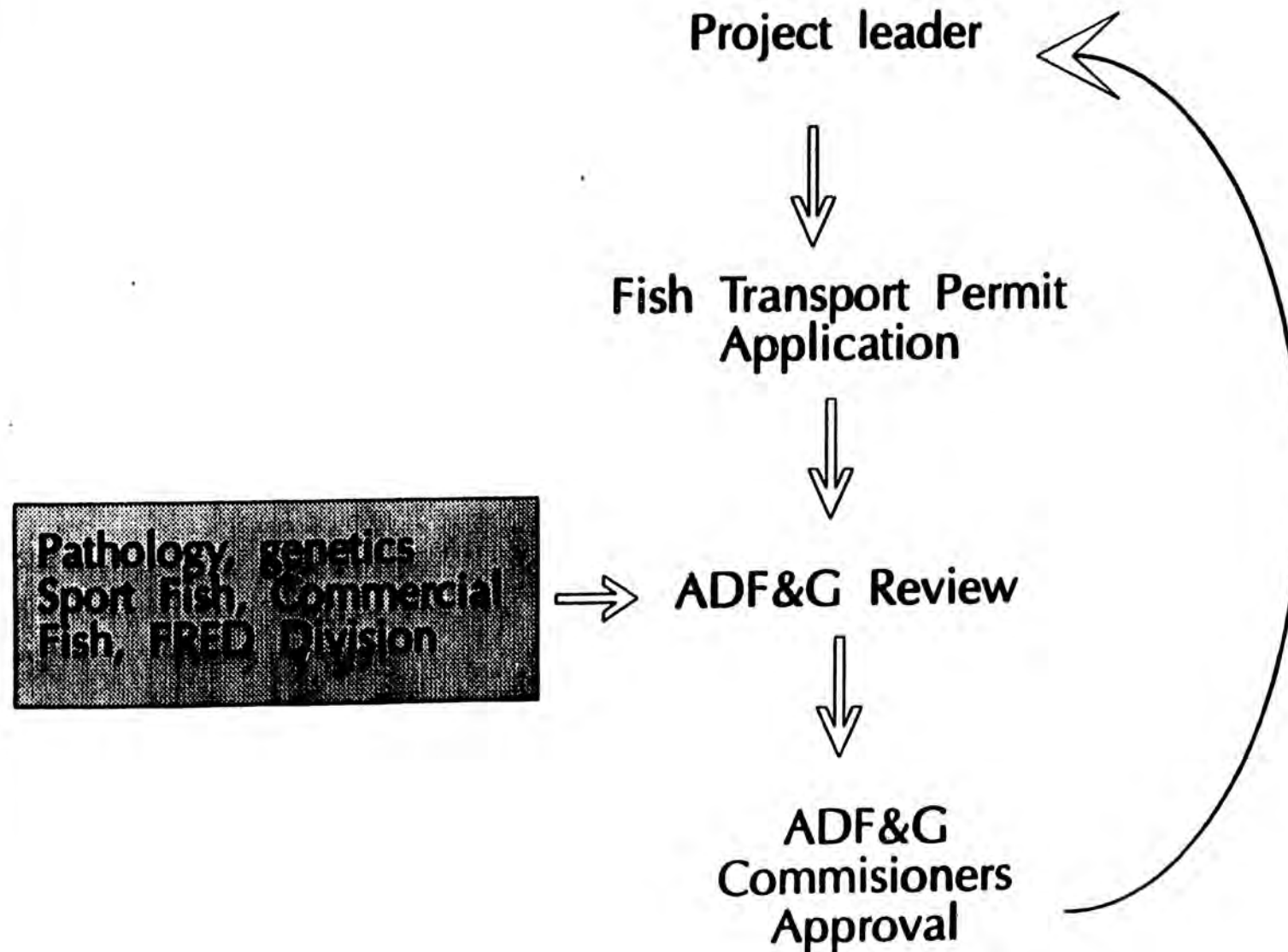
PNP Application Process



Regulation of PNP Hatcheries



Fish Transport Permit Process



CHAPTER VII. BIOLOGICAL/GENETIC ISSUES

In November 1991, in Cordova, Alaska, the Prince William Sound Science Center (PWSSC) and the School of Fisheries and Ocean Sciences, University of Alaska Fairbanks, convened a group of world-renowned experts to examine "The Biological Basis for Maintaining Strong Co-existing Stocks of Natural and Enhanced Salmon Populations in Alaska." This workshop followed a series of international symposiums on this topic during the past two years. Top fisheries biologists, ecologists and geneticists from the United States, Norway, Sweden, the Soviet Union and Japan were present at the Cordova workshop. As a follow-up to the workshop, the group intends to produce a summary report and list of recommended policies and procedures to be considered by the state of Alaska in managing its wild and enhanced salmon stocks. That report is expected in late February.

The cumulative effect of hydroelectric dams, habitat destruction, overfishing, and large-scale hatcheries has led to the decimation of many wild salmon stocks in Pacific Northwest states. Biologists in states with a long history of hatchery programs are generally less enthusiastic about these programs than biologists in areas such as Alaska and British Columbia with comparatively recent programs. *Although poor hatchery practices can clearly endanger wild salmon populations, scientists do not agree on the extent to which hatcheries with sound practices can co-exist with sustained healthy runs of wild salmon.*

The lack of consensus among scientists largely results from insufficient data and research, and at times, professional bias. Even where information exists, however, it is often subject to conflicting interpretations. To complicate matters, results of specific studies may not be transferable to other areas or salmon species, and year-to-year environmental changes may affect the results of these studies.

THE GENETIC EFFECTS OF HATCHERIES

Most scientists agree that it is essential to have healthy wild stocks to maintain the health and genetic diversity of both wild and hatchery stocks; genetic diversity must be preserved. Scientific knowledge about the genetic impact on wild stocks of hatchery fish, however, is still incomplete. Reduction in the fitness of salmon stocks, to the extent it has been documented, may involve numerous factors. Most scientists agree that hatcheries can complicate mixed-stock fisheries and affect the genetic composition of wild fish stocks. Scientists do not agree on the extent to which genetic changes affect the short- or long-run fitness of wild stocks.

Straying and intermingling of stocks is a major concern to scientists. The extent of straying, the variables involved in imprinting, and the effects of interbreeding are largely unknown. Large-scale ocean ranching appears to set the stage for straying of wild stocks in the harvest areas of enhanced stocks and also for hatchery fish to stray into the natural streams. What impact this has on the genetic diversity of salmon stocks in a given region is a question that remains to be answered. However, the concern is that intermingling may reduce the fitness of the locally adapted populations.

It is known that the greater the distance between the donor stream or hatchery and the release site, the greater the amount of straying. Many scientists are concerned about the extensive releases at remote sites practiced by many hatchery operations today, with many more planned for the future. They fear that such

straying could potentially, in time, destroy genetic diversity -- resulting in a permanent, irreversible loss. Some scientists believe remote releases should be banned altogether. Others believe they should be permitted with stringent controls and careful monitoring.

OCEAN CARRYING CAPACITY

Some scientists suspect that the carrying capacity of nearshore marine waters and the high seas for salmon may be exceeded by large-scale releases of hatchery salmon. A reduction in the average size of salmon was reported throughout the Pacific region in 1991, but various factors may be responsible. Since 95 percent of the growth of salmon occurs at sea, some researchers believe ocean conditions affect the size of salmon more than competition. Much evidence, however, supports the theory of density-dependent growth for some salmon species, although there is considerable debate regarding its occurrence. More information is needed on the effects of predation and competitors.

DISEASE

Few studies document the transmittal of diseases between hatchery and wild salmon, and there is no documentation of such transmittal in Alaska. Where transmittal of a disease by hatchery salmon has been documented, it occurred after fish were transplanted long distances. Hatchery fish appear to be more vulnerable to disease than wild fish because of the stress of hatchery conditions and large concentrations of eggs and fry. Norway has had considerable problems with disease transmitted by farmed salmon that have escaped and mixed with wild stocks.

Active fish pathology laboratories are maintained by the FRED Division in both Juneau and Anchorage. Their basic function is to implement policies and procedures that guard against the spread of fish and shellfish diseases in Alaska. Reviewing fish transport permits in order to reduce the occurrence of disease is a major task of the labs, as is examining each broodstock for disease prior to its use in a hatchery.

STATE GENETICS PROGRAM AND POLICY

The state genetics program is intended to implement policies and procedures that protect and maintain the genetic uniqueness of Alaska's wild salmon stocks in the face of North America's largest salmon enhancement program. The state's fish genetics policy, considered to be one of the most stringent in the world, was last revised in 1985, and will be reexamined and updated this year.

Alaska's genetic policy contains guidelines and restrictions intended to protect the genetic integrity of wild stocks. The *goal* is to maintain adequate genetic variability, ensuring that the enhanced stock will be able to adapt to changing environmental conditions.

Geneticists have two primary concerns in protecting wild stocks and implementing a successful enhancement program. The first is possible genetic impacts due to gene flow between wild or enhanced stocks; the primary concern being, of course, for wild stocks. The second concern is the loss of genetic variation within or among stocks. Both impacts

can potentially cause the reduction of total fitness in wild stocks and hatchery broodstocks. These problems are addressed in the policy's three main topic areas: stock transport, protection of wild stocks, and the maintenance of genetic variation.

Since specific knowledge of salmon population genetics and the genetic impacts of salmon enhancement on wild stocks was limited, the 1985 genetic policy was based primarily on information from agricultural genetics and research on other species. As a result, the policy contains guidelines that are rather flexible. The policy suggests that because scientific knowledge is limited, fish transport should be evaluated conservatively. For example, if genetic similarity decreases with distance, arbitrary limits must be set on the distance a stock can be transported. For that reason, the Fish Transport Permit process is the prime regulatory tool in the genetic policy. *ADF&G is attempting to clarify some of the flexible guidelines in the revised policy by incorporating knowledge gained from recent studies of the population genetics of salmonids.*

The genetic policy also acknowledges that all salmon runs are not of equal importance. The effect of a salmon enhancement project depends to some degree on the relative value of the stock that might be impacted. However, the policy says that the concept of "significant stock" only relates to the size of a fish population in the context of local importance and use. A population that would be considered insignificant in size in one region, may be of vital importance in another region.

OPTIONS FOR POSSIBLE CONSIDERATION:

Although a report of recommended management actions resulting from the Cordova workshop is expected in late February, some preliminary options for consideration include:

- Evaluation of how well the current hatchery program protects wild salmon from possible negative effects of hatchery salmon. Such a review would help policy makers determine the risk of various alternatives for the future of Alaska's hatchery program.
- Increasing the amount of genetic monitoring required of hatchery operators, and directing ADF&G to continuously review and analyze resulting data statewide.
- Obtaining consensus about research priorities concerning the interaction of hatchery and wild fish in Alaska, coordinating future studies, and deciding how and when to apply the results of those studies to current management practices.
- Conducting research to define the minimum conditions for imprinting for remote release programs.
- Review of current and future programs for their compliance with the state genetics policy.
- Placing greater emphasis on management concerns in the permitting process in order to protect wild stocks.
- Re-examination of escapement goals in order to maximize wild productivity.

- Increased use of marking and tagging programs to monitor interactions between hatchery and wild populations.
- Policy development to minimize inbreeding and straying, including an evaluation of remote releases.
- Treating a remote release site as a de facto hatchery site in terms of broodstock and hatchery site guidelines, even if all fish are expected to be harvested.
- Identification of genetic population structures to determine what populations are genetically distinct.
- Survey of populations prior to any enhancement activity to provide a baseline for subsequent genetic monitoring. Evaluation of genetic consequences of hatchery production on adjacent populations during phased-in expansion, with production increases halted if adverse impacts are noted.
- Monitoring wild and hatchery stocks to determine extent of straying and intermingling.

Alaska State Legislature

Legislative Research Agency



P.O. Box Y
Juneau, AK 99811-3100
Phone: (907) 165-3991
Fax: (907) 163-3331

September 11, 1991

MEMORANDUM

TO: Senator Lloyd Jones
FROM: Glenn T. Gray ^{GT6}
Legislative Analyst
RE: Effect of Hatchery Salmon on Wild Salmon
Research Request 91.303

You requested information about how hatchery-produced salmon affect wild stocks. You asked us to address five specific questions relating to this issue:

- 1) Do hatchery-produced fish cause genetic dilution of natural stocks?
- 2) Does the harvest of hatchery salmon result in unintended harvest of wild stocks?
- 3) Do hatchery salmon compete with wild stocks for food?
- 4) Is predation by hatchery salmon on wild salmon a significant threat to wild stocks?
- 5) Are wild stocks vulnerable to diseases that originate with hatchery-produced fish?

For this memorandum we reviewed studies by scientists from Alaska, other states, Canada, Japan, the Soviet Far East and Europe. We also reviewed abstracts of papers presented at recent conferences concerning the genetic implications of interaction between enhanced and wild fish. We then discussed these studies and related topics with several scientists and personnel from the Alaska Department of Fish and Game (ADF&G).

This memorandum begins by defining some important terms which are commonly used in discussions of salmon biology. Next, an introduction provides an overview of current knowledge of the effects of hatchery salmon on wild fish. Then each of the five questions you posed are addressed. We also identify other possible biological effects of hatchery salmon on wild stocks. This is followed by a discussion of how management can minimize possible negative effects of hatcheries. The memorandum ends with a summary of concerns voiced by biologists about hatcheries and research needs for the future.

DEFINITIONS

Biologists have traditionally recognized six species of Pacific salmon: coho (*Oncorhynchus kisutch*), chum (*Oncorhynchus keta*), chinook (*Oncorhynchus tshawytscha*), pink (*Oncorhynchus gorbuscha*), sockeye (*Oncorhynchus nerka*), and masu (*Oncorhynchus masu*). All but masu salmon may be found in Alaska waters. Recently, cutthroat trout (*Oncorhynchus clarki*) and steelhead (*Oncorhynchus mykiss*) have been reclassified as Pacific salmon. Atlantic salmon (*Salmo salar*) are not native to the Pacific, but some of them have escaped from fish farms in British Columbia.¹ Salmonids are a biological grouping which includes salmon species as well as related fish such as trout, char and whitefish. Most salmon are anadromous, that is they have both freshwater and saltwater residencies during different periods of their life. Some Pacific salmon spend their whole life in fresh water: Kokanee salmon are sockeye salmon that remain in lakes, rainbow trout are steelhead that live in lakes or streams, and cutthroat trout may also spend their life in fresh water.

We use the term stock to refer to groups of fish of the same species with a similar genetic background that return to spawn in the same locality, and do not generally interbreed with other groups of fish.² Some watersheds may have two or more salmon stocks, but these stocks usually spawn at different times or at different parts of the watershed.³ Fish of a particular stock have a unique genetic make-up because wild salmon generally do not interbreed with other stocks. (As a result of natural straying, stocks spawning near each other would be expected to have more similar traits than stocks located further apart.) Some fishery experts prefer the term population because the term stock is often used in many different contexts. Alaska statutes, for example, define fish stocks less precisely.⁴

A wild stock, as used in this memorandum, is a distinct group of fish descended from a population of fish historically found in a particular area that have not bred to a significant degree with fish from another area.⁵ A natural run is a self-sustaining group of "wild" fish in a natural environment that may or may not have genetic influence from hatchery or farmed fish.

¹Although Atlantic salmon have been caught in Alaska waters, there have been no reports of naturally reproducing populations.

²The term stock generally refers to wild fish because hatchery fish may have originated from several different stocks.

³Larkin (1981) notes that in some instances the "differences among the tributaries of a single river are greater than those among comparable tributaries of different rivers" p. 1460.

⁴Alaska Statute 16.05.940(15) defines a fish stock as "a species, subspecies, geographic grouping or other category of fish manageable as a unit."

⁵The Oregon Wild Fish Management Policy defines a wild fish as one that is descended from a population present in the same area since 1800.

A mixed stock fishery occurs when fish of different wild stocks or hatchery and wild stocks intermingle during commercial harvest. Many of the fisheries in Alaska are mixed stock fisheries. Fisheries that occur after stocks separate are known as terminal fisheries. In watersheds where several stocks spawn, individual stocks may not completely separate until they reach up-water spawning grounds. While terminal fisheries are desirable from a management perspective because stocks may be harvested selectively, they may not be economically desirable because the quality of the flesh deteriorates as the fish approach fresh water.

Genetic variability is measured by the "number, frequency, and diversity of alleles present. Alleles are the variant forms of the gene" (Kelly et al. 1989, p. 60). A procedure known as protein electrophoresis measures allele frequencies and can be used to identify different stocks as well as genetic changes these fish may experience.⁶ Electrophoresis may also be used to measure heterozygosity (an indication of the variation of genes) to determine whether hatchery fish have lost genetic variability. Although electrophoresis is useful to determine a difference between some salmon stocks, the test does not reveal differences between all salmon stocks. Salmon stocks that cannot be differentiated by electrophoresis may be marked through a process known as genetic tagging.

Fisheries enhancement includes a variety of methods to augment natural runs. Hatcheries, construction of spawning channels, and lake fertilization are several examples of enhancement. Hatchery-produced fish are released to open water and are known as ranched fish; while fish raised in net pens and never released are known as farmed fish.

Fitness is the ability of fish to survive competition, predation and disease and return to native spawning streams. Some scientists suspect that wild fish are more fit than hatchery fish because wild fish have evolved through thousands of years of natural selection.

Brood stock are the fish used to start or maintain a hatchery. After salmon eggs hatch and their yolk sacs are consumed, the young fish are known as fry. When immature salmon migrate to the sea they are called smolts.

INTRODUCTION

Hatcheries have become a major contributor to commercial fisheries in the Pacific during the past two decades. As the numbers of wild salmon have decreased, Pacific Northwest states have become increasingly dependent on salmon produced by hatcheries. Except for masu and kokanee salmon, Japan depends almost entirely on hatchery stocks to supply its commercial fisheries

⁶Electrophoresis works better with chinook and chum salmon than with sockeye, pink, or coho salmon (Seeb, personal communication).

(Kelly et al. 1989).⁷ Although the Soviet Far East and Alaska still have many wild stocks, both have ambitious hatchery programs. For example, in recent years hatchery fish have comprised up to 98 percent of the total pink salmon harvest in Prince William Sound (Geiger et al. 1991). Despite the increasing contribution of salmon hatcheries, much is still unknown about the effect hatchery fish have on wild stocks. Additionally, some fear that the long-term productivity of hatcheries cannot be sustained (Hilborn 1990).

Each of the questions addressed in this memorandum are discussed separately, but they may actually be related, and addressing them separately may overlook cumulative impacts. For example, the genetic impact of straying salmon may be greater for a stock that has been reduced by over-fishing than for a healthy stock. Likewise, other influences of hatchery fish may have a detrimental cumulative effect when combined with practices destructive to wild fish (e.g., over-fishing and habitat destruction).

Most of the issues addressed in this memorandum ultimately relate to a concern about a reduction of genetic variability in wild salmon stocks. Genetic variability of a specific stock may be reduced when the size of that stock is significantly diminished. The numbers of a specific stock may be reduced by habitat loss, over-fishing, predation, disease, competition, and possibly by disturbance of wild fish nests (redds) by later-spawning salmon. Some geneticists believe that genetic integrity of a stock could also be at risk because of "genetic pollution" which occurs when hatchery fish breed with wild fish and introduce traits that may not be suited to a particular stream. Genetics most likely determine such traits as the timing of smolting, disease resistance, temperature tolerance, size of eggs, size of fish, timing of return, and possibly the ability of a salmon to find its natal stream. Because the brood stock for hatcheries are often obtained from distant watersheds, hatchery salmon may not be genetically suited for rivers near the hatchery. Hatchery fish which stray to local streams and spawn with wild stocks might introduce traits that would reduce the ability of wild salmon fry to survive in their natal stream.

During the 1970's, when Alaska's current hatchery program began, some biologists expressed concern about the risk to wild salmon of large numbers of hatchery salmon.⁸ These concerns have been amplified in recent years. Several scientific conferences have convened to discuss the interactions of wild and hatchery salmon. A recent article by the American Fisheries Society's Endangered Species Committee identifies 159 West Coast salmon stocks at risk of extinction and 54 additional stocks of special concern (Nehlsen et al.

⁷Attempts to develop natural runs of coho, chinook, and sockeye salmon in Japan have been unsuccessful.

⁸The Alaska District of the American Institute of Fishery Research Biologists issued a position paper concerned with genetic implications of hatcheries in 1975 (Attachment A). This organization was concerned that legislation creating private, nonprofit hatcheries did not address genetic issues.

1991).⁹ Habitat loss, over-fishing, and negative interactions with hatchery fish were cited as the major threats to the wild stocks. The article notes that there is a high probability that 104 of these wild stocks have suffered genetic changes from the presence of hatchery fish.

Although researchers have recently placed more emphasis on studying the possible impacts of hatchery salmon on wild salmon, scientists debate the results of these studies. Many factors could be responsible for the decline of a salmon stock. Weak runs may result from habitat disturbance, over-fishing, disease, competition with other fish, or unsatisfactory environmental conditions, as well as a reduction in fitness from the influence of hatchery fish.

Even when evidence suggests that hatchery fish may have adversely affected a specific wild stock, it is difficult to generalize from that evidence about other stocks. First, each species of salmon has a different life history, different lengths of time in freshwater and marine environments, and different preferences for habitat and feeding.¹⁰ Second, a study in one area may produce different results than if it was conducted in another environment or using different research methods. Third, the same study completed during separate years could have different results because of changing environmental conditions from year-to-year. Fourth, the location of a hatchery and its operating procedures will influence the effects of hatchery fish on wild populations. Fifth, the source of hatchery brood stock may determine the effect on local wild salmon. Sixth, different researchers may reach different conclusions from the same data. Lastly, there is often a shortage of baseline data on wild stocks (many significant stocks may not yet be identified), so it is difficult to measure changes that may occur.

Despite the gaps in scientific knowledge, there is consensus on at least two major points. First, fishery experts agree that in mixed stock fisheries where there are strong hatchery returns and weak wild stocks, wild stocks are likely to be over-harvested. Second, fishery geneticists generally agree that hatchery salmon have the potential to alter the genetics of wild fish. Researchers do not agree, however, if interbreeding between hatchery and wild fish will reduce the long-term fitness of wild salmon stocks. Likewise, there is not a consensus about how hatchery fish affect wild fish through competition, transmission of disease, and predation. Large-scale releases of hatchery salmon, however, are more likely to result in more profound effects on wild salmon than are releases of smaller numbers of fish.

⁹Salmon stocks in California, Oregon, Idaho and Washington were examined in this study.

¹⁰Reimers (1979) reports that life histories of juvenile chinook salmon vary both within and among stocks although many managers fail to recognize such variation.

GENETIC DILUTION OF NATURAL FISH STOCKS BY HATCHERY-PRODUCED FISH

The genetic diversity of wild salmon populations in Alaska is the result of ten thousand years of natural selection.¹¹ Biologists assume that specific salmon stocks are best suited to their immediate native environment and that wide genetic diversity permits the stock to withstand extreme changes in environmental conditions. Wild stocks are "adapted to their local habitats, yet flexible enough to respond to future changes in these habitats" (Oregon 1990). The consensus among geneticists is that "fitness (reproductive potential) is enhanced by heterozygosity (genetic variability)" (ADF&G 1985, p. 14).

The subject of genetic dilution is further addressed under several subheadings: the lack of scientific consensus, evidence of reduced genetic variability, causes of reduced variability, interbreeding of hatchery and wild salmon, and evidence of a loss of fitness.

Lack of Scientific Consensus

While there is a general consensus among biologists that hatchery strays can affect the genetic make-up of wild fish, it is difficult to prove that such changes will reduce the fitness of a naturally spawning salmon stock. Kelly et al. (1989) surveyed salmon experts and found no "solid data base which could support a documented position (either pro or con) regarding the effects of interbreeding among wild and hatchery fish" (p. 83). Waples et al. (1990) state that compared to other management problems, there has been little effort to address the genetic aspects of salmon management. The current state of scientific knowledge is unable to bridge the gap between the ardent proponents of aquaculture and those who recommend a more cautious approach. Chettleburgh (1991) states that genetic pollution

has become a rallying point for the opponents of aquaculture, particularly commercial fishermen and environmentalists who use the issue with impunity since it is almost impossible to prove or disprove. The effects, if any, may take centuries to occur. (p. 3)

Many scientists agree that literature on genetic impacts is not conclusive and "is largely speculative in nature and without much hard evidence" (Smoker 1985, p. 3). Poor returns can be blamed on over-fishing or bad environmental conditions (Helle 1981). Yet the increased attention given to the topic during the past few years reflects a growing concern by fisheries managers and

¹¹Two levels of genetic variation occur: differences between fish of the same stock and differences between different stocks (Oregon 1990).

scientists.¹² Those who encourage a conservative approach point out that loss of genetic variability that has evolved for thousands of years may be irreplaceable.

While some scientists are critical of hatcheries because of a fear that they may reduce fitness by altering genetic diversity, others are willing to accept some risks as long as production is increased (Mathisen 1991). As a result, different jurisdictions approach salmon enhancement from different perspectives. For example, while the Alaska Department of Fish and Game (ADF&G) Genetic Policy gives priority to wild stocks, Japan gives priority to enhanced fish.

Evidence of a Reduction in Genetic Variability

Several methods are used to determine the difference between hatchery and wild fish, including scale pattern analyses and starch gel electrophoresis of tissue proteins. Periodic genetic monitoring using electrophoresis can determine if there has been a change in allelic frequencies and therefore a reduction in genetic variability. These studies can reveal if there has been gene flow between a hatchery and wild population and if the genetic variability has been reduced. This process, however, does not reveal if hatchery-wild hybrids are more or less fit than the wild fish. In other words, geneticists can use electrophoresis to determine if a fish is a hatchery fish or a wild fish or if salmon stocks, such as hatchery fish, have lost genetic variability (assuming that the test recognizes a genetic difference between hatchery and wild fish and that electrophoresis data is available for the stocks before hatchery fish entered the gene pool).¹³ With salmon stocks that do not show a discernable difference using electrophoresis, it may be necessary to use a marking program such as coded wire tagging to determine if hatchery fish are spawning with native fish.

Researchers from around the world have found a reduction of genetic variability in enhanced salmon. In Ireland, Whelan and McGinnity (1991) found that a rare allele has been lost in hatchery fish. Japanese researchers found that concerns about a reduction of genetic variability are supported by a decrease in the number of late run chums and odd-year pinks, reduction of variations in

¹²The 1980 FAO-UNEP Expert Consultation on the Conservation of Genetic Resources of Fish, sponsored by the United Nations, was one of the first major conferences to deal with this topic. Several recent conferences include the April 1990 conference in Loen, Norway; the June 1990 NATO-sponsored Genetic Conservation of Salmonid Fishes in Moscow, Idaho; and the International Symposium on Biological Interactions of Enhanced and Wild Salmonids in Nanaimo, British Columbia. Dr. Ole Mathisen is planning a workshop on this topic to be held in Alaska this fall, and Dr. Tony Gharrett is organizing a panel discussion at the November 1991 meeting of the Alaska Chapter of the American Fisheries Society.

¹³According to Steer et al. (1991), there is a scarcity of data for wild stocks compared to enhanced fish.

the timing and duration of maturation of individual fish, and a reduction in the proportion of the effective number of breeding to total number of returning fish (Kaeriyama 1991). A Soviet Far East study of the Ochepukha watershed found that although selected breeding practices reduce the genetic potential of the hatchery salmon, researchers have not been able to detect any significant differences in abundance, size, weight or fertility of males between streams with only natural runs and those with both wild and enhanced stock (Shubin and Kaevo 1991). Ryman and Stahl (1981) report strong evidence suggesting that hatchery fish in Scandinavia have drastically changed the genetic composition of wild brown trout.

Causes of Reductions in Genetic Variability

Hatchery practices can lead to a reduction of genetic variability. For example, poor hatchery management could reduce the genetic variability through inbreeding or as a result of inadvertent or purposeful selection.

Inbreeding

Crossing salmon that are directly related to one another can result in a loss of genetic variability known as inbreeding. According to Smoker (1985),¹⁴ studies have shown that inbreeding is a distinct possibility in a hatchery. Practices such as the use of a low male to female ratio or too few fish for brood stock may increase the possibility of inbred fish in future generations. The use of local wild stocks to periodically refresh hatchery populations is one way to avoid inbreeding. Studies have not yet documented inbreeding for Pacific salmon hatchery stocks. Riddell et al. (1991), however, speculate that inbreeding could account for reductions in body size of cohos. Waples et al. (1990) note that there have been no comprehensive attempts to determine if hatcheries have been successful in their attempts to prevent inbreeding. Inbreeding depression (loss of vigor) has been documented for some hatchery-raised trout species and Atlantic salmon (Kelly et al. 1989). This may be the result of using a small number of fish to start these hatcheries.

Additionally, studies have not documented a reduction in the average heterozygosity of a Pacific salmon hatchery stock when compared to the whole species (Kelly et al. 1989, Smoker 1985).¹⁵ A lower value of heterozygosity

¹⁴Smoker (1985) reports that a study has shown that with 50 spawners, a hatchery would lose 10 percent variability after ten generations and 25 percent after 20 to 30 generations.

¹⁵Unless studies have been completed for wild fish before genetic interaction with hatchery fish, comparing average heterozygosity of hatchery fish to that of "wild" fish may not be valid.

in Japanese chum salmon when compared with U.S.¹⁶ chum salmon suggests a loss of genetic variability for chum salmon in Japan.

Selection

The rate of genetic change may increase dramatically in hatcheries through selection, which may be either deliberate or unintentional. Selection of large males and earlier-run salmon for hatchery brood stock has resulted in earlier runs of Sakhalin Island chum salmon. The fish are bigger but the rate of reproduction has decreased (Khorevin 1991). Larkin (1981) suggests that a change in traits of hatchery salmon is likely and selection over generations may explain a perceived decline in the fitness of hatchery stocks.

Some scientists recommend against intentional selection for hatchery fish for specific characteristics such as size, growth, and color (Krueger et al. 1981). The ADF&G's Genetic Policy recommends that brood stock represent a broad cross section of the genetic diversity of a run. However, Larkin (1981) suggests that selected hatchery stocks could improve wild stocks and that the "truth may well be that wild stocks improve hatchery strains rather than that hatchery strains dilute wild stocks" (p. 1473). He suggests that deliberate selection could also offset selection by the fishery, perfect transplanting techniques, and determine the timing of hatchery runs. Smoker (1985) also suggests that hatchery salmon could increase genetic diversity in stocks that have been decimated through over-fishing or as a result of natural population crashes. This is because a small escapement of such a stock could lead to inbreeding.

Actions of hatchery personnel or hatchery conditions may result in inadvertent selection. Hatchery-produced salmon may adapt to hatchery conditions which differ from conditions in the wild. To avoid selection of fish tolerant of hatchery conditions Krueger et al. (1981) recommend release of fish at an early age.

Spawning behavior in the wild involves an elaborate courtship ritual and an establishment of a hierarchy of males. Pink salmon tend to mate with similar sized mates and these progeny tend to be more viable than matings between fish of different sizes, as often occurs in hatcheries (Chebanov 1991). Thus, even random pairing of hatchery fish are likely to produce different pairings than what would occur naturally (Helle 1981).

Natural selection in hatcheries produce fish adapted to hatchery conditions which may not have survived in freshwater conditions (for those salmon that do not migrate immediately). If these salmon survive ocean conditions, they could stray to local streams and if successful at reproduction they could reduce fitness.

¹⁶Japanese fisheries are almost completely dependent on hatchery production.

Interbreeding of Hatchery and Wild Fish

The increased straying of hatchery salmon, especially transplanted fish, can result in the transfer of ill-adapted genes. Large-scale hatcheries can be expected to have more strays than small-scale hatcheries (Smoker 1985).

Although it is known that salmon will stray to some degree, scientists do not agree about the degree straying occurs. We were unable to find many studies that predict a specific percentage of strays for either wild, hatchery or farmed salmon.¹⁷ Gritsenko (1991) found that there is a significant increase in spawners due to straying from large rivers in the Okhotsk Sea coast of Sakhalin Island, but that there is poor survival of their progeny. Using a mathematical model, Zhivotovsky et al. (1991) found that straying between stocks had a significant influence on the dynamics of pink salmon populations. On the other hand, an Alaska study at Auke Creek suggests that pink salmon do not ordinarily stray in large numbers to nearby streams, and that there may be some degree of genetic isolation between runs that spawn at different times in the same stream (Gharrett and McGregor 1991). Other studies may not consider that pink salmon are known to test various streams before ultimately spawning in their natal stream (Gharrett, personal communication). Therefore, the extent of straying suggested by some researchers may be exaggerated.

Many authors report that transplanted and hatchery salmon stray more often than wild salmon. Helle (1981) reports that transplanted salmon have a reduced homing ability. Waples et al. (1990) think that straying rates may be higher for hatchery fish. Gausen and Moen (1991) found that greater numbers of escaped farm salmon spawn in rivers within twenty kilometers of a net pen facility. Bams (1976) conducted an experiment in British Columbia using transplanted pink salmon, hybrids of transplanted males and wild females, and wild salmon. He found that for a stream in British Columbia, transplanted salmon were the least likely to return to spawn. The hybrids were more likely to return, but the wild salmon had the best chances of returning. In a similar experiment, Smoker (1985) found that transplanted salmon may be more fit than transplanted-wild hybrids. The propensity of transplants to stray may mean that genetics play a role in the ability of pink salmon to return to their natal streams. Larkin (1981) suggests that the straying of hatchery fish may be due to rearing conditions instead of or in addition to genetics.

Although hatchery salmon may stray more than wild salmon, Soviet scientists Gritsenko and Kovtun (1991) think that locating a hatchery away from natural spawning areas can reduce straying and the impact of straying on the gene pool of wild stocks. The authors maintain that wild and enhanced fish can co-exist as two reproductively isolated groups.

¹⁷A 1991 study by Hard and Heard that studied chinook returns from a fish hatchery in Little Port Walter that used transplanted salmon. Of the 1.1 percent of the fish that strayed, approximately 1/3 of them strayed within 7 kilometers, almost 2/3 strayed less than 25 kilometers, and the most distant stray was 500 kilometers away. Curiously, none of them strayed to their original rivers which were 250 kilometers from the hatchery.

The ADF&G Genetic Policy acknowledges the potential of straying hatchery fish to reduce the fitness of the naturally spawning fish, but it also suggests that hatchery strays may have little impact on wild stocks.

The degree of interbreeding between hatchery and wild fish can only be detected if there is a significant genetic difference between the two. Studies have revealed little contributions by hatchery steelhead fish to wild fish in the Skagit River after twenty years of stocking. On the Yakima River, considerable introgression (introduction of genetic material from one gene pool to another) between hatchery and nonanadromous wild steelhead occurred, yet anadromous steelhead have shown little introgression with hatchery fish (Campton 1991). Hindar et al. (1991) cite several other studies that reveal introgression between hatchery or farmed salmonids and wild stocks.

Evidence of a Loss of Fitness

Some studies have shown that hybrids of wild and nonlocal salmon are less fit than their wild counterparts (Waples et al. 1990). Because many traits are thought to be inherited, biologists fear that hybrids will be less able to compete, less resistant to disease, and more vulnerable to predation. Allendorf (1991) points to the growing evidence of a loss of local adaptations. Larkin (1981) reports that some people suspect that declining success of hatcheries after a decade or so may be due to genetic changes. Hindar et al. (1991) state that a "considerable body of relevant indirect evidence" points to adaptive changes resulting from interbreeding (p. 950).

On the other hand, according to Kelly et al. (1989), some fishery specialists do not think that hatchery-wild hybrids will detrimentally affect wild stocks. Additionally, there is speculation that in some cases of over-fished wild salmon stocks, hatchery fish may actually increase the fitness of the wild stocks (Kelly et al. 1989; Larkin 1981). However, according to Davis and Burkett (1989), "[a]ny loss of genetic variation results in a loss of fitness, but any gain in genetic variation may or may not improve fitness" (p. 4).

Some researchers have found that wild smolts are more likely to survive than hatchery smolts (Hilborn et al. 1991; Whelan and McGinnity 1991). Swain and Riddell (1991) suggest that if hatchery fish mate with wild stocks, the offspring may be less fit than the wild fish, but that throughout time, wild fish stocks would likely regain fitness.

A study in Norway found that farmed brown trout males do not survive well in wild streams and that only a limited amount of spawning occurred between wild males and farmed females (Skaala et al. 1991). Flemming and Gross (1991) found similar results with hatchery-reared coho salmon in Vancouver Island, British Columbia. Hatchery salmon, especially males, did not reproduce well unless there were no fish in the stream. As the density of spawners increased, the reproductive success of the hatchery fish decreased. Hatchery fish that do breed in the wild could produce a genetically inferior fish. Reisenbichler and McIntyre (1977) revealed that hatchery steelhead were genetically different from wild steelhead and that they did not survive as well as wild fish.

Some studies using hatchery and wild fish from the same parents have found that the hatchery fish do not survive as well as wild fish in natural conditions. These results suggest that a reduction in fitness is a response to hatchery conditions rather than caused by genetics. A study using progeny of the same parents reared one group naturally and the other in the hatchery found that the hatchery group had a reduced osmoregulatory ability (i.e., diffusion of water through cell walls). Because both came from same stock, the difference was probably a response to the rearing environment (Shrimpton et al. 1991). Ward et al. (1991) found that pen-reared steelhead from wild parents survived at lower rates than wild steelhead.

Transplants

Hatchery salmon bred from salmon transplanted from long distances have a greater chance of being less fit than those bred from a local stock. The ADF&G Genetic Policy assumes that hatchery stock from a different geographic area could reduce fitness of a salmon stock, but it is not known if this reduction is critical (Davis and Burkett 1989). The policy suggests that it may be safe to transfer stocks from within the same region for brood stock (ADF&G 1985).

Many states, including Alaska, restrict the transport of live fish or gametes (eggs or sperm) to decrease the chance of spreading disease and to be sure fish used in hatchery operations are similar to local stocks. Recently, however, an increase of fish smuggling by aquacultural operators was reported in California (CAA 1990).

INCREASED FISHING PRESSURE ON WILD STOCKS

In a survey of fishery professionals about the effect of hatchery fish on wild fish, Kelly et al. (1989) found that the greatest consensus was that large-scale releases of hatchery fish can be detrimental to wild fish stocks if there is no feasible way to separate the fish before harvest. "Almost all hatchery-produced salmon in Alaska have the potential for engendering mixed-stock fishery management problems" (Smoker 1985, 14). Mixed stock fisheries are difficult to manage because there is a danger that the smaller stocks will be over-harvested. The state's mixed stock policy encourages terminal fisheries whenever possible (fisheries that occur after the stocks separate). It is not economically feasible to fish at many terminal fisheries because once salmon near their spawning area, the quality of their flesh declines as they adopt spawning characteristics.

While there is danger of over-exploitation of a weak stock in mixed stock fisheries, the problem is compounded with the addition of hatchery stocks (Smoker 1985). Hatchery stocks need less brood stock than wild fish, so it is

possible to have a higher harvest rate for hatchery fish than for wild fish.¹⁸ Especially with large-scale hatcheries, it is difficult to estimate the numbers of wild fish returning (unless they are separated physically or at the time of return). A certain number of wild fish are needed to sustain a stock's genetic variability.

The director of ADF&G's Division of Commercial Fisheries in 1982 explained that with fisheries enhancement, "[w]e may not be able to fully develop some sites and stocks without declines in natural stocks or foregoing harvests of enhanced stock unless we modify our current way of managing" (Pennoyer 1982, p. 113). Under mixed stock fisheries "stocks which are of consistently lower productivity will probably have consistently lower escapements and sooner or later will decline, often drastically, even with 'good management'" (Pennoyer 1982, p. 112).

Many examples document that optimum harvest of hatchery fish in mixed stock fisheries has occurred at the expense of wild fish. Because hatchery fish can withstand a higher exploitation rate than wild fish, wild stocks will be over-harvested unless the entire fishery is limited (Waples et al. 1990). An Oregon study found that the decline in abundance of wild coho salmon in the Columbia river coincided with a sharp increase in harvest rates. The study suggests that current harvest rates will result in the extinction of wild coho (Cramer 1991).

In the Baltic Sea, the number of natural Atlantic salmon drastically declined as a result of an off-shore fishery on mixed stocks (Eriksson and Eriksson 1991). Hilborn (1990) reports that high harvest rates of hatchery fish in the waters between British Columbia's Vancouver Island and the mainland has resulted in an increase in hatchery production, a decline in wild stocks "and the Canadians have no more coho now than they did fifteen years ago" (p. 3). Enhancement activities (new spawning channels) in Babine Lake of British Columbia's Skeena River basin significantly increased production at the expense of other basin stocks (Smoker 1985).

The risks inherent in mixed-stock fishing may be reduced if hatchery and wild fish spawn at different times. Although original hatchery stocks in Prince William Sound were selected to be later or earlier than the wild runs, there is some overlap. Wild stocks can be easily over-harvested at the entrance to the sound in areas where stocks are mixed, such as happened during 1990 (Geiger et al. 1991). According to Eggers et al. (1991), the recent decline in wild pink salmon in Prince William Sound is believed to be a result of low escapement due to over-fishing of wild stocks. Hatchery and wild stocks are harvested together "in the near-terminal mixed-stocks fishing areas and as cost

¹⁸Optimum harvest rates for hatchery fish are 90 to 95 percent while optimum rates of harvest for wild fish are between 60 to 75 percent (Kelly et al. 1989). Hatchery production results in fewer mortalities than wild production because wild fish are subject to changing environmental conditions, competition and disturbance of redds by other fish.

recovery in the hatchery terminal harvest areas" (p. 4). The authors ascribe the low escapement of wild fish to "a weak implementation of the fixed escapement goal policy" (p. 27). In other words, in order to harvest the high numbers of hatchery-reared salmon before they lose quality, harvest rates of wild salmon in these fisheries have reduced the number of wild salmon escapement to levels lower than before the hatcheries were built.

To assess the pressure exerted upon wild fish, some method of identifying the numbers of wild and hatchery salmon must be used. Coded wire tags are sometimes inserted in juvenile fish. The coded wire tag program in Prince William Sound, however, doubled the cost of managing that fishery. A recently introduced marking method, known as thermo-marking, relies on distinctive markings on the fish's otolith (ear bone) as a result of different water temperatures in the hatchery. Each hatchery using this method uses a different sequence of water temperatures. Electrophoresis is another technique that can be used to separate stocks, although it has limitations. The lack of a marking program for hatchery fish from the Gastineau hatchery in Juneau made it impossible to determine if poor returns in 1989 were due to over-harvesting (Geiger et al. 1991).

Smoker (1985) recommends several possible solutions to reduce over-fishing of mixed hatchery-wild stocks: 1) identify the percentage of wild fish in the mixed-stock fishery and reduce catch levels to permit sufficient escapement of the wild stocks, 2) establish annual catch quotas for the fishery, 3) use hatchery stock that return at a different time than wild fish, and 4) restrict the numbers of hatchery fish produced. Smoker acknowledges the problems with each of these solutions.

COMPETITION FOR FOOD BETWEEN WILD AND HATCHERY-PRODUCED FISH

The issue of carrying capacity (the number of fish that can be supported in a given area) of salmon is still contentious. Inhibited growth of salmon due to competition with other fish is known as density-dependent growth. It is difficult to determine if density dependency is the cause of a reduced average size of salmon or if this reduction is a result of poor environmental conditions (e.g., less food sources due to colder water temperatures), or a combination of factors. It should be noted that even if density dependency is found to be an important factor in one area, it may not be as important in another area or at another time. Environmental conditions may be different during different years and in different places. Also, salmon of the same species may have different migration patterns in different areas.¹⁹ Different

¹⁹In the Soviet Far East, salmon from East and West Kamchatka spend about three months in coastal waters while those in southwestern Sakhalin Island spend up to five months in coastal waters (Karpenko 1991).

life histories of Pacific salmon species makes it difficult to generalize about density-dependency factors for all salmon.²⁰

According to Peterman (1984), "[d]ensity-dependent growth or survival has been well documented for the freshwater life phase of Pacific salmon," but less is known about such limitations in marine waters. Given the lack of knowledge of density-dependent growth among wild fish, it is even more difficult to determine how important competition between hatchery and wild fish is. Many scientists suspect, however, that hatchery and wild salmon may compete for food in freshwater, in estuaries, in saltwater nearshore areas, and in the open ocean. Hatchery fish may also displace wild fish from their habitat during juvenile freshwater residence and during spawning (Hindar et al. 1991). Additionally, Kelly et al. (1989) report that some scientists believe that hatchery-wild hybrids may be less able to compete with other fish for food. The density-dependency dispute will only be answered by studies that span many years and consider a variety of factors including fluctuations in environmental conditions and the numbers of hatchery fish released. The discussion below centers on existing studies on this subject.

Competition in Freshwater

A Washington study in two rivers suggests that hatchery coho fry were better able to compete than wild fry. The production of hatchery fry increased, but the total number of fry living to smolts stayed the same. While the number of hatchery smolts increased, the number of wild smolts decreased (Seiler et al. 1991). Reisenbichler and McIntyre (1977) also found that hatchery fish released into stream systems may affect wild fish through competition for food and space. Lichatowich and McIntyre (1987) report that hatchery coho smolts displaced wild fry. Another Washington study, however, found that neither wild nor hatchery coho (from native stock) fry were affected by the presence of the other when released into four streams (Wampler et al. 1991). A study in France showed that if prey density is low, coho salmon escaped from farms could affect the density and growth rate of native Atlantic salmon (Beall and Heland 1991).

Competition in Estuaries

Some evidence points to density dependence in estuaries. Larkin (1981) notes that the unnaturally high numbers of hatchery salmon released at one time may displace wild fish at the site of release as well as in the estuaries and offshore rearing areas. Preliminary research in British Columbia estuaries reveals that migration of large numbers of hatchery-raised sockeye smolts may affect the growth and distribution of wild chinook fry in some estuaries. The researchers suspect that the limitations in the estuary may be due to space and food (McAllister and Levings 1991).

²⁰For example, pink and chum salmon immediately migrate to salt water and do not have competition pressures in freshwater. On the other hand, sockeye coho salmon may spend several years in freshwater and are therefore subject to different types of competition.

Competition in Nearshore Areas

Ocean survival may depend on nearshore competition. Bob Burkett, chief of technology and development for the FRED division places a high priority on studies concerning the nearshore carrying capacity (Gay 1991). Some salmon spend the early portion of their marine life in nearshore areas. Ivankov and Volkov (1991) found that competition for food is an important factor in early marine life survival for juvenile salmon. Karpenko (1991) found that the availability of food, determined in part by the numbers of juveniles, is a major factor determining survival of juveniles. An Oregon study that involved the review of demographic records of salmon stocks suggests that the carrying capacity of nearshore areas may be exceeded during some years. However, according to Smoker (1985), other authors have interpreted the same data and reached the opposite conclusion.

Eggers et al. (1991) acknowledge that it is possible that the nearshore carrying capacity of Prince William Sound may be nearly reached, but there "does not appear to be any competitive interaction between hatchery and wild stocks" (p. 23). Some people speculate, however, that the reduced size in salmon during the 1991 season was due to competition as a result of high hatchery production (Miller 1991).

Competition in the Ocean

Studies suggest that there may be density-dependent growth in the Gulf of Alaska. Peterman (1984) revealed that significant reductions in body sizes of adult sockeye salmon occurred during years of high numbers of sockeye salmon in the Gulf of Alaska. This study suggests that growth in the gulf is slowed during early ocean life and most likely results from "competition for food among similar-sized sockeye."²¹ Eggers et al. (1991) report that a trend in decreasing average weight suggests that pink salmon growth in the Gulf of Alaska may also be density dependent, affected in part to increasing hatchery returns.

Studies in other parts of the world also suggest a relationship between high numbers of salmon and reduced growth. A Japanese study found that during the last decade of increased chum salmon hatchery production, salmon have decreased in size along with a decrease of the mean age at maturity. Stunted growth during the first year in the ocean suggests that the rate of growth decreased because of increased numbers of fish competing for food (Hayashizaki and Hitoshi 1991). Kaeriyama (1991) also suggests that a reduction in size and average age of adult chum results from density-dependent growth, but found little evidence that survival has declined (Kaeriyama 1991).

²¹According to Peterman (1984) 80 percent of the sockeye in the Gulf of Alaska are from British Columbia and Bristol Bay. The density-dependent growth appears to be between fish of the same stocks as well as among sockeye from different origins.

Smoker (1985) modeled factors affecting ocean survival and found that large releases of hatchery salmon could not only result in a reduction of survival and growth but also could lead to increased variability of salmon abundance from generation to generation. While salmon may have more food available than they need in many areas, food may be patchy during their first summer at sea and "transitory limits to carrying capacity" may be important. Production of salmon has been more variable as hatchery production has increased in Hokkaido Island, Japan and in Oregon (Smoker 1985).

Ricker (1981) notes a decrease in the average size and age of Pacific salmon since the 1920s. He attributes this decrease to eight possible causes, including the possibility that some aspect of artificial propagation has caused slower growth.

Other studies suggest that density-dependent growth is unlikely. Smoker (1985) reports several studies that show no evidence that ocean growth is limited by density of the salmon. One of these studies simulated the growth and survival of salmon during the first six months of ocean life and found that more food is available to Pacific salmon than is consumed.

Should nearshore density-dependency growth be a threat, possible solutions include staggering the release of stocks and rearing salmon to a larger size before release. Future monitoring of growth, age and survival records will help determine where density-dependent growth appears to be a problem.

PREDATION ON WILD STOCKS BY HATCHERY PRODUCED FISH

Little is known about predation by hatchery fish. Generalities based on individual studies are problematic because of differences in the life histories of different salmon species (e.g., differences in freshwater residency, time spent in nearshore areas and ocean migration patterns). While there is evidence of predation by hatchery fish on wild salmon, wild salmon also target hatchery fry.

Ivankov and Volkov (1991) found that predation was an important factor in early marine life survival for juvenile salmon. Most knowledge of predation is in freshwater, estuaries and nearshore areas, and few studies quantify the loss of wild salmon by predation of hatchery fish (Smoker 1985). Hilborn (1990) states that hatchery fish pose a possible threat to wild fish by predation upon them. Smoker (1985) also suspects that enhanced fish may prey upon wild fish. Correlations between releases of hatchery salmon and declines in wild stocks have been observed. Hatchery releases of coho have been found to be coincident with decreases in pink and chum stocks in Washington. In another part of the state, delaying the release of hatchery coho until pink salmon migrated resulted in greater survival of pink salmon (Smoker 1985).

Coho salmon raised as smolts are known to feed on hatchery-produced pink salmon, and early predation in estuaries may be heavier than later predation. Additionally, large numbers of hatchery-released fry may attract coho salmon, which will feed on hatchery as well as wild salmon fry (Smoker 1985, Hindar et al. 1991).

Wood et al. (1991) found that declining sockeye returns to four lakes on Vancouver Island, British Columbia, were not a result of predation by hatchery smolts during the downstream migration. The researchers suspect that marine survival may be affected by predators attracted to nearshore areas because of the large numbers of juvenile salmon present there.

Karpenko (1991) reports that mortality of salmon due to predation varies from 1.5 to 52 percent in coastal waters of various regions. Fish, birds and marine mammals feed on juvenile salmon, but other species of fish (e.g., smelt, Arctic char and Siberian Char) are the most significant predators. Predation was found to be highest during the peak period of downstream out-migration for pink and chum salmon.

Some authors report predation upon hatchery fish as a reason for a reduction in hatchery fish. Beamish and Thomson (1991) report that in the Strait of Georgia, British Columbia, the average survival of hatchery coho and chinook were initially higher than that for wild fish, but after five years the survival rate decreased below historic levels for wild fish. The authors speculate that the cause of the decline in the survival rate may be due to a cyclic decrease in other food for predators so that they target hatchery fish. A Washington study suggests that hatchery fish may be more vulnerable than wild fish to predation by squawfish although the researchers concede that the higher predation may be because the hatchery fish were the most abundant prey (Fresh et al. 1991). One laboratory revealed that under pressure of predation hatchery chum had reduced feeding when compared to wild chum (Tompkins 1991).

THREAT OF DISEASE FROM HATCHERY-PRODUCED FISH ON WILD STOCKS

The threat of disease and parasites is twofold. First, a possible reduction of genetic diversity resulting from interbreeding with hatchery fish could make a natural population of salmon more susceptible to disease. Second, diseased hatchery stock could transmit the illness to wild stocks.

Few studies document the transmission of disease between hatchery and wild fish. However, Kitchell (1991) reports that hatchery-transmitted diseases may have led to the death of thousands of salmon in the Great Lakes. In a California hatchery, an unintentional cross between chinook and coho resulted in a hybrid that may have resulted in the first outbreak of IHN in coho (a viral disease lethal to hatchery chinook not normally found in coho salmon). None of these crossbreeds have been found returning to a hatchery, however (Bragg 1991). The ADF&G fisheries pathologist Ted Meyers knows of no instances in Alaska where hatchery fish have transmitted diseases to wild fish (personal communication). The ADF&G policy about the control of disease prescribes methods to reduce the transmittal of disease from hatchery-fish to wild fish (Attachment B).

The use of transplanted fish from one area to another can increase the chance of disease outbreak in the wild fish. For example, 23 wild stocks in Norway were decimated after the introduction of fish from the Baltic spread a parasite (Menke 1990). Smoker (1985) reports that researchers in Oregon speculate that transplanted coho may have weakened the ability of wild coho to resist the

pathogen *Ceratomyxa shasta* in Nehalem Bay. Although transplanting fish from outside of Alaska is prohibited now, during the 1970s out-of-state chinook stock were raised in Ketchikan's Crystal Lake hatchery and in the Dredge Lake area in Juneau. The ADF&G terminated this project after the IHN virus infested the transplanted chinook salmon (Burkett, personal communication).

Captive fish are more susceptible to disease because of stress caused by the hatchery environment (FFTF 1990). There is some speculation that hatchery-wild hybrids may be less resistant to disease than wild fish (Kelly et al. 1989).

OTHER EFFECTS

Hatchery salmon may affect wild salmon in other ways not addressed above. Some professionals theorize that wild fish may follow hatchery fish as a result of a chemical (pheromonal) attraction (Kelly et al. 1989). A detrimental effect of hatchery salmon may result when late-spawning hatchery strays dig up the redds of the wild fish (Menke 1990). Additionally, in Pacific Northwest states some hatcheries that fail to produce adults must use wild stocks for a source of eggs and thereby present a net drain to already dwindling numbers of wild stocks (Hilborn et al. 1991). Over-exploitation of wild brood stock for a hatchery on Sakhalin Island in the Soviet Far East also resulted in destroying chum salmon runs from small brooks of the Tym River (Gritsenko and Kovtun 1991).

Recent experiments with gene transfer techniques could someday be used in commercial salmon hatcheries to produce faster-growing fish or ones with greater environmental tolerance. The American Fisheries Society has recommended that such fish not be used in aquaculture facilities without completion of risk assessment studies (Kapuscinski and Hallerman 1990).

An additional consideration relates to the effect large unharvested returns of hatchery salmon may have on wild salmon. During the 1991 season, a significantly large return of hatchery pink salmon returned later than normal but matured earlier than normal. As a result of market saturation, millions of these fish were not harvested. The effect of this large unharvested return is unknown and a few questions remain unanswered. Did hatchery fish displace wild salmon in local streams? Will there be a subsequent reduction of wild salmon in future years? Will there be a larger number of hatchery-wild hybrids? Although there are no funds allocated to study these questions, tissue samples from Prince William Sound rivers are being preserved for possible study in the future.

HATCHERY MANAGEMENT IMPLICATIONS FOR WILD SALMON

Proper siting of a hatchery along with good hatchery management and effective management of the commercial fisheries will reduce the potential for adverse biological interaction between hatcheries and wild fish. Conversely, improper siting and poor management practices will increase the risks of adverse interaction. The following discussion considers the effects of management in

general and then provides an overview of management programs in Alaska and Pacific Northwest states.

Sound Hatchery Management Practices

According to Helle (1981), the location of a hatchery is the most important factor that will help maintain wild populations. Hatcheries must be able to separate wild and enhanced stocks either through time or space. General consensus among biologists is that large-scale hatcheries can potentially wield more damage to wild stocks than smaller facilities. Larkin (1981), however, notes that in some cases large centralized hatchery facilities may be practical.

Other potential problems resulting from hatcheries may be minimized by following specific procedures. The risk of losing genetic variability in hatchery salmon can be reduced by using a large founder population, random pairing representing a wide cross section of the local run, avoiding intentional selection, and crossing wild and hatchery fish every season (Kelly et al. 1989). Although there is no official policy for renewing hatchery stocks Menke (1990) claims that

Alaska fisheries officials agree that it may be a good idea to renew hatchery production with wild eggs and sperm on a frequent cyclic basis, perhaps every four years or so (p. 50).

Some scientists recommend that wild salmon mating behavior be emulated as much as possible (e.g., use as high a ratio of male to female fish as occurs in the wild). Hatchery and wild fish can be kept genetically similar by initially using local brood stock and by periodically renewing hatchery stock with local fish.

Maitland et al. (1981) recommend the establishment of a worldwide system to identify and monitor wild salmonids. They suggest that a group such as the International Union of Nature and Natural Resources (IUCN) undertake this project. Others advocate the creation of areas known as genetic sanctuaries to protect significant salmon stocks. Enhancement activities would be prohibited in these areas (FFTF 1990; Helle 1981, ADF&G 1985).²²

Waples et al. (1990) recommend that programs be expanded to identify different genetic stocks, monitor genetic changes in hatcheries, and evaluate the consequences of proposed large-scale enhancement programs. Kelly et al. (1989) recommend meticulous record keeping for hatcheries about such topics as breeding practices, disease resistance and average heterozygosity. Use of recently developed thermo-marking techniques may eventually make it feasible to mark all hatchery fish and determine the extent to which salmon stray.

²²No gene bank programs for salmon are officially recognized in the U.S. (Kelly et al. 1989).

Other management initiatives may become important in the future. Release of sterile hatchery salmon may be used to prevent hatchery fish from affecting the gene pools of wild stocks.²³ Sperm from fish can be stored (cryopreserved), but preservation of eggs or embryos has not yet been accomplished (Thorgaard and Cloud 1991).²⁴ Wildt and Rall (1991) warn that such techniques should not be used as a "quick-fix" but instead be used along with other conservation techniques. Norway's gene bank program involves the deep freeze of sperm and establishment of living gene banks in brook stock-stations. The program began in an effort to preserve genetic material before the genetic make-up of wild fish were negatively affected by fish farm strays (Gausen 1991). Gene banks have also been established in the Soviet Union (Helle 1983).

A paper by the American Fisheries Society recommends federal regulation of salmon and steelhead hatchery programs to preserve existing genetic diversity (Nehlsen et al. 1991). The authors think that federal regulation now could reduce future listings of stocks as required by the Endangered Species Act.

Alaska Hatchery Management

Because management can minimize or exacerbate the negative impacts of hatcheries, some discussion of Alaska statutes, regulations and policies is appropriate. However, a critique Alaska's hatchery program is beyond the scope of this memorandum.

The intent language of the 1974 legislation authorizing private nonprofit hatcheries reflects a priority for wild stocks.

The program shall be operated without adversely affecting natural stocks of fish in the state and under a policy of management which allows reasonable segregation of returning hatchery-reared salmon from naturally occurring stocks (Chapter 111 SLA 1974).

Alaska Statute 16.10.400 states that the ADF&G commissioner will not issue a hatchery permit unless the hatchery "would result in substantial public benefits and would not jeopardize natural stocks." Other statutes do not show a clear preference for management of wild stocks over hatchery salmon (White, personal communication; Utermohle, personal communication).

Alaska statutes direct ADF&G's Division of Fisheries Rehabilitation, Enhancement and Development (FRED) to complete state and regional plans. Alaska Statute 16.05.090(1) requires the FRED division to "develop and

²³Sterile triploid brook trout are recommended by Corely-Smith et al. (1991) to protect their genetic material. Triploid fish can be created by using heat treatments or by crossing tetraploid females with diploid males. Seeb (1991) reports that the British Columbia government is considering the use of sterile net pen fish to prevent escapees from spawning with wild fish.

²⁴Alaska is using sperm cryopreservation for fish on the Chilcat River (Seeb 1991).

continually maintain a comprehensive, coordinated state plan for the orderly present and long-range rehabilitation, enhancement and development of all aspects of the state's fisheries . . . and revise and update this plan annually." Alaska Statute 16.10.375 mandates the completion of comprehensive salmon plans by regional planning teams. State statutes also require each hatchery to complete an annual report including information about the brood stock used (AS 16.10.470).

The ADF&G regulations seek to minimize adverse impacts of hatcheries. For example, regulations specify that during the application phase for hatchery construction, regional planning teams review permit applications including provisions to protect natural stocks (5 AAC 40.170), a public hearing is held, and the department reviews the permit to be sure that hatchery returns will not "unreasonably or adversely affect management of natural stocks" (5 AAC 40.220). Regulations also mandate that hatcheries complete an annual management plan that outlines production goals, brood stock management and the management of the harvest of hatchery returns (5 AAC 40.840). A performance review is also required that evaluates the effect of the hatchery on natural stocks (5 AAC 40.860). Regulations require that a fish transport permit be obtained before transporting live fish within the state (5 AAC 41.005), and prohibit the importation of live fish from outside the state (5 AAC 41.070). Regulations also mandate disease control and inspection (5 AAC 41.310).

The ADF&G policies also address hatchery management. A 1982 draft manual of policies and procedures for the nonprofit hatchery program was never approved, but some of the policies were codified in regulation (ADF&G 1982). The Genetics Policy, is one of the most important current policies about hatcheries. This policy, a policy about disease and a policy about permitting nonprofit salmon hatcheries in Alaska are contained in Attachment B.

The ADF&G's Genetic Policy was created to "protect the genetic integrity of important wild stocks."²⁵ An eight-member team of public and private salmon experts produced the most recent version in 1985, but the policy is currently being reevaluated. The policy gives first priority "to protection of wild stocks from possible harmful interactions with introduced stocks." Comments by ADF&G officials have, however, indicated that preference could be given to

²⁵The Finfish Farming Task Force (1990) alleged that the policy is not always rigorously enforced and recommended that an ad hoc committee be appointed to assess compliance with this policy. The task force also recommended that guidelines in the policy be codified in statute.

hatchery stocks in certain situations.²⁶ The Genetic Policy also recommends that:

- stocks should not be transported between the large geographical areas of the state (no maximum distance is identified),
- donor stock should be physically similar to local stocks but local stocks are preferred,
- significant wild stocks should be identified, and watersheds with such stocks should only be stocked with progeny from indigenous fish,²⁷
- wild stock sanctuaries should be established where enhancement would be prohibited,²⁸
- a single donor stock should not be used for more than three hatchery stocks, and
- a minimum effective population of 400 brood stock should be used to develop and maintain hatchery stocks.

The second portion of the policy describes current knowledge and uncertainties about the effects of hatchery fish on wild fish.

The State of Alaska addresses the impact of hatcheries on wild stocks through statutes, regulations and policy, but some ADF&G commercial fisheries personnel have suggested changes. Geiger et al. (1991) recommend establishment of clear guiding principles for the hatchery program. The authors suggest that production-based objectives are in conflict with preservation of the genetic integrity of wild stocks and the reduction of fishing effort on specific wild stocks. Eggers et al. (1991) argue for an integrated management system "to

²⁶Kelly et al. (1989) report that the commissioner of ADF&G in 1981 stated that "... in some instances ADF&G would consider carrying out a program to purposely alter a wild stock for the benefit of a hatchery stock, provided circumstances indicate that the best interests of both the public and the resources would be served" (p. 30). The director of the Division of Commercial Fisheries in 1981 stated that "[c]onscious trade-offs of weak or smaller natural stocks may be justified by the magnitude of enhancement opportunity, but this cost must be carefully measured" (Pennoyer 1982, p. 113).

²⁷The team did not define "significant stocks" but instead left it to the Salmon Enhancement Regional Planning Teams to define this term. To date, significant stocks have not been identified.

²⁸At this time, there have been no formal designations of wild stock sanctuaries or conservation areas. A formal policy is currently being written that will outline procedures to establish such sanctuaries (Burkett personal communication).

meet dual objectives of protecting wild stocks and hatchery cost recovery/brood stock needs" (p. 30).

Wild Salmon Management in Other West Coast States

Severely depleted runs of wild salmon in Pacific Northwest states have prompted proposals to classify some of these stocks as endangered species. Fishery scientists there have a growing concern about the role of hatcheries in the depletion of natural runs. Accordingly, Oregon responded to the decrease in wild salmon by creating its Wild Fish Management Policy in 1990 (Attachment C).²⁹ The policy mandates that the Department of Fish and Wildlife identify all salmon populations (stocks) in the state. The policy also prescribes specific standards to protect wild salmon,

Other jurisdictions approach wild fish management in a variety of ways. Idaho gives first consideration to wild fish if there is a conflict between the two, and it gives priority to preserving genetic integrity over maximizing harvest potential. Washington has allocated 25 percent of Puget Sound for hatchery salmon, but the rest of the sound is managed for wild fish (Hindar et al. 1991). British Columbia classifies streams in three categories ranging from management for wild salmon (with some hatchery production) to streams managed for hatchery fish (Kelly et al 1991).

SUMMARY

The cumulative effect of habitat destruction, over-fishing and large-scale hatcheries has lead to the decimation of many wild salmon stocks in Pacific Northwest states. Biologists in states with a long history of hatchery programs are generally less enthusiastic about these programs than biologists in areas such as Alaska and British Columbia with comparatively recent programs. Although poor hatchery practices can clearly endanger wild salmon populations, scientists do not agree on the extent to which hatcheries with sound practices can coexist with sustained healthy runs of wild salmon.

Current Knowledge About the Effect of Hatcheries

Little is known about the interactions of hatchery and wild fish, but most scientists agree that hatcheries can complicate mixed stock fisheries and affect the genetics of wild fish stocks. Scientists do not agree on the degree such genetic changes will affect the fitness of wild stocks or if long-term fitness will be affected at all. Those who think that hatcheries negatively affect wild salmon generally agree that small-scale, strategically located facilities using local stocks will minimize the effects. Many biologists think that the biggest threat to wild fish occurs in areas where there are extremely

²⁹The policy, written in the form of regulations by the Oregon Fish and Wildlife Commission, is an enforceable standard of law.

large releases of hatchery fish that will compete with, predate upon, or mate with wild fish.

The lack of consensus among scientists results from a lack of data and research, but even where information exists, it is often subject to different interpretations. To complicate matters, results of specific studies may not be transferable to other areas or other salmon species, and year-to-year environmental changes may affect the results of these studies.

Genetic Ramifications

Scientific knowledge about the genetic impact on wild stocks of hatchery fish is still incomplete. Reduction in the fitness of salmon stocks, to the extent it has been documented, may involve numerous factors. Many studies report that hatchery fish are not as fit as wild fish both in juvenile residence in freshwater and during spawning. However, it is unknown if the long-term fitness of wild stocks will be affected, and some researchers think that observed reductions in hatchery fish may be the result of rearing conditions rather than genetics. Without baseline studies and adequate long-term monitoring, genetic changes are difficult to prove. Many researchers have noted a lack of emphasis in genetic studies, especially those that compare hatchery fish to wild fish. For many areas, including Alaska, not all significant wild stocks have been identified.

Scientists assume that wild stocks are the best suited to their stream of origin. Because many traits are thought to be inherited, biologists fear that hybrids will be less able to compete, less resistant to disease, and more vulnerable to predation. Such traits as egg size (evolved to reflect local conditions of stream substrate) and temperature tolerance are thought to be inherited. Some geneticists speculate that the homing ability of salmon may be a heritable quality. Thus, it may be important to keep hatchery salmon as genetically similar to local wild salmon as possible, and the practice of transporting brood stock even within a region may be detrimental. Additionally, the location of hatcheries where enhanced fish can easily stray to native streams may be detrimental to wild stocks (hatchery fish appear to be more likely to stray than wild fish).

Studies of hatchery salmon that measure genetic variability by average heterozygosity fail to show a significant loss of variability. The average heterozygosity of Japanese salmon, however, is below the U.S. average and this may indicate a loss of variability. Additionally, inbreeding has resulted in a reduction of variability for some other hatchery salmonids.

To complicate matters, some scientists doubt that hatcheries cause a loss in fitness of wild salmon. Some speculate that hatchery salmon could add variability to some wild salmon stocks.

Over-harvest of Wild Stocks

There is a general consensus among scientists that large-scale releases of hatchery salmon endanger wild stocks when returning hatchery fish are harvested in mixed stock fisheries with wild salmon. Some speculate that wild fish may be chemically attracted to hatchery fish and therefore school with them. Almost all Alaska fisheries had some degree of mixed stocks even before current hatcheries began operation. Smaller stocks are always in danger of depletion in mixed stock fisheries because there is a tendency to optimally harvest the larger stocks before they lose commercial quality at the terminal fisheries.

Competition

Some scientists suspect that the carrying capacity of freshwater rearing areas, nearshore waters, and on the high seas for salmon may be exceeded by the large-scale releases of hatchery salmon. A reduction in the average size of salmon has been reported throughout the Pacific, but various factors may be responsible. Some researchers believe ocean conditions affect the size of salmon more than competition. Much evidence, however, supports the theory of density-dependent growth for some salmon species during their rearing in freshwater. Some researchers also suggest that density-dependent growth occurs in estuaries, nearshore areas and in the ocean. Several studies suggest that density-dependent growth of sockeye and pink salmon occurs in the Gulf of Alaska.

Predation

Much is unknown about predation by hatchery salmon, but the greatest potential danger appears to be from the release of large numbers of coho smolts. There is speculation that large releases of hatchery fry may attract wild coho that will also feed upon wild fry.

Disease

Few studies document the transmittal of diseases between hatchery and wild salmon and there is no documentation of such transmittal in Alaska. Where transmittal of a disease by hatchery salmon has been documented, it occurred after fish were transplanted long distances. Hatchery fish appear to be more vulnerable to disease than wild fish because of the stress of hatchery conditions and large concentrations of eggs and fry.

Other Effects

Hatcheries may affect wild stocks in several other ways. Late-spawning hatchery strays may disturb the redds of wild fish. In the Pacific Northwest, there is some concern that unsuccessful hatcheries are resulting in a net drain when they use brood stock from depleted wild stocks. In the future, the use of salmon genetically altered to provide certain characteristics may affect

wild stocks. Lastly, the long-term effects of millions of unharvested hatchery pink salmon is unknown.

Tasks for the Future

Many tasks face scientists, managers, and policy makers during the coming decade. Such challenges include setting research priorities, minimizing possible impacts, and reviewing current practices and policies.

Setting Research Priorities

A major challenge for the next decade will be to obtain a consensus about research priorities concerning the interaction of hatchery and wild fish in Alaska. Coordination of studies among university researchers, commercial fisheries managers, federal and state government scientists, hatchery personnel, and fishermen may also be useful.

The current lack of knowledge includes an absence of information about a variety of issues: the degree that wild stocks school with hatchery fish, migration patterns of wild and hatchery fish, the percentage of hatchery and wild fish that stray, the reproductive success of these strays, the carrying capacity of marine and freshwater environments, harvest alternatives for mixed stock fisheries, ways to emulate mating behavior of wild salmon in a hatchery setting, cryopreservation techniques for eggs and embryos, and the effects of large-scale escapement of hatchery salmon. Without a better inventory of significant wild stocks and constant monitoring of their fitness, the long-term effects of enhancement may not be known until it is too late to correct them. Cataloguing genetic characteristics of significant stocks will provide baseline data for future study of the effects of hatchery salmon. Better knowledge in these areas will permit policy makers to make informed decisions and to consider the risks associated with various decisions.

Minimizing Impacts

Although the effects of hatcheries on wild fish are uncertain, the risk of such effects warrant a cautious approach. Rather than more studies, Hindar et al. (1991) think that the current knowledge of the effects of cultured fish on wild fish is enough to call for immediate action. The authors cite recommendations from symposiums on this subject. Practices that will reduce such impacts include siting hatcheries where hatchery fish will have minimal opportunities to interact with wild fish as well as specific prescriptions that will keep hatchery fish as genetically similar to wild fish as possible.

Reviewing Current Practices and Policies

Some fishery specialists recommend approval of new or expanded hatchery operations on a case-by-case basis only after a thorough examination of possible effects. Many researchers emphasize that hatcheries should strive for an optimum annual production rather than maximum production. Others suggest that further expansion of hatchery programs be delayed until more is known about their effects (Mathisen 1991). Hilborn (1990) recommends that there be a moratorium on the construction of new hatcheries and that hatcheries that cause adverse impacts on wild fish be closed.

Alaska statutes, ADF&G regulations and department policies contain many procedures to protect wild stocks. However, we were unable to locate any thorough studies that evaluate how well the current hatchery program protects wild salmon from possible negative effects of hatchery salmon. Such a review would help policy makers determine the risk of various alternatives for the future of Alaska's hatchery program.

I hope this information is useful. If you have any questions or want additional information, please contact this agency.

Attachments

REFERENCES

- ADF&G. 1982. "Policies and Procedures for the Private Nonprofit Hatchery Program and Regional Comprehensive Salmon Planning (Draft)." Alaska Department of Fish and Game, Division of FRED.
- ADF&G. 1985. "Alaska Department of Fish and Game Genetic Policy." Genetic Policy Review Team. Alaska Department of Fish and Game.
- ADF&G. 1986. "Selected Alaska Statutes and Regulations for Private Nonprofit Salmon Hatcheries." Alaska Department of Fish and Game, FRED Division.
- Alaska Finfish Farming Task Force. 1990. "Report to the Alaska Legislature." Juneau.
- Allendorf, F.W. 1991. "Effects of Genetic Changes in Enhanced Stocks on Productivity of Wild and Enhanced Salmonid Populations." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 17, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Bams, R.A. 1976. "Survival and Propensity for Homing as Affected by Presence or Absence of Locally Adapted Paternal Genes in Two Transplanted Populations of Pink Salmon (*Oncorhynchus gorbuscha*)." *Canadian Journal of Fisheries Aquatic Science* Vol. 33: 2716-2725.
- Beall, E.P. and M. Heland. 1991. "The Influence of Introduced Coho Salmon (*Oncorhynchus kisutch*) Juveniles on the Survival, Growth, Distribution, and Production of Atlantic Salmon (*Salmo salar*) Fry and Parr." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 35, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Beamish, R.J. and B.L. Thomson. 1991. "Survival of Hatchery-Reared Salmon in the Strait of Georgia." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Bragg, John. 1990. "The Conooks are Coming." *Pacific Fishing*. December 38-39.
- CAA. 1990. "Fish Smuggling Becoming Big Business." *California Aquatic Farming*. California Aquaculture Association. October 1990.

- Chebanov, N.A. 1991. "Experimental Assessment of Genetic Aberrations in Hatchery Salmon and Recommended Procedures for Reducing Their Occurrence." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 19, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Chettleburgh, Peter. 1991. "Notebook." *Northern Aquaculture*.
- Campton, Donald. 1991. "Genetic Contribution of Hatchery Steelhead to Wild Populations." Abstract of a poster presentation at symposium, Genetic Conservation of Salmonid Fishes, 24 June - 5 July, at Moscow, Idaho, and Pullman, Washington.
- Corley-Smith, Graham, Kanji Tsumura, Mark Siemens, Godin Teresa, and Edward Donaldson. 1991. "Preservation of Wild Stocks by Triploid Sterilization of Introduced Brook Trout." Abstract of a poster presentation at symposium, Genetic Conservation of Salmonid Fishes, 24 June - 5 July, at Moscow, Idaho, and Pullman, Washington.
- Cramer, S.P. 1991. "Dynamics of the Decline in Wild Coho (*Oncorhynchus kisutch*) Populations in the Lower Columbia River." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 38, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Davis, Bob and Bob Burkett. 1989. "Background of the Genetic Policy of the Alaska Department of Fish and Game." Alaska Department of Fish and Game.
- Eriksson, C. and T. Eriksson. 1991. "Delayed Release of Baltic Salmon: Survival, Migration, and Management Implications." Abstract from a poster presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 53, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- FFTF. 1990. "Alaska Finfish Farming Task Force: Report to the Legislature."
- Fleming, I.A. and M.A. Gross. 1991. "Breeding Competition and Reproductive Success in Hatchery Versus Wild Coho Salmon (*Oncorhynchus kisutch*).". Abstract from a poster presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 54, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Francis, R.C. and R.D. Brodeus. 1991. "Production and Management of Coho Salmon (*Oncorhynchus kisutch*): a Simulations Model Incorporating Environmental Variability." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 41, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Fresh, K.L., S.L. Schroder, and M.I. Carr. 1991. "Predation by Northern Squawfish (*Ptychocheilus oregonensis*) on Hatchery and Wild Coho Salmon Juveniles (*Oncorhynchus kisutch*) in the Chehalis River, Washington." Abstract from a poster presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 55, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.

- Fryer, J.K. and M. Schwartzberg. 1991. "Identification of Hatchery and Naturally Spawning Stocks of Columbia Basin Spring Chinook Salmon (*Oncorhynchus tshawytscha*) Using Scale Pattern Analyses." Abstract from a poster presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 57, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Gausen, Dagfinn. 1991. "The Norwegian Gene Bank Programme for Atlantic Salmon (*Salmo salar*)." Abstract of an oral presentation at symposium, Genetic Conservation of Salmonid Fishes, 24 June - 5 July, at Moscow, Idaho, and Pullman, Washington.
- Gausen, D. and V. Moen. 1991. "Large-scale Escapes of Farmed Atlantic Salmon (*Salmo Salar*) into Norwegian Rivers Threaten Natural Populations." *Canadian Journal of Fisheries Aquatic Science* Vol 48: 426-428.
- Gay, Joel. 1991. "Growing Fish: the Future of Alaska's Hatcheries." *Pacific Fishing*. March: 60-68.
- Geiger, H.J., J.A. Brady, D.M. Gaudet, S. McGeem and L. Peltz. 1991. "The Management of the Alaskan Salmon Hatchery Commercial Harvest." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Gharrett, A.J.; S. Lane, A.J. McGregor, and S.G. Taylor. 1991. "Use of a Genetic Marker to Examine Genetic Interaction among Subpopulations of Pink Salmon (*Oncorhynchus gorbuscha*)." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, 17-20 June, p. 20, at Pacific Biological Station, Nanaimo, British Columbia.
- Gritsenko, O.F. 1991. "Populations Structure of Sakhalin Pink Salmon (*Oncorhynchus gorbuscha*)." Abstract from a poster presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 58, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Gritsenko, O.F. and A.A. Kovtun. 1991. "Interaction Between Wild and Hatchery-Reared Chum Salmon (*Oncorhynchus keta*) from the Tym River." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 26, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Hard, J. and W.R. Heard. 1991. "Homing and Straying in Two Stocks of Transplanted Chinook Salmon (*Oncorhynchus tshawytscha*)." Abstract from a poster presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 60, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Hayashizaki, Ken-ichi and Ida Hitoshi. 1991. "Size Decrease of Chum Salmon, - *Oncorhynchus keta*, in Tohoku Districts, Japan." Abstract from a poster presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, 17-20 June, p. 45, at Pacific Biological Station, Nanaimo, British Columbia.

- Helle, John. 1981. "Significance of the Stock Concept in Artificial Propagation of Salmonids in Alaska." *Canadian Journal of Fishery Aquatic Science* Vol. 38: 1665-1671.
- Helle, John. 1982. "Genetic Considerations in Management of Wild and Hatchery Stocks of Salmonids." *The Role of Hatcheries in the Management of Wild Salmonids: Proceedings of a Symposium*. p. 25-29, 21 February, Reno, Nevada.
- Helle, John. 1983. "Gene Banks for Wild Fish Stocks." *Proceedings of the Olympic Wild Fish Conference*, 23-25 June, p. 41-44, Port Angeles, Washington.
- Hilborn, Ray. 1990. "Hatcheries and the Future of Salmon in the Northwest." Unpublished manuscript.
- Hilborn, R., R.C. Francis, and S.R. Hare. 1991. "Hatchery and Wild Fish Production on the Columbia River." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 14, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Hindar, Kjetil, Nils Ryman and Fred Utter. 1991. "Genetic Effects of Cultured Fish on Natural Fish Populations." *Canadian Journal of Fisheries Aquatic Science* Vol. 48: 945-957.
- Irvine, J.R., R.E. Bailey, and R.C. Bocking. 1991. "Variability in Freshwater Survivals of Outplanted Coho Salmon (*Oncorhynchus kisutch*) in the Trent River, British Columbia, and a Preliminary Comparison Between the Marine Survivals of these Fish and Wild Trent River Coho." Abstract from a poster presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 62, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Ivankov, V.N. and I.N. Volkov. 1991. "Dynamics of Downstream Migration and Survival of Juvenile Salmon during Early Marine Life." Abstract from a poster presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 64, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Kaeriyama, Masahide. 1991. "Production Trends of Salmon Enhancement in Japan." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 11, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Kapuscinski, A.R. and E.M. Hallerman. 1990. "AFS Position Statement: Transgenic Fishes." *Fisheries* Vol. 15 (4): 2-4.
- Karpenko, V.I. 1991. "The Role of Early Marine Life in the Production of Pacific Salmon." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 29, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.

- Kawamura, Hiroshi. 1991. "Stock Enhancement of Masu Salmon (*Oncorhynchus masu*) with Hatchery-Reared Fish and Difference in Timing of Smolting between Hatchery and Wild Populations in Hokkaido, Japan." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 24, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Kelly, Michael, William Wilson, Patricia McMillan, and William Smoker. 1989. "Interactions Between Wild and Hatchery-Produced Salmon in Northwest North America, and Issues and Concerns over Sikusikaq Springs Hatchery on the Noatak River, Alaska." Arctic Environmental Information and Data Center, University of Alaska Anchorage for the U.S. National Park Service. Cooperative Agreement No. CA-9700-5-8016.
- Khorevin, L.D. 1991. "Biological Monitoring of Artificially Propagated Chum Populations of Sakhalin Island." Abstract from a poster presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 66, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Kitchell, J.F. 1991. "Salmon in the Great Lakes: a Compromised Miracle." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 28, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Krueger, Charles, Anthony Gharrett, Terrence Dehring, and Fred Allendorf. 1981. "Genetic Aspects of Fisheries Rehabilitation Programs." *Canadian Journal of Fisheries Aquatic Science* Vol. 38.
- Larkin, P.A. 1981. "A Perspective on Population Genetics and Salmon Management." *Canadian Journal of Fisheries Aquatic Science* Vol. 38: 1469-1475.
- Lichatowich, James and John McIntyre. 1987. "Use of Hatcheries in the Management of Pacific Anadromous Salmonids." *American Fisheries Society Symposium* Vol. 1: 131-136.
- Maitland, P.S., H.A. Reiger, G. Power, and N.A. Nilsson. 1981. "A Wild Salmon, Trout, and Char Watch: An International Strategy for Salmonid Conservation." *Canadian Journal of Fisheries Aquatic Science* Vol. 38: 1882-1888.
- Mathisen, Ole. 1991. Letter to Representative Fran Ulmer. Director of the Juneau Center for Fisheries and Ocean Sciences, University of Alaska. 24 June.
- McAllister, C.D. and C.D. Levings. 1991. "Evidence of Habitat Limitations for Hatchery and Wild Chinook Salmon (*Oncorhynchus tshawytscha*) in Two British Columbia Estuaries." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 34, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Menke, Kathleen. 1990. "In Danger of Diluting the Salmon Gene Pool." *Pacific Fishing*. December: 46-50.
- Miller, Dirk. 1991. "Record Year for Pinks?" *Juneau Empire* August 23. p. 1.

- Nehlen, Willa, Jack Williams, and Lichatowich. 1991. "Pacific Salmon at the Crossroads: Stocks at Risk from California, Oregon, Idaho, and Washington." *Fisheries* Vol. 16 (2): 4-21.
- Oregon. 1990. "Oregon's Wild Fish Management Policy: What is it and What Does it do?" Unpublished briefing paper.
- Peltz, L., D. Eggers, B. Barrett, B. Bue, N. Dudiak, M. Johnson, S. Sharr, L. White, and H. Yuen. 1991. "Trends in Abundance of Hatchery and Wild Stocks of Pink Salmon (*Oncorhynchus gorbuscha*) in Kodiak Island, Lower Cook Inlet, and Prince William Sound, Alaska." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Peterman, Randall M. 1984. "Density-Dependent Growth in Early Ocean Life of Sockeye Salmon (*Oncorhynchus nerka*)." *Canadian Journal of Fisheries and Aquatic Sciences* Vol. 41: 20-27.
- Reimers, Paul. 1979. "Success in a Hatchery Program with Fall Chinook Salmon by Simulating the Natural Life History of the Stock." *The Progressive Fish-Culturist* Vol. 41 (4): 192-195.
- Reisenbichler, R.R. and J.D. McIntyre. 1977. "Genetic Differences in Growth and Survival of Juvenile Hatchery and Wild Steelhead Trout (*Salmo gairneri*)." *Journal Fisheries Research Board of Canada* Vol. 34: 123-128.
- Ricker, W.E. 1981. "Changes in the Average Size and Average Age of Pacific Salmon." *Canadian Journal of Fisheries and Aquatic Sciences* Vol. 38: 1636-1656.
- Riddell, B., R. Withler, T. Carter, and D. Tuck. 1991. "Realized Heritability of Size at Maturity in Coho (*Oncorhynchus kisutch*) Salmon." Abstract from a poster presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 69a, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Ryman, Nils and Gunnar Stahl. 1981. "Genetic Perspectives of the Identification and Conservation of Scandinavian Stocks of Fish." *Canadian Journal of Fisheries and Aquatic Sciences* Vol. 38: 1562-1575.
- Seeb, Jim. 1991. Principal Geneticist for the Alaska Department of Fish and Game. Letter to Commissioner Carl Rosier. 19 August.
- Seiler, D., L. Lestelle, S. Meadows, G. Blair, S. Chitwood, and S. Neuhauser. 1991. "Supplementation of Wild Coho Salmon (*Oncorhynchus kisutch*) with Hatchery-Produced Fry in Washington Coastal Streams." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 36, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.

- Shrimpton, J.M., N.J. Bernier, G.K. Iwama, and D.J. Randall. 1991. "Osmoregulatory Ability in Sea Water in Smolting Hatchery and Wild Coho Salmon (*Oncorhynchus kisutch*). Abstract from a poster presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 71, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Shubin, A.O. and V.E. Kaevo. 1991. "The Influence of a Pink Salmon (*Oncorhynchus gorbuscha*) Hatchery on Natural Pink Salmon Production in the Ochepukha River, Sakhalin." Abstract from a poster presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 72, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Skaala, O., K.E. Jorstad, and R. Borgstrom. 1991. "Genetic Impact on Wild Populations from Fish Farming: Experiments with Genetically Tagged Brown Trout (*Salmo trutta* L.)." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Smoker, William. 1985. "Review of Literature on Impacts of Salmon Hatcheries in Alaska." Final Report to the University of Alaska, Juneau, Research Council. School of Fisheries and Science. Juneau.
- Steer, J., P.J. Starr, E.A. Perry, and K.D. Hyatt. 1991. "Trends in Biological Characteristics and Survival Rates of Wild and Enhanced Salmonids in British Columbia." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 13, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Swain, D.P. and B.E. Riddell. 1991. "Quantitative Genetic Variation for Morphology in Hatchery and Wild Populations of Coho Salmon (*Oncorhynchus kisutch*). Abstract from a poster presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 74, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Thorgaard, Gary and Joseph Cloud. 1991. "Reconstitution of Genetic Strains of Fish using Androgenesis and Chimeras." Abstract of an oral presentation at symposium, Genetic Conservation of Salmonid Fishes, 24 June - 5 July, at Moscow Idaho and Pullman, Washington.
- Thompkins, A. 1991. "Responses of Wild and Hatchery Chum Fry (*Oncorhynchus keta*) to Risk of Predation." Abstract from a poster presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 77, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Ward, B.R., P.A. Slaney, and A.F. Tautz. 1991. "Differential Survival and Synchronous Return from the Sea in Keogh River Wild and Hatchery Steelhead (*Oncorhynchus mykiss*). Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 42, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.

- Wampler, P.T., J.D. Anderson, E.E. and Knudsen. 1991. "Evaluation of Planting Native Hatchery Coho Fry into Streams Containing Wild Coho Fry." Abstract from a poster presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 79, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Waples, Robin, Gary Winans, Fred Utter, and Conrad Mahnken. 1990. "Genetic Approaches to the Management of Pacific Salmon." *Fisheries* Vol. 15 (5): 19-25.
- Whelan, K.F. and P. McGinnity. 1991. "A Comparative Biological and Genetic Profile of Wild and Ranched Atlantic Salmon (*Salmo salar*) Stocks from the Burrishoole System, Co. Mayo, Western Ireland." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 15, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Wildt, David and William Rall. 1991. "Strategies for Collecting, Cryopreserving and Using Germplasm and Embryos from Wildlife Species." Abstract of an oral presentation at symposium, Genetic Conservation of Salmonid Fishes, 24 June - 5 July, at Moscow, Idaho, and Pullman, Washington.
- Wood, C.C., K.D. Hyatt, D. Boisclair, E.W. Carter, and B. Emmett. 1991. "Testing for Ecological Interactions between Wild and Hatchery-Reared Salmonids as an Explanation for Declining Smolt-to-Adult Survival in Sockeye Salmon (*Oncorhynchus nerka*) Populations of Barkley Sound, Vancouver Island." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 32, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.
- Zhivotovsky, L.A., V. Hramtsov, and M. Glubokovsky. 1991. "Population Dynamics in Pink Salmon (*Oncorhynchus gorbuscha*)." Abstract from a paper presented at symposium, International Symposium on Biological Interactions of Enhanced and Wild Salmonids, p. 21, 17-20 June, at Pacific Biological Station, Nanaimo, British Columbia.

PERSONAL COMMUNICATIONS

Burkett, Bob. Telephone interview. Division of Fisheries Rehabilitation, Enhancement and Development. September 1991. Juneau.

Duffy, Kevin. Telephone interview. Planning Coordinator for the Division of Fisheries Rehabilitation, Enhancement and Development. September 1991. Juneau.

Gharet, Tony. Telephone interview. Professor at the University of Alaska. September 1991. Juneau.

Mathisen, Ole. Personal interview. Director Juneau Center for Fisheries and Ocean Sciences, University of Alaska. August 1991. Juneau.

Seeb, Jim. Telephone conversations. Principal geneticist for the Division of Fisheries Rehabilitation, Enhancement and Development. September 1991. Anchorage.

Meyers, Ted. Telephone conversation. Fisheries pathologist for the Division of Fisheries Rehabilitation, Enhancement and Development. September 1991. Juneau.

Utermohle, George. Telephone conversation. Legislative counsel for the Legislative Affairs Agency. September 1991. Juneau.

Wertheimer, Alex. Telephone conversation. Biologist for the National Marine Fisheries Service, Auke Bay Laboratory. August 1991. Auke Bay.

White, Steve. Telephone conversation. Assistant attorney general for the Alaska Department of Law. September 1991. Juneau.

ATTACHMENT A
1975 Position Paper of the Alaska District of the
American Institute of Fishery Research Biologists

GENETIC CONSIDERATIONS IN
ARTIFICIAL PROPAGATION OF SALMONIDS

WHEREAS throughout North America there is an accelerating interest in artificial propagation as a means of supplementing our natural salmonid stocks, and an urgent need exists for special planning regarding genetic considerations in artificial propagation of salmonid fishes; and

WHEREAS need for genetic planning exists in all salmonid enhancement programs in North America; and

WHEREAS it is desirable to maintain existing wild stocks in concert with artificially propagated stocks through:

- (1) location of sites for artificial propagation with regard to indigenous wild stocks, so that the adaptive genetic diversity of wild stocks will not be lost or diluted by chance interbreeding with cultured stocks;
- (2) management of fishing pressure so as not to endanger reproduction of wild stocks;
- (3) recognition of the potential behavioral and genetic stresses on native fishes caused by transplant stocks; and

WHEREAS it is also desirable to maintain adaptive genetic diversity in most artificially propagated stocks through:

- (1) use of sufficient numbers of females and males in brood stock to avoid inbreeding depression problems;
- (2) avoidance of selective breeding except in special situations or when used as a research technique: Now, therefore, be it

RESOLVED, That enhancement or rehabilitation of salmonid stocks in a stream or lake system should utilize native stocks already present; and be it further

RESOLVED, That in special situations where no alternative to transplantation exists, the characteristics of the donor stock be carefully matched so as to be compatible with the new environment; and be it further

RESOLVED, That the biological impact of transplantation on stocks of fish present in the recipient and surrounding watersheds be thoroughly evaluated; and be it further

RESOLVED, That artificially propagated stocks should be isolated (in time and in space) from wild stocks to allow effective management of fishing pressure on both types; and be it further

RESOLVED, That all agencies involved in enhancement and management of wild and cultured stocks of salmonids evaluate their present policies with respect to conservation of genetic diversity in wild stocks; and be it further

RESOLVED, That copies of this resolution be forwarded to agencies involved in artificial propagation and enhancement of salmonid fishes.

RESOLUTION

AMERICAN FISHERIES SOCIETY

Presented at American Fisheries Society
Detroit, Michigan September 22, 1976

Genetic Considerations in Artificial Propagation of Fishes

WHEREAS throughout North America there is an accelerating interest in artificial propagation as a means of supplementing our natural stocks, and an urgent need exists for special planning regarding genetic considerations in artificial propagation of fishes; and

WHEREAS need for genetic planning exists in all fish enhancement programs in North America; and

WHEREAS it is desirable to maintain existing wild stocks in concert with artificially propagated stocks through:

- (1) location of sites for artificial propagation with regard to indigenous wild stocks, so that the adaptive genetic diversity of wild stocks will not be lost or diluted by chance interbreeding with cultured stocks,
- (2) management of fishing pressure so as not to endanger reproduction of wild stocks,
- (3) recognition of the potential behavioral and genetic stresses on native fishes caused by transplant stocks; and

WHEREAS it is also desirable to maintain adaptive genetic diversity in most artificially propagated stocks through:

- (1) use of sufficient numbers of females and males in brood stock to avoid inbreeding depression problems,
- (2) avoidance of deleterious selective breeding: Now, therefore be it

RESOLVED, That all agencies involved in enhancement and management of wild and cultured fish stocks evaluate their present policies and implement appropriate practices with respect to conservation of genetic diversity in wild stocks; and be it further

RESOLVED, That copies of this resolution be forwarded to all state, provincial, and federal agencies involved in artificial propagation and enhancement of fishes.

ATTACHMENT B
ADF&G Policies Relating to Hatcheries

Alaska Department of Fish & Game
GENETIC POLICY

by

Genetic Policy Review Team
Bob Davis - ADF&G, FRED, Chairman

Other Team Members:

Brian Allee - PWSAC, Cordova
Don Amend - SSRAA, Ketchikan
Bruce Bachen - NSRAA, Sitka
Bill Davidson - SJC, Sitka
Tony Gharrett - UAJ, Juneau
Scott Marshall - ADF&G, Comm. Fish
Alex Wertheimer - Auke Bay Lab

Approved:



Don W. Collinsworth, Commissioner
Alaska Department of Fish and Game

Date: 6.11.85

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
INTRODUCTION	1
POLICY STATEMENT	3
Stock Transport	3
Protection of Wild Stocks	4
Maintenance of Genetic Variance	5
GUIDELINES AND JUSTIFICATIONS	6
Stock Transport	6
Protection of Wild Stocks	8
Maintenance of Genetic Variance	12
RESEARCH	19
APPENDIX A	22

INTRODUCTION

Alaska's valuable salmon industry relies on production from wild systems and, increasingly, on fish produced by aquaculture programs. The importance of maintaining healthy wild stocks and implementing successful enhancement activities underlies the need for an effective genetic policy. The genetic guidelines created to steer Alaska's aquaculture efforts were established in the mid-70's and have been reviewed to ensure that they reflect current knowledge, and goals. A revised genetic policy has been established that contains guidelines, supporting information and recommendations.

The genetic policy contains restrictions that will serve to protect the genetic integrity of important wild stocks. Certainly in Alaska where wild stocks are the mainstay of the commercial fishery economy, it is necessary to protect these stocks through careful consideration of the impacts of enhancement activities. Another important aspect of the genetic policy is the orientation towards increasing the productivity of enhancement programs in the state. Adherence to the guidelines will help maintain adequate genetic variability ensuring that the enhanced stock will be able to adapt to changing environmental conditions. The policy also includes considerations for selective breeding for desirable characteristics.

Due to the limited amount of information available on the genetic impacts of salmon enhancement on wild stocks, much of the basis for these guidelines is theoretical or based on work done with other species. Consequently, the most important considerations used in writing the guidelines are presented as a mechanism for illustrating the intent of the policy. An understanding of the rationale behind the policy is imperative to its effective application to individual cases under the very diverse conditions found in Alaska.

The importance of the genetic guidelines will continue to increase as aquaculture activities expand their production. This policy represents a consensus of opinion and should continue to be periodically reviewed to ensure that the guidelines are consistent with current knowledge. By doing so, we will be able to meet the goal of greater fish production through enhancement while maintaining healthy wild stocks.

POLICY STATEMENT

I. Stock Transport

- A. Interstate: Live salmonids, including gametes, will not be imported from sources outside the state. Exceptions may be allowed for trans-boundary rivers.
- B. Inter-regional: Stocks will not be transported between major geographic areas: Southeast, Kodiak Island, Prince William Sound, Cook Inlet, Bristol Bay, AYK and Interior.
- C. Regional: Acceptability of transport within regions will be judged on the following criteria.
 - 1. Phenotypic characteristics of the donor stock must be shown to be appropriate for the proposed fish culture regions and the goals set in the management plan.
 - 2. No distance is set or specified for transport within a region. It is recognized that transplants occurring over greater distances may result in increased straying and reduce the likelihood of a successful transplant. Although the risk of failure affects the agency transporting the fish, transplants with high probability of failure will be denied. Proposals for long distance transport should be accompanied by adequate justification for using nonlocal stock.

II. Protection of Wild Stocks

- A. Gene flow from hatchery fish straying and intermingling with wild stocks may have significant detrimental effects on wild stocks. First priority will be given to protection of wild stocks from possible harmful interactions with introduced stocks. Stocks cannot be introduced to sites where the introduced stock may have significant interaction or impact on significant or unique wild stocks.
- B. Significant or unique wild stocks must be identified on a regional and species basis so as to define sensitive and nonsensitive areas for movement of stocks.
- C. Stock Rehabilitation and Enhancement
 - 1. A watershed with a significant wild stock can only be stocked with progeny from the indigenous stocks.
 - 2. Gametes may be removed, placed in a hatchery, and subsequently returned to the donor system at the appropriate life history state (eyed egg, fry or fingerling). However, no more than one generation of separation from the donor system to stocking of the progeny will be allowed.
- D. Drainages should be established as wild stock sanctuaries on a regional and species basis. These sanctuaries will be areas in which no enhancement activity is permitted except gamete removal for broodstock development. Use of such reservoirs for broodstock development should be considered on a case-by-case basis, and sliding egg take removal schedules applied to such systems should be conservative.

- E. Fish releases at sites where no interaction with, or impact on significant or unique wild stocks will occur, and which are not for the purpose of developing, rehabilitation of, or enhancement of a stock (e.g., release for terminal harvest or in landlocked lakes) will not produce a detrimental genetic effect. Such releases need not be restricted by genetic concerns.

III. Maintenance of Genetic Variance

A. Genetic diversity among hatcheries

1. A single donor stock cannot be used to establish or contribute to more than three hatchery stocks.
2. Off-site releases for terminal harvest rather than development or enhancement of a stock need not be restricted by III.A.1, if such release sites are selected so that they do not impact significant wild stocks, wild stock sanctuaries, or other hatchery stocks.

B. Genetic diversity within hatcheries and from donor stocks

1. A minimum effective population (N_e) of 400 should be used for broodstock development and maintained in hatchery stocks. However, small population sizes may be unavoidable with chinook and steelhead.
2. To ensure all segments of the run have the opportunity to spawn, sliding egg take scales for donor stock transplants will not allocate more than 30% of any segment of the run for broodstock.

GUIDELINES AND JUSTIFICATIONS

I. Stock Transport

- A. Interstate: It is generally accepted that population of salmonids which have existed over many generations in a given watershed have evolved traits that make them best adapted for survival in that environment. The greater the distance that a population is transferred from its native environment or the greater the difference in environmental conditions between the donor and transplant stream, the less likely the genetic characteristics of the population will fit the new environment. If the fitness of the population is indeed reduced in the new environment, then the probability of the transplant succeeding would be affected. In addition, interbreeding of a transferred stock with indigenous stocks could transfer gene traits that would reduce the fitness of the native populations. In many states, discrete stocks cannot be identified because excessive movement and interbreeding have already occurred. The State of Alaska, therefore, desires to protect and develop local stocks by restricting the movement of live fish or eggs into the state. There are, however, several trans-boundary rivers penetrating British Columbia, Canada, that flow into the state of Alaska. In some instances, donors from these stocks might fit a well-designed management plan.
- B. Inter-regional: The environment can vary greatly from one region to another in a state as large as Alaska. For similar reasons given in I.A. above, the transfer of fish from one region to another is restricted. Consideration may be given to regional border areas, especially when no suitable donor stock is available within a region.

C. Regional: Although it is recognized that indigenous stocks are best for donor stock development, there have been numerous successful transplants, especially if the environment at the new site is similar to that of the donor stock and distance between the sites is not great. There is insufficient scientific data to predict how far or how diverse the environment must be before a negative impact will occur. However, it is believed that within a region site matching opportunities may be available. As site matching characteristics decrease and transplant distance increases within the regional borders greater justification is required for the proposed transplant. The following should be considered when selecting a donor stock:

1. Matching: Phenotypic characteristics of the donor stock should be matched to the environment at the site and to the management goals. Water chemistry and temperature profiles should be considered. Island stocks should be matched to other islands or to short rivers of comparable characteristics where possible. Time of spawning and fry emergence should be matched or compensated with the hatchery temperature required. Any deviations should be addressed and justified in the permit application or the annual management plan.
2. Migration Routes: The probable migration routes and potential user groups should be identified. The applicant must determine a probable migration route based on the migration route of the proposed stock and characteristics (topography) of the transplant site. Coded wire tagging of hatchery releases can determine the accuracy of migration route predictions as well as assess possible impact on local stocks.

II. Protection of Wild Stocks

A. Prevention of detrimental effects of gene flow from hatchery fish straying and interbreeding with wild fish.

Straying of hatchery fish released at the hatchery or off-station can potentially impact the fitness of wild fish populations through interbreeding of wild and hatchery fish. This assumes that hatchery and wild fish are adapted to different environments and either would presumably be less fit in the environment of the other and that hybrids would be less fit for either environment. Wild stocks have presumably been rigorously adapted to their native environment. Because of the large number of loci involved in the adaptation, many "successful" combinations of genetic information are possible along with the enormous number of "unsuccessful" combinations. Hybridization between discrete populations may produce a stock that has reduced fitness and therefore reduced production. Hatchery fish have been subjected to selection pressure for survival within artificial culture regimes, and may also have been originally derived from another stock adapted to totally different conditions than the impacted wild stock. Continued influx of hatchery fish together with the return of hybrids may alter the wild gene pool, reduce stock fitness, and thus threaten the survival of the wild population.

An alternative perspective is that hatchery strays will have little genetic impact on wild stocks. The influx of new genetic material through straying is a natural process in the development and expansion of salmon populations. If adaptation of the natural population is indeed very specific and selection is intense, then

selection will favor and maintain the genetic complex of the wild populations. If adaptation is less specific and less intensive, then the genetic impacts from gene flow are insignificant. It is true that some straying occurs among adjacent wild populations and in most cases has occurred for a long enough time that such populations are quite similar genetically. However, situations in which transplanted stocks are involved are not analogous, as transplanted stocks would be less similar and gene flow would have a more profound effect. It is also true that the impact of introgression into the wild gene pool of genes from fish transplanted from a radically different environment may be limited by natural selection. Again the situations of concern do not necessarily lie near this extreme; hybrids and strays may be fit enough to dilute or replace the wild genome. Inherent homeostatic mechanisms for gene expression may compensate for some genetic influx.

The magnitude of straying relative to the size of the wild run is the most important criterion, as massive spawning by hatchery strays may jeopardize a wild population by displacement on spawning habitat and superimposition of redds, as well as, genetic influx. A conservative management approach dictates avoiding release sites where large numbers of hatchery strays can be expected to interact with significant or unique wild stocks. This approach can be achieved by spatial or temporal isolation of the hatchery and wild stock.

B. Regional designation of significant and unique wild stocks.

The magnitude of salmon populations varies between watersheds from intermittent runs maintained by

straying to hundreds of thousands of fish. In evaluating the impacts of salmon enhancement projects, consideration must be given to the potential of detrimental effects from straying and intermingling with wild populations and possible resultant loss of wild production. Such consideration must take into account the benefits of the enhancement activity and the significance of the wild stocks impacted. Designation of criteria for runs of fish that are considered significant would greatly expedite the evaluation process. However, "significance" must be defined not only by the magnitude of the run, but also in the context of local importance and utilization. A small sockeye salmon stock near a village in southeast Alaska may be "significant", whereas the same size population may be too small to be considered a manageable entity in Bristol Bay. Because local utilization is an important concern, a regional planning group such as the Salmon Enhancement Regional Planning Teams, should consider what criteria will be used to determine significant stocks within a region and recommend such stock designations.

C. Stock rehabilitation and enhancement.

1. A watershed with significant wild stocks can only be stocked with progeny from the indigenous stocks. Rehabilitation of a watershed implies that there is insufficient production in habitat that formerly maintained a stock of some magnitude. Unless the indigenous stock has gone to extinction, use of an exogenous stock has potential for genetic damage noted in II.A. This damage will be exacerbated by the imprinting and homing of the transplanted stock to the impacted watershed, and potential displacement of wild

juveniles by the exotics stocked in the rearing habitat.

Enhancement of habitat not naturally accessible to salmon involves stocking eyed eggs, fry, or fingerlings, thus gaining production from this unutilized habitat. Where the inaccessible habitat is located above barriers on watersheds that maintain significant natural populations, stocking nonindigenous populations again has potential for genetic impacts noted in II.A., exacerbated by imprinting and homing of the transplanted stock to the watershed. For both rehabilitation and above barrier stockings, use of the indigenous stock alleviates these concerns.

2. When enhancing a stream using the indigenous stock, the fish used for stocking shall not be removed from the wild system to a hatchery for more than one generation.

Hatchery incubation and rearing select for a limited set of biological and behavioral traits which are not necessarily the most suitable for survival in the wild environment. Because of this potential for such selection, the transfer of hatchery fish to rehabilitate or enhance stocks in depleted or underutilized watersheds runs the risk of altering the genetic character of the wild stock, even if the indigenous stock was the original donor stock for hatchery population. By restricting the separation between the transfer to the hatchery and the stocking to no more than one generation (e.g., eggs taken in a given year are cultured to fry or fingerling release at the hatchery; eggs or fish from the returns to the

hatchery of this donor transplant are used for stocking), the risk of negative effects due to selection in the hatchery are minimized.

D. Establishment of wild stock sanctuaries.

As noted in preceding sections, there is concern that hatchery culture of salmon through their freshwater (and in some cases, initial estuarine) life history phases may select for a limited set of biological traits that are not suitable for wild populations. Loss of genetic variability through intensive inbreeding for domestication and desired traits has often resulted in detrimental genetic effects in agronomy and agriculture, such as reduced resistance to disease or adverse environmental conditions. Original wild strains can provide the genetic variability needed to outbreed domestics and alleviate inbreeding depression. Because there is potential for detrimental impacts due to reduction of genetic variability, there is a need to preserve a variety of wild types for future broodstock development and outbreeding for enhancement programs. Designation of watersheds where hatcheries or hatchery plants are not allowed would allow wild stocks within these watersheds to be subjected to natural selection only, within the life history phases cultured at hatcheries. These watersheds would be "gene banks" of wild-type genetic variability.

III. Maintenance of Genetic Variance

A. Genetic diversity among hatcheries.

There is general agreement that by introducing and maintaining a wide diversity of wild donor stock

populations into the hatchery system that the prospects for long term success of the hatchery program in Alaska will be enhanced. Diversity tends to buffer biological systems against disaster, either natural or man-made. Developing and maintaining hatchery broodstock from a wide variety of donors will buffer the hatchery system against future catastrophes. Agricultural crop production in the U. S. provides a prime example of the dangers of genetic uniformity.

In an effort to increase yield, plant breeders have come to rely on a few highly productive strains. In 1970 approximately 15% of the corn production in the United States was lost to corn blight. The corn blight responsible, a mutant of the normal blight causing fungus, did not attack all strains. Only one strain of corn was vulnerable, but that strain of corn was grown by nearly every farmer in the country. Breeders were able to recover from the corn blight epidemic by replacing Texas cytoplasm with normal cytoplasm. Recovery was rapid because adequate genetic variability was available. There are other examples.

How does this relate to salmonid culture? Salmonid stocks apparently differ in levels of disease resistance, temperature tolerance, acid tolerance, and in their response to artificial selection. It seems imprudent to assume that conditions similar to those found in agriculture will not occur in aquaculture. In addition, the ability to genetically improve hatchery broodstock performance in the future will depend on the availability of genetic variability such as is found among wild salmonid stocks. A hatchery system with a variety of diverse broodstocks will be a valuable resource.

Genetic diversity does not guarantee protection from disaster, but uniformity seems to invite catastrophe. Local failures are inevitable within the hatchery system. It seems prudent to provide the system with a level of insurance by developing and preserving diversity among hatcheries.

Off-site releases for terminal harvest, whether for the commercial fishery or for a put and take sport fishery should have no adverse genetic effect if they are released at sites selected so that they do not impact significant wild stocks, wild stock sanctuaries or other hatchery stocks. The success of this type of release from a genetic standpoint depends on the ability to manage and harvest the return. If returns can not be harvested, increased straying may result which might lead to an impact on wild stocks at a greater than expected distance from the release site.

B. Genetic diversity within hatcheries and from donor stocks.

There is a general consensus among geneticists that fitness (reproductive potential) is enhanced by heterozygosity (genetic variability). Any loss of genetic variation will be accompanied by a concomitant reduction in fitness. Genetic variation allows a population to adapt to a changing environment or to adapt to and colonize a new environment. Available genetic variation determines how rapidly a population will respond to either artificial or natural selection. On the other hand, selection, inbreeding and random genetic drift will reduce genetic variability in a population.

Natural selection, that is selection for fitness, is a continuing process and should not be so intense that it

has a significant effect in reduction of genetic variation, unless the population is in a new and quite different environment. Artificial selection on the other hand can be very intense, but can either be avoided or designed to assure that possible negative effects to fitness are offset by increased production efficiency due to the selection program, and by more efficient culture techniques. Inbreeding due to the deliberate mating of related individuals can be easily avoided in salmon hatcheries. Undoubtedly, in hatcheries and possibly in natural stocks the most important cause of loss of genetic variation is random genetic drift. In hatcheries reduction of genetic variation caused by inbreeding and genetic drift can easily be avoided by using adequate numbers of spawners.

Random genetic drift in general refers to fluctuations in gene frequency that occur as a result of chance. Such fluctuations occur, especially in small populations, as a result of random sampling among gametes. The amount of change but not the direction of change, can be predicted. The rate of this change is related inversely to effective population size (N_e). The smaller the effective population size the greater the fluctuation in gene frequencies. In small populations random genetic drift can result in inadvertent loss of genetic variability which may significantly reduce the fitness of the population.

Effective population size (N_e) is defined as the size of an idealized population that would lose genetic variability at the same rate as the sample population. An idealized population is one in which there is no

mutation or selection, there are equal numbers of males and females, mating is random, etc. Obviously it is very unlikely that any natural population will meet all criteria for an idealized population.

Breeding structure of a population can profoundly affect the rate at which genetic variability is lost. However, we can determine the effective breeding size (N_e) for breeding structures and obtain the rate of inbreeding (ΔF) as

$$\Delta F = 1/2N_e$$

so the consequences of breeding structure can be related to the loss of variation.

Many breeding structure variations can influence the effective population size. Four seem likely to operate in a salmon hatchery population: (1) numbers of males and females in the breeding population; (2) unequal numbers in successive generations; (3) nonrandom distribution of offspring among families; and (4) overlapping generations. These are discussed in greater detail in Appendix A.

Any of these variations in breeding structure may have a marked effect on N_e . Although it may be impossible to control or even to measure variation in family size it is important to keep in mind the relationship to effective population size. Breeding plans that would aggravate or increase the variation of family size should be avoided. The effect of overlapping populations is to increase the effective population number, in that individuals mating in different years contribute to greater diversity. For example, it would

take a larger number of pink salmon each year to maintain $N_e = 400$ than it would sockeye salmon.

The factor having the greatest potential effect in the hatchery and over which we have most control is sex ratio. As the formula indicates (Appendix A) the effective population size is affected most by the numbers of the least frequent sex. It is important to consider this in the breeding plan. In salmon, because a male can be used to fertilize the eggs of a large number of females, there is a temptation to do so. This temptation should be moderated by the necessity to maintain an effective population size which will assure that adequate genetic variation is maintained in the population. A minimum effective population (N_e) of 400 should be maintained. At this size the rate of inbreeding will be 0.125 percent per generation which should not have a significant effect on the long term fitness of the population.

In some cases, for example with chinook and steelhead, small population size may be unavoidable. In such cases a plan should be developed to offset the effects of small population size by infusion of genes from a source outside the hatchery population, such as the original donor source. Help in designing these breeding plans can be obtained from the Principal Geneticist, FRED Division, Alaska Department of Fish and Game.

While developing hatchery stocks from wild donor sources it is important that the genetic variability in the donor stock be protected. Cropping of the early or late run segments of a donor stock can change the timing of that run, which will reduce genetic variability of the population and may be detrimental to the stock's prospects for long term survival. To prevent

such selection, sliding egg take scales for donor st
transplants should allocate no more than 90% of any
segment of a run for broodstock.

RESEARCH

The necessity for much of this policy arises from our ignorance of the genetics of wild salmon populations and the effects of their domestication in hatcheries. The policy is based more on extrapolation from other disciplines such as agriculture than from first-hand knowledge of our resource. As a result, the policy is a somewhat conservative interpretation of these data in order to assure the long-term viability of salmon populations. The Committee has identified several areas in which specific knowledge would clarify this policy and contribute to the effectiveness of salmon enhancement. The Committee encourages cooperative research efforts among the university, state, federal and private sectors directed toward the general areas listed below.

1. Development of performance profiles of hatchery stocks and potential for genetic improvement. Information about stocks kept in culture will be useful in several ways. If taken in a standard manner, the data will be useful in determining the extent of variability in the species and will aid in the choice of stock to be used for outplanting or transplanting. The information will also be helpful in maximizing the production of a particular facility.
2. Potential for genetic improvement of cultured stocks. A sequel to the cataloging of the variability within and among stocks will be to experimentally assess the potential for genetic improvement by selective breeding. To do this, it is necessary to determine the heritabilities for traits of interest, that is the part of the phenotypic variability present in a population which results from genetic (heritable) causes as opposed to environmental causes. Traits such as size of adults, age of return and various timing parameters are particularly interesting to industry.

Application of artificial selection is responsible for the enormous advances that have been made in agriculture; the potential also exists in aquaculture.

3. Assessment of the effect of introgression of genes from hatchery fish into wild populations. To examine this effect, one must first have an estimate of the rate of straying and the factors that influence straying. Such factors might include transplant distance, run strength, source of the hatchery stock and year-to-year environmental differences. By using a genetically marked stock, one can monitor the flow of "hatchery genes" into other populations. Because the effect of such introgression may develop over time, it is necessary that such an experiment be conducted over several generations. For this kind of study, it may be necessary to develop a means for marking fish cultured at production levels.

The second part of this problem is to establish the impact of introgression. A range of potential interactions is possible ranging from introgression between two unrelated stocks to the introgression of fish subject to the selective pressures of a hatchery back into the wild stock from which they were derived. Research to examine these effects could best be done in an experimental hatchery where hybrid stocks could be produced and all releases marked. Port sampling and stream walking would be necessary to evaluate survival, straying and other phenotypic effects.

4. The effects of inbreeding and maintenance of inbred lines. Accompanying the artificial propagation of a species is the potential for inbreeding, loss of genetic variability and increased homozygosity. Information pertinent to the extent of inbreeding depression that results from various levels of inbreeding is necessary in determining adequate effective population sizes. This is especially important for species

for which a large effective population size is difficult to maintain. In addition, this information would permit a judgement on the efficacy of enhancing very small remnant populations. This work could be done both by performing crosses designed to accomplish some level of inbreeding, and by the maintenance of small randomly breeding populations. In both cases, it is important to keep careful controls.

APPENDIX A

Appendix A

The relationship of breeding structure, effective population size, and rate of inbreeding.

Breeding structure can profoundly affect effective breeding size (N_e) of a population. We can, at least in theory, determine the effective breeding size for many breeding structures and obtain the rate of inbreeding (ΔF) as

$$\Delta F = 1/2N_e$$

directly relating variation in breeding structure to loss of genetic variation.^{1/}

The following demonstrates the consequence of some breeding structures to effective population size.

Number of males and females: Unequal numbers of males and females in the breeding population reduce effective population size. Sex ratio is related to effective population number (N_e) as

$$N_e = 4N_m N_f / (N_m + N_f)$$

where N_m and N_f refer to the total number of males and females respectively. The effective population size is strongly influenced by the number of the least frequent sex.

Unequal numbers in successive generations: If the numbers of breeding individuals is not constant in successive generations the mean effective number is the harmonic mean of the number in

^{1/} See D.S. Falconer. 1981. Introduction to Quantitative Genetics. Longman Inc., New York.

each generation. Over generations the effective number is approximately,

$$1/N_e = 1/t(1/N_1 + 1/N_2 + 1/N_3 + \dots + 1/N_t).$$

The generation that has the smallest number will have the largest effect.

Nonrandom distribution of offspring among families: When there is large variation in family size the next generation is made up of the progeny of a smaller than expected number of parents. This can be related to loss of genetic variation through effective population number as

$$N_e = 4N/(V_k + 2)$$

where V_k refers to the variance in family size. When variation of family size V_k is equal to 2, then $N_e = N$. When the number of males and females are unequal, the variance of family size may be unequal in the two sexes and

$$N_e = 8N/(V_{km} + V_{kf} + 4)$$

where V_{km} and V_{kf} are the variance of family size for males and females respectively.

Overlapping generations: In species other than pink salmon generations are not discrete, they are overlapping. When generations overlap the effective population size is

$$N_e = 4N_c L/(V_{km} + 2)$$

where L is the generation time and N_c is the number of individuals born in a year, that is the cohort size. The cohort size N_c is related to the total number (N_t) by $N_c = N_t/E$ and E is the mean age at death. As before V_{km} is the variation of family size.

The effect of unequal sex ratio and unequal numbers in successive generations on population size can be easily estimated. On the other hand it will be difficult or perhaps impossible to estimate the variance of family size. Nevertheless, we should keep in mind the relationships of family size and overlapping generations. Overlapping generations will in general increase the effective population number in that individuals mating in different years contribute to greater diversity. Variance of family size can radically reduce effective population size. Procedures that contribute to variance of family size or separation of year classes should be avoided.

STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

OFFICE OF THE COMMISSIONER

WILLIAM A. EGAN, GOVERNOR

SUPPORT BUILDING
JUNEAU 99801

DEPARTMENT POLICY

STATEMENT OF POLICY ON PERMITTING NONPROFIT SALMON HATCHERIES IN ALASKA

Approved by:

James W. Brooks
James W. Brooks, Commissioner

Date:

October 3, 1974

STATEMENT OF POLICY ON PERMITTING NONPROFIT SALMON HATCHERIES IN ALASKA

References to Statutory Authority

ALASKA STATUTES:

1. AS 10.10.400-470--Authorizing the operation of private nonprofit salmon hatcheries.
2. AS 10.20--Nonprofit Corporations.

THE NEED FOR POLICY--The way in which privately owned salmon hatcheries develop in Alaska is of significant importance to the managers of the state's common property fishery resources. Spawners or eggs must be obtained from the public's natural resources to stock the private hatcheries; the salmon fry produced in the hatchery will be released from the hatchery operators control into the natural waters of the state to grow, migrate, and mix with wild stocks in a natural manner; and at some designated point near the hatchery site the returning adult salmon surviving the oceanic elements and the traditional fishery will again become the private property of the hatchery owner.

The questions of where the private hatcheries are to be located, which species are to be produced, and how and by whom the returning adults are to be harvested are the central issues of concern to the Alaska Department of Fish and Game. For each proposed hatchery decisions must be made, for example, on (1) where the hatchery should be located so that the management of the state's naturally produced salmon will not become drastically complicated or even impossible because of mixing of wild and hatchery fish; (2) how many spawning fish may be taken from perhaps an already depressed run to stock a private hatchery; (3) whether or not the public's best interests would be served by a private hatchery or public enhancement project at the proposed site; (4) whether or not the private hatchery will preempt from the public the recreational-use fishery potentials near the hatchery site; and (5) how the harvest of the returning run of adult fish--likely mixed with wild stocks--can be best managed.

Policies have been developed to serve as guidelines for determining present and future decisions on how privately owned salmon hatcheries can operate to best serve the interests of the people of Alaska.

These policies will aid in defining which course of action the department should select from a choice of several alternative and perhaps less desirable courses of action. They are to reinforce rather than diminish the need for the managers to use their keenest ingenuity and skill in formulating the numerous complex decisions that must be made in each private hatchery situation. The Department recognizes that the policies must be responsive to a given set of conditions. As conditions change and as hatcheries evolve in Alaska and as they are evaluated, the policies will also change.

Two sets of "statements of policy" are expressed below:

1. The first set deals with the determinations that will be made by the commissioner of ADI&G in judging whether or not a permit for a private salmon hatchery should be granted to an applicant, and
2. the second set deals more with the operational aspect of private salmon hatcheries.

STATEMENTS OF POLICY FOR GRANTING PERMITS--It is the policy of the State of Alaska to foster the private ownership of salmon hatcheries by qualified non-profit corporations when the following qualifying considerations are satisfied:

1. A determination by the Commissioner of the Alaska Department of Fish and Game that the stream at the proposed hatchery site is either depleted of salmon or is a non-significant producer of salmon and that the stream is unlikely to be restored or enhanced to levels supporting an adequate harvest in a reasonable time by either natural processes or by rehabilitation measures that may be taken by the state.
 - (a) The basis for declaring a stream "depleted" will be the determination that either the stream has been adversely altered to destroy its production potential or that, for whatever reason, the escapement history of the salmon spawning runs in the stream indicated a significantly reduced and consistently low level of production.
 - (b) The basis for declaring a stream a "non-significant producer" will be the determination that the stream's natural productivity of salmon--even at its maximum--is very low because of its physical limitations, e.g. because very-limited spawning area is available. One of the major factors that will be considered in permitting a private nonprofit salmon hatchery on a stream declared a "non-significant producer" will be a judgement as to whether or not substantial increases in salmon production are likely to be achieved by a hatchery. Included in this judgement will be consideration of the quality and quantity of water available and whether or not the stream has an ample egg source for stocking the hatchery.
2. A determination by the commissioner that the nonprofit corporation is both technically and financially qualified and capable of managing a hatchery. That is, a corporation that has been judged as qualified by the Commissioner is one that demonstrates that it has technical advisors with a knowledge of contemporary salmon husbandry practices to assure that seed-stock acquired from the State will not be wasted and is one that is financially capable of paying for necessary monitoring, inspections, and advisory services needed.

3. A determination by the Commissioner that the management of naturally occurring wild stocks will not be unduly hampered by locating the hatchery at the proposed site. If complexities arise in managing mixed stocks, including both hatchery fish and wild fish, it will be State policy to manage the collective resource in a manner that favors protection of the wild stocks.
4. The Commissioner's assurance that the applicant's plans indicate that operation of the hatchery will be consistent with the State's policies on fish genetics and fish disease control.

The Alaska Department of Fish and Game will restrict its hatchery permit procedures to cover only its own responsibilities as the state's fishery management agency. Thus, an ADFG permit to construct and operate a private non-profit salmon hatchery will not represent approvals, permits, or licenses that a corporation may be required to obtain from other state and federal and local agencies concerned with matters of real estate, water use, taxation, structures in navigable waters, and environmental protection.

As a provisional policy, the state will use the date-of-receipt of the application with the \$100 filing fee as a means for recognizing a proprietary claim to a hatchery site on public lands.

It will be a policy of the department to process only one permit at a time for any private non-profit corporation and to require that the first hatchery show satisfactory progress prior to issuing a permit to construct and operate a second hatchery at another site.

STATEMENTS OF POLICY FOR OPERATION OF PRIVATE SALMON HATCHERIES--

These policy statements apply to the manner in which private hatcheries should operate so that the public interests will be protected. Many of these statements amplify or supplement statements expressed in the Alaska Statutes.

1. Transplantation of Eggs--The department shall closely administer the taking and transplantation of eggs to be used in Alaska salmon hatcheries. Transplantation of eggs is one of the major overriding concerns of the department because this activity can disseminate disease in epidemic proportions and adversely affect important genetic characteristics of both propagated and wild races of fish. The role of fish disease in natural and wild populations is for the most part little understood and remains as one of the major areas of economic risk in management of hatcheries and fish rearing facilities.

Genetic manipulation of fish stocks through inadvertent management practices and transplants of stocks can disturb the heritable characteristics and thereby materially diminish the homing instinct of major portions of fish runs and affect the timing of egg development and hatching, smolt outmigration, and returns of adults. Transplantation of eggs from one stream to another is potentially one of the major biological risks in Alaska's salmon hatchery practices.

The department will not authorize the importation and introduction of salmon eggs from sources outside the State of Alaska for either public or private hatcheries. During the initial development of private hatcheries in Alaska, the department will be especially cautious about approving transplantation of surplus eggs from one private hatchery to another.

The Department of Fish and Game will not assume responsibility for egg mortalities that may occur during the collection, transportation, and after the eggs are received at the hatchery.

2. Ownership of Hatchery Reared Salmon--Salmon reared by private non-profit hatcheries are declared to be a common property Alaskan natural resource from the time they are released into the natural waters of the state until the time that they segregate from naturally occurring stocks at the specific location designated in this permit by the department. After resumption of control of returning fish by the hatchery, the highest priority use of the mature fish will be to provide hatchery brood stock requirements, and if applicable, to provide the natural spawning requirements of the hatchery water source. These requirements must be met before surplus fish or eggs can be sold or otherwise disposed of by the hatchery. Hatchery fish held under positive control within a closed system are declared to be property of the owners of the hatchery.
3. Availability of Fingerling or Smolt from State Hatcheries--The state will allow the purchase of fingerling or smolt stock by private salmon hatchery corporations when such stocks are surplus to the state's needs. Current needs for king and coho salmon stock by Alaska's public hatchery and rehabilitation program are so great that sales of fingerlings and smolts in quantities sufficient for commercial operations will not be available in the foreseeable future. The cost of the fish to the purchaser will be determined on a basis of either the pro rata cost of the state's total hatchery operation or on a highest bid arrangement when competitive bidding is expected.
4. Management of Common Property Fishery--By granting a permit for a private hatchery, the department recognizes its obligation to regulate the fishery to achieve escapements to the private nonprofit salmon hatcheries. It will be the policy of ADF&G to manage the commercial and sports fisheries to return adult fish to the hatchery site in the same manner as it regulates fisheries to obtain a return of spawners to natural streams. While the department will not institute any irregular restrictions on the traditional

fishery, it will strive for an escapement of spawners sufficient for stocking the hatchery and for obtaining an optimum number of natural spawners to the hatchery water source stream.

5. Use of Natural Lakes by Private Hatcheries--The department will exercise particular discretionary and cautious judgement before granting the use of natural lakes to private corporations. Among other things, the department must consider to what extent the permit may deny access of the lake to sport fishermen or to other public uses. As a provisional policy, the department will not permit natural lakes of greater size than 10 surface acres to be used solely for rearing of fish by private fish farming or by private nonprofit salmon hatcheries.

Department of Fish and Game
Division of F.R.E.D.

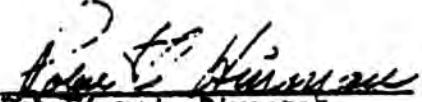
STATEMENT OF POLICY ON CONTROL OF FISH DISEASE

Disease is an important limiting factor in the success of all operations dealing with animal populations. In populations of aquatic animals, diseases may be caused by pathogenic microorganisms, the effects of toxic materials, or general environmental deterioration. It is known that subtle physical changes in aquatic environments may result in stress and lead to the impairment of fish health. However, the role of disease in the dynamics of wild fish populations is for the most part little understood. The health of these populations must not be jeopardized by enhancement and rehabilitation efforts.

Statements of Policy

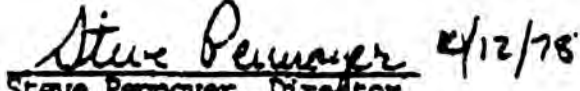
1. Protection of Wild Stocks - Wild stocks of fish and shellfish are one of the most valuable of all Alaskan resources. The health of these populations is an important consideration in disease control efforts and the determination of the status of disease in these populations is a research objective. F.R.E.D. Division's Fish Pathology Section shall monitor and guard against any hatchery practices, effluents, or stocks which pose a threat to the health of wild fish populations.
2. Rearing, Movement and Release of Infected Fish - The rearing, movement or release of infected fish shall be avoided. Apparent disease problems must be treated and controlled prior to release of fish. Regular reports dealing with fish health, site inspections, and examination of lots before release are necessary to accomplish detection and control of fish diseases. In cases where treatment is either impossible or impractical, the Fish Pathology Section will, on an individual basis, recommend either destruction of the lot or release with limitations on uses and release sites. Movement of disease carriers into watersheds without a previous history of this disease will be prohibited. All proposed egg and fish transports will require prior approval using the transfer request form.
3. Stock Selection - Import of fish or eggs from distant watersheds, whether intrastate or interstate, will be strongly discouraged. The use of native or resident stocks in all enhancement projects will be strongly encouraged to avoid importation of new pathogens. If the use of actual or suspected disease carrier stocks is necessary to maintain the genetic integrity of a watershed, the Fish Pathology Section will, if possible, recommend techniques designed to prevent or minimize these potential problems.
4. Hatchery Practices - The Fish Pathology Section will promote the use of hatchery practices designed to prevent disease. Egg disinfection will be required for all transfers between watersheds, regardless of whether or not a hatchery facility is involved. Fish pathology personnel and facility personnel will work closely concerning actions which have significant fish health ramifications.

5. Use of Chemotherapy - The use of vaccines and preventative methods of fish culture are preferable to treatment of epizootics after they occur. For most purposes, chemotherapy will be considered a last resort to be used when cultural and management techniques have failed to prevent disease. Indiscriminant use of any chemotherapy is prohibited. The decision to treat with any non-cleared drugs, on an experimental basis, shall only be with the advice and approval of the Fish Pathology Section.
6. Consistency of Public and Private Aquaculture Disease Policy - Regulations, policies, and hatchery practices related to disease prevention and control shall be consistent for all Public and Private Facilities.

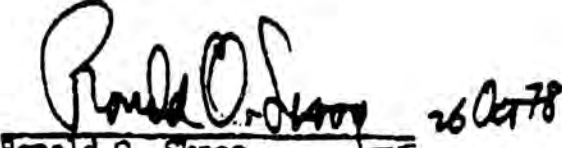

Bob Hirman, Director
Game Division

 9/21/78
Russ Clark, Director
Administration Division

 9/21/78
Robert S. Roys, Director
F.R.E.D. Division

 4/12/78
Steve Pernoy, Director
Commercial Fish Division

 10/23/78
Robert Andrews, Director
Sport Fish Division

 26 Oct 78
Ronald O. Skoog
Commissioner

ATTACHMENT C
Oregon's Wild Fish Management Policy

Oregon's Wild Fish Management Policy
What is it and what does it do ?

November 5, 1990

The revised Wild Fish Management Policy (WFMP). was passed by the Oregon Fish and Wildlife Commission in January, 1990 with the singular purpose to protect the genetic resources of Oregon's native fish species.

To understand what the WFMP is really all about, there must first be some agreement as to what a "wild fish" is. In addition, the term "genetic resources" and why they are important needs to be clarified.

What is a wild fish ?

The words "wild fish" mean different things to different people. The definition used for Oregon's WFMP may not agree with some of these viewpoints. While a clear understanding of our wild fish definition is crucial to comprehending this policy, other definitions when taken out of the WFMP context, may have equal value and utility.

For the purposes of the WFMP, a wild fish must meet two criteria. It must be a species of salmon, trout, whitefish, or sturgeon native to Oregon. Also included are those non-game native fish that have been placed on the state sensitive species list. Secondly, it must be naturally spawned and descended from a population that was present in the same geographical area prior to the year 1800. For example, naturally reproducing populations of brown trout or largemouth bass (both non-native species) are not wild fish. Neither would be naturally produced Umatilla River spring chinook - the historic Umatilla population went extinct at least 50 years ago. Reintroduction efforts currently underway can not restore this lost genetic heritage, the chain of post-1800 generations has been broken.

An important aspect of our definition is that we assume unique genetic resources exist for each population of wild fish. This is a conservative approach. It is based upon the rationale that if one assumes there are differences between populations, the genetic resources of a particular species are not compromised if this assumption is proven wrong by future scientific evidence.

A riskier approach would be to assume our present level of genetic understanding is adequate to judge that important differences do not exist between certain populations or that hatchery fish have "swamped out" unique features of certain

wild populations. Either way new management activities (hatchery programs or fishery harvest) based upon such assessments would likely follow. However, if the original genetic assessment under this approach had been wrong, it is likely the option of recovering and maintaining these population differences would be lost. One of the main objectives of the WFMP was to avoid the possibility of making this type of error. Therefore, given the lack of knowledge surrounding the genetic characteristics of our native fish we determined the conservative approach embodied in the WFMP was the most responsible path to follow.

What are "genetic resources" ?

The construction and operating instruction for every plant or animal is written in the language of DNA and organized in information packages called genes. Like books in a large library, each gene corresponds with instructions for a specific aspect of a fish's structure, function, or behavior. However, any two fish of the same species rarely have the identical instructions for every gene.

Within a given population the existence of variation (i.e., differences in size, shape, behavior, survival...etc.) due to slight differences in specific genes is not uncommon. In addition, when populations of the same species are compared it is not unusual to find larger scale population patterns as to where certain variants of specific genes are found. In other words, genetic variation occurs at two levels: 1) between individuals of a single population, and 2) between populations of an entire species. This two-level genetic variation we define as the "genetic resource" of a species.

Why is protection of genetic resources important ?

The protection of genetic resources is an important issue to fishery management. First, for fish populations to maximize production potential they must retain genetic characteristics which are conducive to high survival in the specific ecological communities and habitats they occupy. Since these habitats vary throughout the range of a species, it is reasonable to assume that genetic characteristics also vary in a corresponding manner. To disrupt this type of variation may result in populations that are less adapted to survive in their native habitats and as a consequence experience a decline in their production (fewer fish).

Second, habitat and ecological communities are not static. Whether natural or human-caused, changes occur. To give a population (and ultimately a species) the best chance for surviving these changes it must retain the capacity to make the appropriate genetic response. In most cases this response consists of a corresponding genetic change. A

population that contains a large supply of genetic variation among individuals is, in general, best prepared for making such adaptive changes.

In summary, the preservation of sustainable fish production is contingent upon maintaining populations that are adapted to their local habitats, yet flexible enough to respond to future changes in these habitats. The protection of genetic resources facilitates the mechanism by which this adaptive yet flexible capacity is maintained.

Summary of the Wild Fish Management Policy (WFMP)

Why do we have it ?

The purpose of the WFMP is to protect the genetic resources of wild fish (OAR 635-07-525). However, the other intent of this short section is to limit the management scope of the WFMP. By intentional omission, the WFMP does not classify waters of the state as to where hatchery fish can or can not be planted. Nor does the WFMP require that populations of wild fish be managed to maximize the productive capacity of natural habitat. Fishery management issues that fall outside of protecting the genetic resources of wild fish are not addressed by the WFMP. For example, a wild steelhead population that has been depressed from a run size of 5,000 to a stable level 500 fish due to dam mortalities, over-fishing and adverse interactions with hatchery fish might still be consistent with the specific standards of the WFMP and therefore be acceptable from the genetic standpoint. However, such a depressed population would unlikely meet natural production objectives and corrective actions would be taken. The WFMP provides the genetic foundation upon which desired natural production objectives set in basin plans can be built.

What does it direct us to do ?

The general policy statement of the WFMP is contained in OAR 635-07-526. First, it states that for wild fish, protection of genetic resources is job number one. As such it takes management priority over all other economic, commercial, recreational, and aesthetic benefits. However, it also states that sustaining these benefits is the reason for protecting genetic resources. Second, it directs that all populations of wild fish be managed to meet specific conditions spelled out in subsequent portions of the policy unless withdrawn from consideration by direct action of the Commission. Third, it directs the Department to not take a sudden, "meat cleaver" approach in implementing this policy.

It recognizes that the process of bringing all wild populations into compliance with the WFMP standard may take time, however, incremental progress towards this long-term goal is expected.

What is the WFMP standard ?

The operating principles section of this policy (635-07-527) describes in detail the standard that is desired to be met for all wild populations. While a long section, the standard can be generally stated as follows. For a wild population to be consistent with WFMP it must have no fewer than 300 spawners (with some exceptions). In addition, if hatchery fish exist and spawn naturally within the geographical area where a wild population is found a limit is placed on their relative numbers. For most situations, this limit is set so that during the time period wild fish are spawning, hatchery fish may comprise no more than 10% of the total spawning population. However, in those circumstances where the hatchery fish are from a broodstock that is genetically similar to the wild population the limit is raised to 50%.

A more detailed description of the WFMP standard begins with the first paragraph of 635-07-527. This paragraph stresses that there is uncertainty with respect to the standard developed for the WFMP. The criteria used to define the WFMP standard were based upon our best judgement as to what would be necessary to protect the genetic resources of wild fish. A conscious effort was made to take these criteria measurable in order to avoid the ambiguity and difficulty of such phrases as "... to the extent possible" or "...having a minimum impact". However, the danger of providing a measurable standard is that future evidence may suggest that it is scientifically incorrect. Therefore, as new and better information becomes available the WFMP will be revised as appropriate.

Operating principle number 1, relating to the interbreeding of hatchery fish with wild fish, is the most complex of the six operating principles that define the WFMP standard. Under this principle, several options are given concerning the use of hatchery fish. Hatchery fish can either be removed entirely (option a), manipulated such that they will not reproduce (option b) or controlled in some other way such that their assumed genetic impact on the wild population will not be significant (options c and d).

Option (c) consists of using genetically similar hatchery fish in controlled numbers such that they will not outnumber wild fish on the spawning grounds (i.e., hatchery fish comprise less than 50% of the total spawning population). The 50% limitation is specified because it is unknown if a

hatchery can spawn and rear fish from wild broodstock without some genetic change occurring either immediately or in successive generations. Therefore, this limitation is intended to offer some protection should future analyses show that our guidelines for development of hatchery stocks that are genetically similar to specific wild populations do not work.

The concept behind the type of hatchery fish described under option (d) is that they spawn at different locations or times than do wild fish. The objective of this strategy is to reproductively isolate hatchery fish from wild fish. Given this reproductive isolation, it is acceptable if these fish are genetically different from the wild population. For example, if coho salmon released into a particular river all return to the hatchery site as adult spawners, then they will not be able to interbreed with wild fish. Isolation may also occur if the hatchery fish spawn at a much earlier time than do their wild counterparts. The critical issue under option (d) is to prevent hatchery x wild matings in the natural environment.

Finally, a further limitation with respect to hatchery fish is presented in paragraph (e). Particularly for anadromous species, hatchery fish often stray to river systems adjacent to those where they are planted. A high level of straying can seriously impact the genetics of wild populations. In addition, it is not realistic to assume that option (d) hatchery fish will be 100% isolated from wild spawners. Most likely, both option (d) hatchery fish and hatchery strays from adjacent rivers will differ genetically from the wild fish. Therefore, they are lumped together and given a maximum limit in paragraph (e) of 10%. This limit applies only to the time period when the wild fish are spawning. For example a wild population having 900 spawners existing in a watershed which also has 900 naturally spawning hatchery fish may be consistent with WFMP under certain conditions. One of these conditions would be if the hatchery fish spawned so early that only 100 were left during the period wild fish were spawning. This would result in relative numbers that would meet the 10% limit (900 wild fish and 100 hatchery fish) and therefore be acceptable.

During the course of developing the WFMP the 10% limit was a topic of considerable debate. However, based upon the comments received from several geneticists and the output from several different genetic modelling exercises, we feel that the 10% limit provides adequate genetic protection in most situations. The policy does allow for this limit to be reduced when hatchery fish differ substantially from the wild fish.

Operating principles 2, 3, and 4 relate to largely the same genetic concern. A population that has been reduced to a small number of breeding individuals tends to lose genetic variation through a random process geneticists call "genetic drift". Mortality, from any source that suddenly drives a population down to these levels is therefore genetically risky. For each of these three operating principles (each relating to different source of mortality) a boundary of 300 breeding individuals was set as the minimum stable population size that is acceptable under the WFMP standard. In addition, if the population is declining, this decline is only acceptable under the WFMP standard if a breeding population of 300 or fewer fish is not expected within the next 5 years.

The fifth operating principle is a description of special situation that requires an exception from the 300 fish criteria described for principles 2, 3, and 4. A small, trout population isolated by a barrier waterfall best exemplifies this special situation. In such a case there is simply not enough habitat to support a spawning population of more than say 150 adults. However, such a population differs from a population that has been suddenly reduced from 2,000 to 150 fish due to human activities. Because genetic differences between naturally small populations are often great, collectively they represent an important genetic resource. Principle 5 was written to make sure such populations are recognized and that the WFMP accepts them in their natural, below 300 condition.

The last operating principle, number 6, addresses management concerns specific to fisheries operating on aggregates of many different populations. It would be disruptive, for example, to place severe harvest restrictions on a coho salmon fishery in order to bring one or two small populations into compliance with the WFMP when they are aggregated with fish from 50 other populations that are healthy and can withstand harvest. This principle then, is a recognition of the fact that for populations which enter aggregate fisheries extra care must be exercised in bringing them into compliance with WFMP so as to minimize adverse social and economic impacts.

Are there exceptions ?

The WFMP has a provision whereby individual populations may be exempted from ever meeting the WFMP standard (OAR 635-07-528). Although it is hoped this option will be used infrequently under certain conditions the Oregon Fish and Wildlife Commission may take such action.

To exempt a population the Commission must find that social and economic considerations offset the biological

consequences of losing the genetic resources of the population involved. Before making such a decision however, the Department is required to prepare an analysis of the long-term biological implications should the population in question be granted an exemption. The critical issue will be whether such action might cause a serious depletion of the species within Oregon. This analysis will also be made available to the public for comment, 45 days prior to the meeting date the Commission considers the exemption.

How will the WFMP be implemented ?

The last section of the WFMP (OAR 635-07-529) describes the steps that will be taken to implement this policy. In developing this section one of the primary goals was to make it possible for the public to objectively measure if the Department was making progress towards achieving the overall policy goal of meeting the WFMP standard for all populations. In addition, it was intended that this section provide directions for a deliberate and accountable process in making key decisions, which implementation of this policy will require.

The first paragraph of this section directs the Department to develop a list of populations for all species of wild fish by January 1991. This is an extremely significant step, because the WFMP is designed to work on a population by population basis. These populations will become the units by which the policy is implemented and by which progress will be judged.

In many situations it will be difficult to identify individual populations, because we do not have enough information to discern clear population boundaries. In those cases when we are in doubt if a group of fish is isolated enough to be a population, we will err on the side of being too conservative and call them a population. Once developed, this list of populations will be examined one at a time against the WFMP standard.

In general, paragraphs 2, 3, and 4 of this section describe actions that the Department is directed to take during the interim period prior to achieving full compliance with the WFMP. They recognize that while existing basin and species management plans are being rewritten to be in compliance with the WFMP, the WFMP will take preference. For preparation of new basin plans, direction is given that they include for each species at least one strategy that is consistent with the WFMP standard. Finally, the Department is directed to not stock hatchery fish into wild fish populations not currently being stocked. The only exception being if such action is approved in a basin plan or if the wild population has been exempted from the WFMP.

Paragraph 5 of this last section describes the preparation of a status report which the Department is required to do every two years beginning with December, 1991. This report will have five components.

First, for each population a historical and current status summary will be prepared based upon best available information. Past records of hatchery fish introductions, changes in habitat, and harvest patterns will be the focus of the historical portion. The current status portion will require an estimate of the number of wild spawners for each population. In addition, if hatchery fish occur within the geographical boundaries of the wild population, estimates of the proportion of hatchery fish naturally spawning during the time the wild fish spawn and whether they are genetically similar to the wild fish will be necessary.

The second part of the report will describe the results of comparing each wild population, using the information described above, against the WFMP standard. Out of this comparison will come two lists. A "pass" list of populations which that consistent with the WFMP standard, and a "fail" list of populations which are either not consistent with the standard or for that there is insufficient information to make a reasonable determination of compliance. This process is to be repeated for each biennial report (every two years).

It is envisioned that the number of populations on the fail list will be used as a report card on the progress with which the WFMP is being implemented. The rate at which the size of this list decreases over the next 10 years will provide an accountable and objective basis for measuring our progress in achieving the intent and goal of the WFMP.

An identification and description of problems for each population on the fail list will be presented in the third portion of the report. Again, lack of data may make this assessment difficult, even for populations that are known not to meet the standard. For example, it may be hard to tell if over-harvest or loss of habitat is responsible for depressing a population below the 300 spawner level (recall that a minimum of 300 spawners is needed to pass the WFMP standard). Questions about the potential productive capacity of the existing habitat and spawner-recruit relationships would need to be at least crudely understood to identify the problem that caused the decline.

The next section in the report will describe possible solutions that the Department has developed for each population on the fail list. The intent of these solutions is, that if implemented, they would result in the population eventually being moved from the fail list to the pass list.

An approximate cost for each of these solutions will be included as part this presentation.

At least initially, the "solution" for many populations may be to obtain the data necessary to fill in crucial data gaps required to permit testing the population against the WFMP standard. For other populations, enough information will be available to propose immediate on-the-ground solutions to bring them in compliance with the WFMP standard. For populations that have failed because of having less than 300 spawners, possible solutions might include: 1) habitat restoration, 2) screening of water diversions, 3) improving passage at dams, 4) changing release locations and numbers of hatchery fish to reduce competition and predation, 5) closing of certain areas to fisheries to protect spawners, 6) reducing direct or incidental fishing mortality on juvenile or adult fish.

For other populations which have failed the WFMP standard because hatchery fish are exceeding the natural spawning limit, another range of possible solutions exist. These include: 1) decrease the number hatchery fish that reach the spawning grounds by reducing the number of fish planted or implementing strategies to target increased harvest on hatchery fish, 2) release hatchery fish that are sterile, 3) increase the number of wild spawners through strategies that increase natural production (i.e., habitat restoration) or regulations to reduce fishing mortality, 3) switch to a hatchery broodstock that is genetically similar to the wild population, 4) develop strategies to draw returning adult hatchery fish away from natural spawning areas (e.g., acclimation ponds, changes in time and place of releases, etc.).

Finally, at the end of this report, a list of those strategies that may have significant effect on future management direction, user groups, or funding requests. This list will include a summary of the decision needed in each case and a corresponding assessment of what each of the possible decision outcomes (i.e., accept, reject, or defer) might mean to the resource, the public, and the Department. Where appropriate the Oregon Fish and Wildlife Commission would be asked to take the action necessary to make specific decisions.

The last portion of the WFMP concerns a short paragraph directing the Department to develop a gene conservation policy and associated program to monitor the genetic status of representative populations.

Mark W. Chilcote, ODFW Natural Production Program
November 5, 1990

Wild Fish Management Policy

Purpose of Wild Fish Management Rules

635-07-525 These rules are established to guide the management and conservation of genetic resources of wild fish in Oregon. Although direction with respect to natural production is provided by OAR 635-07-521 through OAR 635-07-524, additional guidance is required to assure that genetic resources of wild fish are protected. f. & ef. 1-24-90

General Policies of Wild Fish Management

635-07-526 (1) Protection of genetic resources shall be the priority in the management of wild fish to assure optimum economic, commercial, recreational, and aesthetic benefits for present and future residents of Oregon.

(2) It is the policy of the Department to implement the Wild Fish Management Rules for all populations of wild fish except those populations specifically exempted by the Commission in accordance with OAR 635-07-528.

(3) It is recognized that management of some populations may not currently be fully consistent with these rules. However, it is the Department's long-term goal to bring these populations into compliance, with the exception of populations specifically exempted by the Commission in accordance with OAR 635-07-528. f. & ef. 1-24-90

Operating Principles for Wild Fish Management

635-07-527 The Department recognizes that the operating principles developed to implement this policy are associated with varying levels of uncertainty. These principles shall be continuously revised as better information becomes available. In addition to the operating principles of the Natural Production Rules (OAR 635-07-521 through 635-07-524), the following operating principles apply to the management of populations of wild fish.

(1) Interbreeding of hatchery and wild fish: The interbreeding of hatchery fish with wild fish poses risks to conserving and utilizing the genetic resources of wild populations. These risks shall be limited by implementing either strategy (a), (b), (c), or (d) listed below, consistent with the further limitation described in (a) below.

(a) Eliminate the release of hatchery fish.

(b) Release hatchery fish that are sterile and that do not attempt to spawn.

(c) Release hatchery fish that are maintained to be genetically similar to the wild population and limit the number of all naturally spawning hatchery fish to no more than 50% of the total number of naturally spawning hatchery and

hatchery fish that are genetically similar to the wild population are:

(A) Use only hatchery fish that originated from the wild population;
(B) Incorporate naturally produced fish in the broodstock in every generation; and

(C) Avoid random and nonrandom genetic change due to failure to maintain a representative sampling of the genes within a population.

(d) Release fish that are demonstrated to be reproductively isolated (spatially or temporally) from the wild population. The Department recognizes that absolute reproductive isolation may not be possible to achieve and therefore these fish shall be included in the limitation of 10% dissimilar fish stated in (e) below.

(e) Except for genetically similar hatchery fish described in (c), hatchery fish that spawn at the same time and place as the wild population, shall comprise no more than 10% of the total number of naturally spawning fish. A more restrictive level may be designated for those situations where the hatchery fish are known to differ substantially from the wild population in their genetic makeup.

(2) Habitat: Degradation of habitat that reduces the potential for fish production or adversely affects fish migration routes poses a risk to conserving and utilizing the genetic resources of wild populations. The Department shall oppose habitat degradation that causes a population to experience a decline in abundance that if continued for an additional 5 years would likely reduce the number of spawners to 300 fish. In addition, the Department shall advocate the restoration of degraded habitat that has depressed a population to a stable level of 300 or fewer spawners.

(3) Competition, predation, and disease: Introductions of fish of the same or different species as those already present may seriously reduce the survival of wild fish through competition for food and space or through predation. Introductions of disease may also deplete a wild population. An extreme level of mortality from these sources poses a risk to conserving and utilizing the genetic resources of wild populations. The Department shall oppose any actions that allow mortality from competition, predation or disease to cause a population to experience a decline in abundance that if continued for an additional 5 years would likely reduce the number of spawners to 300 fish. In addition, where a population has been depressed to a stable level of 300 or fewer spawners, the Department shall support and advocate actions to correct the cause of such population decrease.

(4) Harvest: providing the opportunity for optimum harvest benefits is consistent with wild fish management. However, an extreme level of harvest, or harvest that disproportionately reduces some segment of a population, poses a risk to conserving and utilizing the genetic resources of a wild population. The Department shall oppose harvest strategies that, by themselves, cause a population to experience a decline in abundance that if continued for an additional 5 years would reduce the number of spawners to 300 fish. In addition, the Department shall advocate the termination of harvest strategies that have depressed a population to a stable level of 300 or fewer spawners.

(5) Small populations: It is recognized that even in the absence of changes brought on by human activities, populations of 300 or fewer spawners may exist naturally. Such populations have survived even though random genetic processes, operating over long periods of time, have probably caused a reduction in genetic variation. Often in the process of losing this variation, rare genetic characteristics become established. From an evolutionary

perspective, protection of these small populations is highly desirable because of the unique features they contain. Therefore, these populations shall not be excluded from consideration for wild fish management.

(6) Aggregate stock fishery management: Some fisheries, such as ocean salmon fisheries, target on aggregations of fish belonging to many different populations. In implementing the Wild Fish Management Rules (OAR 535-07-529), the Department shall pursue the most cost effective, least disruptive (in terms of adverse social and economic impacts on those fisheries), and feasible strategy consistent with the policies and operating principles set forth in the rules. To bring individual populations into compliance with wild fish management, priority shall be given to correcting problems as they relate to use of hatchery fish, habitat, competition, predation, and disease before harvest restrictions on any aggregate stock fishery shall be considered. P. & ef. 1-24-90

Wild Fish Management Exemption Procedure

635-07-528 (1) The Commission may decide, at the request of any person, the Department, or on its own initiative, to determine whether a population shall be exempted from wild fish management.

(2) Such exemptions shall be scheduled for consideration through a rule making either at the next meeting at which the Commission adopts or reviews a basin plan for the area where the population is found, or at the next meeting at which the wild fish management progress report, described in OAR 635-07-529(6), shall be presented.

(3) Before scheduling a rule making on a proposed exemption, the Commission shall direct the Department to prepare a written analysis describing the biological significance and long-term implications of losing the genetic resources of the population proposed for exemption. The Department's report shall also assess whether the proposed exemption would cause a serious depletion of the species within Oregon. In addition, the Commission shall request that the proponent of the exemption prepare a written analysis of the social and economic justification for such action.

(4) The analyses described in (3) shall be made available for public review and comment at least 45 days in advance of the rule making on the proposed exemption.

(5) To exempt a population, the Commission shall find that social and economic considerations offset biological consequences, and that such exemption, when considered alone and in light of any other exemptions that have been granted, shall not cause a serious depletion of the species within Oregon. P. & ef. 1-24-90

Implementation of Wild Fish Management Rules

635-07-529 (1) Within one year of the effective date of these rules, the Department shall develop, for approval by the Commission, a provisional statewide list of populations of wild fish. This list shall be made available to the public for review prior to Commission consideration and approval.

(2) It is the intent of the Commission that, to the extent any basin and/or species plan currently adopted plan shall now be governed by these rules. As existing plans are reviewed and new plans are adopted, the Commission intends that they be explicitly brought into conformity with these rules.

(3) Basin plans presented to the Commission after the adoption of the Wild Fish Management Rules shall present at least one alternative strategy for

wild population which is consistent with wild fish management. For those basins with existing hatchery programs, two alternatives consistent with wild fish management shall be presented; one without hatchery supplementation and one with hatchery supplementation.

(4) The Department shall not stock hatchery fish into wild fish populations not currently being stocked, without authorization in a basin plan approved by the Commission or an exemption of the wild population in accordance with OAR 635-07-528.

(5) Progress toward achieving consistency with these Wild Fish Management Rules shall be reported to the Commission during the first six months of each biennium, prior to preparation of the next biennial budget. Beginning in 1991, each biennial report shall include, by species, the following information:

(a) Documentation of the management history of each wild population based on best available information. This shall include the current status of the population and a history of habitat change, harvest, and hatchery introductions;

(b) A list of populations of wild fish not currently managed consistent with the Wild Fish Management Rules;

(c) Identification and description of the problems preventing the Department from achieving consistency with the Wild Fish Management Rules for each of these populations;

(d) A description of the short- and long-term strategies and associated funding necessary to solve these problems; and

(e) A list of Commission actions, as appropriate, necessary to implement strategies identified in (d).

(6) The Department shall develop a gene conservation policy and a program to monitor the genetic status of representative populations. f. & ef. 1-24-90

Definitions

635-07-501 As used in this Division and Division 40:

(16) "Hatchery fish" means a fish spawned and/or reared under artificial conditions regardless of the history of the parent stock.

(23) "Management Plan" means:

(a) A plan which provides the basic framework (goals, policies and objectives) for managing a resource, geographic area, watershed (waterbody) or species adopted by the Fish and Wildlife Commission in public hearing; and

(b) Which may include specific information or alternatives relative to how the goals and policies may be achieved, e.g., techniques and guidance for implementation of the basic plan normally found in operation plans.

(27) "Natural Production" means the maintenance of naturally spawned fishes and their capacity to reproduce and rear in habitats which allow those fishes to fulfill all their necessary life history functions.

(36) "Population" means a group of fish spawning in a particular area at a particular time which do not interbreed to any substantial degree with any other group spawning in a different area or in the same area at a different time.

(43) "Sensitive" means those fishes that have been designated for special consideration pursuant to OAR 635-100-040.

(48) "Stray" means a hatchery fish that spawns naturally in a location different from the location intended when the fish was stocked.

(52) "Wild fish" means any naturally spawned fish belonging to an indigenous population of the following species:

- (A) *Oncorhynchus clarki*, commonly known as cutthroat trout.
- (B) *Oncorhynchus keta*, commonly known as chum salmon.
- (C) *Oncorhynchus kisutch*, commonly known as coho salmon.
- (D) *Oncorhynchus mykiss*, commonly known as steelhead (anadromous form) or Rainbow trout (non-anadromous form).
- (E) *Oncorhynchus nerka*, commonly known as sockeye salmon (anadromous form) or kokanee (non-anadromous form).
- (F) *Oncorhynchus tshawytscha*, commonly known as chinook salmon.
- (G) *Salvelinus confluentus*, commonly known as bull trout.
- (H) *Prosopium williamsoni*, commonly known as mountain whitefish.
- (I) *Acipenser transmontanus*, commonly known as white sturgeon.
- (J) *Acipenser medirostris*, commonly known as green sturgeon.
- (K) All fishes that have been designated as sensitive, pursuant to OAR 635-100-040.

CHAPTER VIII. FUNDING OF THE ALASKA SALMON ENHANCEMENT PROGRAM

INTRODUCTION

Sources of funds for the Alaska salmon enhancement program and projects include bond issuances, state general fund appropriations, salmon enhancement tax assessments paid by fishermen, state enhancement loans, and cost recovery sales of fish. This chapter provides information on funding of Alaska salmon enhancement program.

STATE HATCHERIES AND ENHANCEMENT PROJECTS

The Alaska Department of Fish and Game, Fisheries Rehabilitation and Enhancement Division (FRED) was established by the State Legislature in 1971 to encourage the use of hatcheries and other enhancement techniques to return the state's then depressed salmon fisheries to abundance.

At its peak, the division operated 20 hatcheries. Currently, the FRED Division operates 12 (though 16 are owned by the State) hatcheries to produce salmonid fishes for commercial, sport, and subsistence fisheries. As a result of declining state revenues, state policy shifted regarding the construction and operation of state hatcheries. In general, the state will only continue to operate salmon hatcheries that primarily benefit sport and subsistence fisheries and/or are primarily research facilities. In keeping with this policy, four permits have been issued to regional aquaculture associations for the operation of state-owned hatcheries at Trail Lakes, Cannery Creek, Kitoi Bay, and Hidden Falls. Additional permits will be issued to regional aquaculture associations for operation of the Main Bay, Tutka, and Beaver Falls hatcheries in 1992. Many of the state hatcheries were constructed for research purposes and not with cost recovery and loan repayment in mind. Therefore, in order to transfer these facilities to PNPs, the state has invested funds to make the hatcheries cost effective. While these transfers may be cost effective from an amortized capital and annual operating cost analysis, questions have been raised regarding the resulting fisheries management problems. Information on state hatcheries is provided in Table 1.

In addition to hatcheries, FRED has constructed numerous fish passes (several maintained cooperatively with the U.S. Forest Service) which provide access to spawning and rearing habitat that would otherwise be unavailable to salmon stocks. Other enhancement operations include lake fertilization, habitat improvement, and fish stock introduction to provide increased freshwater survival and new salmon production opportunities.

FRED also administers the PNP Hatchery Program and coordinates the development of regional aquaculture associations, approves annual operations management plans for all salmon hatcheries, and reviews PNP hatchery applications and the permitting process (which includes hatchery and fish and egg transporting permits). FRED operates five biological laboratories--Fish Pathology, Genetics, Limnology, and Tag Recovery facilities--which provide information and support for FRED and PNP hatchery programs. FRED also provides engineering service support to the department (including field facilities) and coordination with consultants, contractors, and landowners.¹

¹Brad Pierce, Aquaculture in Alaska, House Research Agency Report 87-B, February 1987, p.30.

Alaska Department of Fish and Game-FRED Division
Public Hatchery Strategic Plan

15-Mar-91

Hatchery	Location	Species	Percent Commercial	Percent Sport	Percent ** Substance	FY92 Operating Costs	Funding Source	Operational Plan FY	Agency	Comments
1 Beaver Falls	Ketchikan	Sockeye	100%	0%	---			92	SSRAA	
2 Big Lake	Big Lake	Sockeye Coho	85% 30%	0% 65%	15% 5%	\$50.0 \$344.3	Unfunded GF	92	FRED	Sockeye unfunded Interim funding or contract required.
3 Cannery Creek	Whittier	Pink	100%					89	PWSAC	
4 Clear	Clear	Arctic char Arctic grayling Lake trout		100% 100% 100%		\$22.4 \$308.5 \$90.8	GF DJWB F&G	92	FRED	Major sport fish production facility Vital to US/Can chum and chinook programs
5 Crooked Creek	Soldotna	Sockeye Coho Steelhead	95%	0% 95% 100%	5% 5%	\$46.0 \$348.2 \$120	CIAA GF PgR	92	FRED CIAA	Sockeye contracted to CIAA Contributes substantially to chinook sport fish program through eggtraps for other facilities
6 Crystal Lake	Petersburg	Chinook CL rel. Chinook remote rel. Coho Steelhead	55% 99% 83%	41% 1% 17% 100%	---	\$618.7	GF	92	FRED	Large US/Can capital investment US/Can involvement including Harding River, Deep Cove, and Faragut River Provides 5-7 million chinook eggs in addition to its own needs, primary stream rehab work from unique isolation modules.
7 Deer Mountain	Ketchikan	Chinook Coho Steelhead	60% 83%	40% 17% 100%	---	\$144.2 \$144.2	GF ANAD	92	FRED	Fisheries technology development results supplied to other state and private programs. Prime tourist facility, over 200,000 visitors annually. Major role in public education.
8 Elmendorf	Anchorage	Chinook Coho	9% 10%	90% 87%	1% 3%	\$112.6 \$375.2 \$67.9	F&G DJWB GF	92	FRED	Major sport fish production facility High visibility tourist attraction
9 Ft Richardson	Anchorage	Chinook Coho Rainbow	13% 10%	88% 90% 100%		\$144.2 \$583.5 \$181.6	GF DJWB F&G	92	FRED	Major sport fish production facility

Hatchery	Location	Species	Percent Command	Percent Sport	Percent ** Subsistence	FY92 Operating Costs	Funding Source	Operational Plan FY Agency	Comments
10	Gulkana	Glennallen Sockeye Chinook	90% 50%	2% 30%	8% 20%			92 FRED/PWSA	The most cost effective sockeye facility in the world 35 million sockeye salmon eggs take annually
11	Hidden Falls	Sitka Pink Chum	100% 100%					89 NSRAA	
12	Kitol Bay	Kodiak Pink Chum Coho Sockeye	100% 100% 80% 100%	50%				92 FRED/KRAA	
13	Klawock	Klawock Sockeye Coho Steelhead Chum	93% 50%	7% 100%	100% *** 50%	\$446.9 GF \$18.0 WB \$100.0 BIA (request)		92 FRED	BIA funds to address local projects, chum and sockeye. GF used in projects to rehabilitate POW in post-logging y
14	Main Bay	Whittier Sockeye	98%	1%				92 PWSAC	
15	Pillar Creek	Kodiak Sockeye	100%		***	\$200.1 PgR 38.6 GF		92 FRED/KRAA	Unfunded Interim funding or contract required
16	Russell Creek	Cold Bay Chum Pink Coho	100% 98% 50%	1% 50%		\$420.1 GF \$53.0 PgR		99 Reg. Assoc.	FY92 PgR from Aleutian's East Borough Fisheries developmental facility to be contracted in FY99
17	Situsulaq	Kotzebue Chum	80%		20%	\$391.4 GF		99 Reg. Assoc.	Developmental facility, fisheries technology development Great potential for subsistence harvest. To be contracted in FY99
18	Snettisham	Juneau Sockeye CIF Sockeye (smolt) Chinook (Deep Cove) Chinook (juvenile)	100% 100% 94% 88%	6% 34%	*** ***	\$775.8 GF \$167.6 US/Can Deep Cove \$108.0 US/CAN \$190.0 WB		92 FRED	Tremendous involvement in US/Can projects, \$1.35 million 5 years operational funding in Deep Cove. Applied technology development for sockeye smolt. Major sport fish production in Juneau recreation project.
19	Trail Lakes	Moose Pass Coho Sockeye	100%	100%	***			89 CIAA	
20	Tutka	Homer Pink Chum Sockeye	98% 100% 100%	2%	*** ***	\$429.3 CIP		96 CIAA/ LCI Seiners	Unfunded Interim funding or contract required.

** - Includes potential use

*** - Thought to contribute to subsistence but as yet unspecified

STATE ENHANCEMENT PROJECT FUNDING

Funding for the operation of the state salmon enhancement program and state project construction, operation, and maintenance has been primarily through state bonds and general fund appropriations to ADF&G, FRED Division. From FY 72 - 92 operating budget, funding for the FRED Division totalled approximately \$210.3 million, the majority of which was for salmon enhancement. Bond issues totalling \$56.17 million were authorized by the 1976 and 1978 Legislatures, and overwhelmingly endorsed by voters, to fund the construction and operation of hatchery production and other enhancement projects in each region of the state. Of the \$56.17 million in bond issues for FRED enhancement projects, \$50.3 million was spent on the construction of hatcheries, while the remainder was used for other enhancement projects. In addition to bond issues, the capital appropriations for FRED division construction of state facilities totaled approximately \$24.8 million through FY 92.

As part of the Pacific Salmon Treaty, the federal government agreed to provide \$20 million in mitigation monies to produce new salmon through enhancement as a means to mitigate losses to Alaska fishermen resulting from treaty catch quotas. These funds were to be transferred over a five year period. The final \$2 million will be paid this year.

PRIVATE NONPROFIT HATCHERIES

The PNP Hatchery Program was created by the legislature to provide private sector participation in rebuilding Alaska's depleted salmon fisheries. The impetus for the program came from the desire of commercial fishermen to enhance the severely depressed salmon stocks of the early 1970s. The program represented an unprecedented partnership among fishermen, processors, legislators, and the Governor's Office.² The statutes for PNP salmon hatcheries (AS 16.10.375-620 passed in 1974) authorized the ADF&G, FRED to issue hatchery permits to qualified PNP corporations. The intent of the program was to allow private ownership of salmon hatcheries that would contribute to the state's salmon fisheries. Costs of constructing and operating these hatcheries was to be derived from the sale of a portion of the returning fish. Comprehensive salmon planning is part of the PNP program and is implemented through the regional planning teams in conjuncture with the regional aquaculture associations.

Since the inception of the PNP program, 30 salmon-hatchery permits have been issued and three given up. The ADF&G is currently in the process of revoking another PNP permit. Thirty-nine applications have been either been denied or withdrawn from the permitting process. Twenty-two of the permitted PNP hatcheries are in operation, and all but one (Bell Island) had returns of adult salmon in 1991. Currently, there are 3 applications for PNP hatchery permits under consideration. Another application is expected in early 1992.

²Brian J. Allee, "The Private, Non-Profit Hatchery Perspective," Alaska Fish and Game, May/June 1986, p. 17 and Brad Pierce, op.

TABLE 2.
SALMON ENHANCEMENT REVENUE SOURCES, FY 76 - FY 91
(nominal dollars)

REGION/CORPORATION	CAPITAL LOANS	OPERATING LOANS (a)	ENHANCEMENT TAX	COST RECOVERY (b)	TOTAL REVENUE	OUTSTANDING PRINCIPAL
Bristol Bay RAA	\$0	\$100,000	\$0	\$0	\$100,000	\$0
Chignik RAA	0	65,000	0	0	65,000	0
Cook Inlet RAA	1,438,881	783,369	12,069,415	76,295	14,367,960	328,614
Kodiak RAA	0	100,000	3,182,884	11,671,982	14,954,866	0
Lower Yukon/Kuskokwim RAA	0	100,000	0	0	100,000	0
Northern Southeast RAA	2,724,265	1,738,496	9,015,989	3,842,420	17,321,170	2,684,209
Prince William Sound AC	18,676,153	1,185,500	6,053,981	37,045,965	62,961,599	19,869,315
Southern Southeast RAA	8,093,000	2,948,942	15,882,353	6,884,886	33,809,181	12,393,824
Alaska Aquaculture, Inc.	1,091,985	2,537,554	0	376,463	4,006,002	3,876,043
Armstrong-Keta, Inc.	2,002,645	2,015,500	0	753,724	4,771,869	3,961,608
Burro Creek Farms, Inc.	119,500	171,575	0	6,079	297,154	256,651
Douglas Is. Pink & Chum, Inc.	8,124,000	5,193,000	0	990,723	14,307,723	13,445,375
Kake Nonprofit Fisheries Corp.	1,500,724	1,845,060	0	253,878	3,599,662	3,324,227
Sheldon Jackson College AP	362,254	61,370	0	638,797	1,062,421	346,728
Tlingit & Haida Fisheries Dev. Corp.	1,464,000	89,860	0	0	1,553,860	1,200,000
Valdez Fisheries Development Assoc.	3,193,830	3,250,563	0	8,328,064	14,772,457	5,965,383
TOTAL	\$48,791,237	\$22,185,789	\$46,204,622	\$70,869,276	\$188,050,924	\$67,651,977
% Category is of Total Revenues	26%	12%	25%	38%	100%	95% (c)

Notes: (a) Operating loan amounts include initial organizational and planning grants to regional aquaculture associations (\$100,000 except for \$65,000 to the Chignik RAA).
(b) Information on cost recovery from ADF&G, FRED annual reports.
(c) This is the percentage of total loan principal outstanding as of 10/16/91.
Enhancement taxes can only be paid to regional aquaculture associations.

Sources: Alaska Department of Commerce & Economic Development, Division of Investments, November 1991.

Regional Aquaculture Associations

In 1976, the legislature authorized the formation of regional aquaculture associations. Regional associations are comprised of representatives of commercial, sport, and subsistence fishermen; processors; local communities members; and other user groups in the region. Each regional association must have a board of directors consisting of at least one representative from each user group within the association. Currently, there are eight regional aquaculture associations:

- Northern Southeast Regional Aquaculture Association (NSRAA)
- Southern Southeast Regional Aquaculture Association (SSRAA)
- Prince William Sound Aquaculture Association (PWSAC)
- Cook Inlet Aquaculture Association (CIAA)
- Lower Yukon/Kuskokwim Regional Aquaculture Association (LYKRAA)
- Bristol Bay Regional Aquaculture Association (BBRAA)
- Kodiak Regional Aquaculture Association (KRAA)
- Chignik Regional Aquaculture Association (CRAA)

Regional Planning Teams

Three representatives from each regional aquaculture association are appointed by their respective boards of directors to serve on a regional planning team (RPT) along with three ADF&G representatives--two from FRED and one from the Division of Commercial Fisheries. These teams are responsible for developing regional comprehensive salmon plans for both FRED and PNP hatchery production. From FY 77 to FY 86, the legislature provided funds for planning teams via grants and contracts administered through the ADF&G commissioner's office. With the exception of an initial start-up planning grant available to all regional aquaculture associations from DCED, no funds for planning have been provided to regional associations since FY 86.

Private Non-Profit Hatchery Funding

Funding for PNP hatcheries is primarily through state loans, the salmon enhancement tax, and cost recovery sales of fish. To a lesser extent, the state has provided grants to some facilities and fishing organizations; these have totalled approximately \$12.3 million.

Since 1977, a significant portion of the funding necessary for the implementation of salmon rehabilitation and enhancement activities by PNP corporations has been provided through the *Fisheries Enhancement Revolving Loan Fund* administered by the Alaska Department of Commerce and Economic Development (DCED), Division of Investments (AS 16.10.500-620). The loan program has gone through several modifications by the legislature, the most recent occurring in 1987. The maximum loan amount available for an individual project is \$10 million at approximately 9.5 percent interest, with a payback period of up to 30 years.

According to state statute (AS 16.10.525), payments and accrual of interest on these loans *must* be deferred for 6 to 10 years. Loans for non-regional aquaculture association projects have these same terms with the exception that the loan maximum is limited to \$1 million. Loans are available for the purpose of planning, construction, and operation of salmon rehabilitation and enhancement projects, primarily salmon hatcheries. These loans are secured through collateral that may include returning hatchery fish and enhancement assessment of commercial fishermen.

The *Salmon Enhancement Tax* (AS 43.76.010-.015) is charged to limited entry permit holders who are members of qualified regional aquaculture associations. State law allows the associations to set enhancement tax rates at either 1 to 3 percent of the ex-vessel value of the salmon catch, subject to the vote of the membership. The Cook Inlet and Northern and Southern Southeast Regional Association assessment rates (2, 3, and 3 percent, respectively) have been in place since 1981. The Prince William Sound assessment (2 percent) began in 1985 and the Kodiak assessment became effective in 1988. Buyers of salmon are required to collect the tax and remit the revenue to the Alaska Department of Revenue. This is a pass-through program, since the legislature appropriates Salmon Enhancement Tax revenues to the regional associations from whose members the tax was collected.

Cumulative state loans secured by corporations for capital construction and operations, cumulative enhancement funds returned to the regional aquaculture associations, and revenue generated by corporate sales of returning hatchery fish are presented in Table 2.

Through November, 1991, \$71.0 million has been borrowed by PNP corporations. Approximately \$67.7 million (95 percent) of the \$71.0 million principal balance is currently outstanding. Including state appropriations (\$12.3 million), approximately \$83.3 million has been provided in state loans and grants to PNPs. Another \$46.2 million has been generated through enhancement tax assessments. To date, PNP operators have sold approximately \$70.9 million worth of cost recovery fish to help pay for hatchery operations. The amount and percentage of funding by category is shown below.

\$71.0 million	35 percent	State Loans
\$12.3 million	7 percent	General Fund Grants
\$46.2 million	23 percent	Enhancement Tax Assessments
\$70.9 million	35 percent	Cost Recovery Sales of Fish
\$200.4 million		Total

As can be seen, the private sector has provided over 58 percent of the direct funding for PNP operation and construction through self-imposed taxes and cost recovery sales of fish.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Requiring a more extensive public benefit-cost analysis before providing enhancement loans. This means that a project or facility expansion would not only have to be financially feasible--capable of paying back loans--but also provide net benefits to the public.
- Eliminating the statutory loan repayment deferment requirement on operating loans.
- Development of a mechanism for placing moratoriums on state enhancement loans for increased fish production. Consideration of a moratorium on loans until results of the Legislative Enhancement Program Review economic studies are complete.
- Implementing a requirement for more complete analysis of transfers of the operation of state hatchery facilities that includes factors such as fisheries management, increased need for cost recovery, and the impact on traditional common property fisheries.
- Analysis of the enhancement tax program to determine 1) whether costs are distributed in proportion to benefits, and 2) the impact of a mechanism to allow specific gear groups to opt out of the program or pay in proportion to the enhancement benefits they receive.

DRAFT ** DRAFT ** DRAFT ** DRAFT ** DRAFT

- Analysis of increasing the salmon enhancement tax so fishermen who benefit from the program will pay for more of the costs.
- In light of declining state revenues and lower fish prices, development of an auditing mechanism to ensure that annual PNP operating costs, paid by loans, enhancement tax receipts and cost recovery, are "reasonable."
- Development of a requirement that funds provided in treaty agreements for enhancement be used for fish production to the maximum extent possible. In addition, a requirement for a comprehensive feasibility analysis of using enhancement as part of treaty agreements could be considered.

CHAPTER IX. ECONOMICS

INTRODUCTION

Note: This section summarizes the economic studies that are currently in progress under contract. The results of these studies are not yet available and, therefore, are not included in this draft. The full chapter on economic studies provides more detailed information on the contracts. The final report will include the results of the economic studies.

The main focus of the review of the economic impact of salmon hatchery production on Alaska salmon prices is to determine:

- whether current levels of Alaska salmon harvest are over- or under-supplied from a world-market perspective, and
- whether increased hatchery production of salmon will lower prices, fishing and processing revenues, and the total net value of Alaska's salmon fisheries.

To answer these questions requires a benefit-cost analysis. This type of analysis measures the level and cost of enhanced salmon production, the cost of managing, harvesting, and processing enhanced salmon stocks, and the impact or "price responsiveness" of world salmon markets to various levels of Alaska enhanced salmon production. The costs are then subtracted from the benefits to estimate the net benefits of the salmon enhancement program and the incremental net benefits of different levels of enhanced salmon production to commercial fisheries. To analyze only the impact of different levels of salmon production on world salmon markets and prices paid to fishermen is insufficient for thorough policy analysis because it does not measure the net benefits (benefits minus costs) of the commercial salmon fisheries to fishermen or all Alaskans.

An example of some of the policy questions a benefit-cost analysis would help to address are as follows:

- Is increased Alaska salmon hatchery production the cause of this year's lower salmon prices? What is the significance of other factors, such as increased farmed salmon production, exchange rates, economic recessions, and prices of food substitutes?
- What is the most profitable salmon species mix and level of production for the statewide enhancement program? Should the emphasis shift from pink salmon to king and coho salmon, for example, or even to other non-salmon species?
- If Alaska curtailed hatchery salmon production, would Alaska salmon (both wild and hatchery) prices increase or would the resulting market share be filled by farmed salmon from other countries? Ultimately, what would be the net effect or benefits to Alaskans from these changes?
- How are the estimated benefits and/or costs of the existing hatchery production distributed to fishermen and processors in each region of the state? If changes in production occurred, how would these benefits and/or costs be distributed?
- What would be the economic benefits of changes in policy or additional legislative oversight regarding the production capacity and releases of hatchery salmon?

NEED FOR ADDITIONAL RESEARCH

Rather than initiating a new benefit-cost analysis, the Senate Special Fisheries Committee requested the Hatchery Research Group to first identify the specific issues that need additional economic research. In response, the economics group developed a study plan with the initial tasks of reviewing economic and marketing studies completed to date and assessing the need for additional research.

After reviewing current research, the group determined that insufficient economic information currently exists to accurately address salmon enhancement public policy questions. The research that has been completed is either out-of-date, or additional research needs to be done to improve the reliability of existing economic models. As a result of the significant investment by private parties and the state of Alaska in both enhancement projects and commercial fishing, a rigorous analysis using accepted bioeconomic techniques is warranted to fill these information gaps.

Based on our review, the economics group proposed a set of contracts for additional research. The group worked closely with staff from the Alaska Department of Fish and Game (ADF&G), FRED Division to develop the research plan because FRED Division staff have considerable experience in these areas of research and have contracted for previous studies. In addition, we solicited comments from the Divisions of Commercial Fisheries and Sport Fish to ensure that their concerns are addressed. As the committee requested, the studies build on previous research to close information gaps. Funding for the research contracts was approved at the November 1, 1991, Legislative Council meeting.

RESEARCH COMPONENTS

The five principal research components are:

- 1) a hatchery production and cost model,
- 2) a fish biological population model linked to fishing effort and harvests,
- 3) a demand model for Alaska salmon in world markets,
- 4) a fishing cost model, and
- 5) a computer software system to combine the four models.

The five components are described below including estimated costs and a brief summary of the information gaps the research is intended to address. Based on prior research conducted for the FRED Division and expertise, the economics group contacted potential University of Alaska researchers to determine interest in the projects.

As a result of the short time period available to complete the research it will be funded through RSAs. Therefore, interested parties did not formally bid on the projects, but instead provided information on proposed research methodology, pertinent research experience and qualifications, and the ability to complete the contract in the time available.

Hatchery Production and Cost Model

Principal Investigators: Economics Group, Legislative Research Agency, and the ADF&G, FRED Division staff

Anticipated Cost: \$0

This research component consists of a survey of hatchery and enhancement project operators to determine the cost of producing salmon. In economics jargon, survey information will be used to develop an enhancement project "production function" to estimate the incremental cost of changes in the number of salmon produced by these projects. The survey will be developed by the economics group and FRED division staff and administered by the Legislative Research Agency and FRED division. This portion of the research will also solicit information from the ADF&G, Division of Commercial Fisheries regarding the costs of fisheries management of enhancement project stocks. This portion of the research needs to be conducted because no data exist on the incremental costs of enhancement project fish production. When the Governor's fisheries mini-cabinet reviewed the Alaska salmon enhancement program in 1984, a similar survey was conducted. Those results, however, are out-dated and additional salmon enhancement projects have been developed since that time.

Biological Population Model

Principal Investigators: Dr. Jeremy Collie, Juneau Center for Fisheries and Ocean Sciences, University of Alaska Fairbanks

Anticipated Cost: \$10,000

The purpose of the biological population model is to estimate the number of adult fish produced by enhancement projects and available for harvesting. Salmon produced by hatcheries and other projects are exposed to similar biological and environmental conditions and fisheries as wild stocks--as compared to farmed salmon. As a result, this research would estimate the interdependence of wild and enhanced stocks. These estimates will taken into consideration varying management assumptions regarding stock separation and cost recovery. This research component is necessary because ADF&G has not comprehensively analyzed the interaction of wild and enhanced stocks and the impact of different levels of enhanced stock production on commercial fisheries harvests.

Salmon Demand Model

Principal Investigator: Dr. Mark Herrmann, Department of Economics, and Dr. Joshua Greenberg, School of Land Resources Management, University of Alaska Fairbanks

Anticipated Cost: \$18,000

This contract will extend and improve research on the salmon enhancement program completed to date by Dr. Boyce for the FRED division. To more fully understand world salmon markets, improvements to existing demand models are needed. Relatively little research has been conducted to date on the demand for Alaska salmon, and models that do exist are insufficient to reliably answer the Legislature's policy questions. The additional work has not been contracted by the FRED because of insufficient funding.

In 1990, Dr. John Boyce's research compared single-equation and system of equations demand models for Alaska salmon. The study compared two, single-equation models developed by Ben Muse of the Alaska Commercial Fisheries Entry Commission (CFEC) in 1984 and Nick Ronan, University of Alaska Anchorage, Institute for Social and Economic Research (ISER) in 1989, and an alternative model proposed by Hongru Zhang, University of Alaska Fairbanks graduate student, using a Two-Stage-Least-Squares (2SLS) approach. Boyce found that the 2SLS approach appears to have superior predictive capability within the sample.

Boyce (1990) estimates ex-vessel and wholesale prices for five species of Pacific salmon, which is required for evaluating enhancement project tradeoffs between different salmon species and markets that are relevant to the state of Alaska. However, Boyce's study did not (1) develop a satisfactory profit function at the wholesale level for all salmon species, (2) conduct a full testing of wild, enhanced, and farmed salmon substitutes, including the extent to which farmed-salmon production is a substitute for Alaska salmon harvests, (3) link ex-vessel markets or wholesale markets to retail consumer markets, and (4) produce demand models for pink and sockeye salmon with low estimation errors.

In addition to this recently completed research by Dr. Boyce, recent econometric analyses completed by Lin and Herrmann (1988) and Mittelhammer, Herrmann, and Lin (1989) provide considerable information on the import and export markets for salmon, and the relationship of farmed-salmon markets to capture-fishery markets.

The models of Mittelhammer, Herrmann, and Lin develop demand functions using import and export data closer to the final markets. They include more substitutes, and incorporate a supply and demand model for farmed salmon. However, the models are not sufficiently stratified by species at the ex-vessel level for evaluating tradeoffs in Alaska's statewide enhancement program.

Neither of the two modeling efforts (Boyce or Mittelhammer, Herrmann, and Lin) were designed to compute regional distribution of gross earnings within the major Alaska salmon fisheries, or the amount of price response imposed on a given region by another region's salmon production. The ability to discern regional impacts is a high priority in evaluating the benefits and costs of the salmon enhancement program.

In summary, two major salmon demand model improvements are needed. The first is in the ability to project future salmon prices and the impact of changes in enhanced salmon production and harvest levels on Alaska salmon prices. The second improvement is incorporating into salmon demand models the impact of changes in world salmon-farming production levels on Alaska salmon markets and prices.

Fishing Cost Model

Principal Investigator: Dr. John Boyce, Department of Economics, University of Alaska Fairbanks

Anticipated Cost: \$20,000

This portion of this study will estimate the cost to fishermen of harvesting salmon to determine the incremental cost of harvesting different levels of enhancement project produced fish. This information can address questions such as--if hatchery production results in a 10 percent increase in harvest levels and a 2 percent decrease in the price of pink

salmon, are the additional revenues minus the additional cost of harvesting the fish sufficient to increase fishermen's net revenues.

The objective of this study is to formulate and test empirical models that will project short- and long-run fishing costs for specific Alaska salmon fisheries. To conduct a benefit-cost analysis, fishing costs must be determined in the short and long run. In the short run, an enhancement project or a management action may encourage salmon fishermen to direct more fishing effort--which is a function of gear, boat size, horse power, and crew size, for example--into a specific statistical area and away from another statistical area (or alternative fishing opportunity). With the existing management constraints on salmon fishing in place, such as limited entry and fisheries openings and closures, the short-run increases in marginal costs may be smaller or larger than the potential short-run revenues from a given project. However, in the long run, fishermen can be expected to increase fishing effort in statistical areas where the marginal revenues are greater than marginal costs of fishing. Fishing effort would be increased even if new vessels are not allowed to enter the fishery. As a result of insufficient research, economists currently can only provide informed guesses of the magnitude of these short- and long-run fishing costs in Alaska's salmon fisheries. Because little extensive or reliable research has been completed on this topic which accounts for the relatively higher cost of this study component.

Combining of Models for Policy Analysis

Principal Investigator: Drs. John Boyce and Mark Herrmann, Department of Economics, and Dr. Diane Bischak, School of Management, University of Alaska Fairbanks

Anticipated Cost: \$10,000

When completed, the four models will be combined into a single, complete software system for the analysis of specific policy questions. This contract will test specific future enhancement program options--such as maintaining, decreasing, or increasing current enhanced salmon production levels, changing the current species mix, and maintaining or changing the location of enhancement projects--on the net economic benefits to fishermen and Alaskans. To the extent possible the analysis will differentiate the distribution of enhancement program net benefits among regions of the state. The results of this analysis will be a written report for the committee that will facilitate the development of public policy decisions.

Preliminary reports on the research being conducted under these contracts are to be submitted to the Legislature in April, 1992, and the final reports in June, 1992. The remainder of the Legislature's hatchery review project can move forward in the meantime. Information gathering and the formation of some conclusions, options and courses of action, regarding the other portion of the project can be accomplished independent of these economic studies.

CONCLUSION

In addition to providing information on Alaska's salmon enhancement programs, the models developed by the study could be used for evaluating other salmon management policy questions.

The total estimated cost of the research is \$58,000 which is approximately \$17,000 less than the UAA, Institute of Economic and Social Research proposal provided in May 1991. The reasons for

the estimated lower costs are that the hatchery cost model work would be done with current legislative and ADF&G staff.

The research does not include studies to develop new markets or products for Alaska salmon for a number of reasons. The time available is insufficient, the cost of reliable marketing studies is usually quite high, and the Alaska Department of Commerce and Economic Development (DCED), Division of Economic Development and the Alaska Seafood Marketing Institute (ASMI) are both initiating salmon marketing studies in response to this summer's lower salmon prices. Therefore, the legislative economics and marketing group plans to provide information to the legislature on the success of past state efforts to market Alaska salmon and coordinate with the DCED efforts to avoid research duplication and encourage the best possible information.

The research also does not include studies to estimate the net benefits of the salmon enhancement program to sport or subsistence users. Including these additional uses would significantly expand the scope and cost of the studies.

CHAPTER X. MARKETING

As a result of the precipitous decline in Alaska salmon prices in 1991, Governor Hickel formed the Salmon Strategy Task Force. The purpose of the group was to identify the problems facing Alaska's salmon fishing industry and recommend state actions to address these problems. A primary focus of the task force was salmon marketing. The task force recently finalized its recommendations. To avoid duplication with the task force's efforts, it was decided that the Legislative review of the Alaska salmon enhancement program would analyze the economic costs and benefits of the enhancement program and review past state salmon marketing efforts. In addition, as part of the legislative review, the Salmon Strategy Task Force's final recommendations are summarized (a copy of the Task Force's report is attached).

INTRODUCTION

The Alaska Seafood Marketing Institute (ASMI) was established in 1981 as a quasi-state corporation in the Alaska Department of Commerce and Economic Development (DCED). The institute's statutory responsibilities include:

- To conduct educational, research, advertising, and sales promotional programs to increase awareness of all species of seafood and their by-products that are harvested in Alaska.
- To develop quality specifications to enhance the high quality image of Alaska seafood worldwide, and to adopt recommendations for the handling of seafood from the moment it is caught until it is shipped to the marketplace.
- To prepare market research and product development plans for all species of seafood and their by-products harvested in Alaska.

State statutes prohibit ASMI from favoring any region, product, or processor. For that reason, ASMI uses "generic" marketing campaigns aimed at enhancing the sales of particular "species" of fish or broad product categories (such as canned or frozen) rather than specific products. Also, because it is likely to favor individual processors, ASMI does not promote new products.

ORGANIZATION

Board of Directors

To accomplish its statutory mission, the ASMI organization consists of a board of directors, numerous committees, and a relatively small number of staff. Policy and program direction is set by the 18-member board of directors. The board membership consists of 12 fish processors, 5 commercial fishermen, and 1 public citizen. Of the 12 processors, 8 are to be appointed from "large processors" (annual Alaska payroll of \$1 million or more) and 4 are to be appointed from "small processors" (annual Alaska payroll between \$50,000 and \$1 million). Although not required by statute, the board has three non-voting ex-officio members: the DCED commissioner, and a legislator appointed from each chamber.

Committees

The ASMI committee system is extensive with the largest portion being a system of marketing committees. The primary marketing committee plans the generic Alaska seafood marketing program for the domestic market. Committee members include the chairs from the five individual species committees (halibut, shellfish, canned seafood, whitefish, and salmon), plus the chairs of the export and quality committees, and two board members. The philosophy of the primary marketing committee is to promote Alaska seafood through the development of long-term marketing goals and strategies.

Under the marketing committee are the five individual species committees. These committees generically address marketing concerns related to their particular species group. The philosophy of the individual marketing committees is to promote the species with short-term marketing goals and strategies that are consistent with the long-term goals and strategies of the marketing committee.

The quality and export committees develop industry guidelines for the care and handling of seafood and oversee the federal Targeted Export Assistance (TEA) program, respectively. The TEA program was developed to increase U.S. exports.

Most of the members of the marketing committees are marketing specialists employed by the fish processors represented on the ASMI board. Other committee members are representatives from fishery organizations that are knowledgeable about the fishing industry.

Staff

The ASMI executive director is selected by the board of directors and permitted to hire additional staff upon approval of the board. The central staff members include: communications manager, comptroller, quality coordinator, special projects coordinator, and office manager. In the past year, ASMI was authorized to hire four additional marketing specialists who had previously worked with ASMI as contractors.

ASMI FUNDING SOURCES

A portion of ASMI's funding is derived from a self-imposed seafood marketing assessment. All fish processors who purchase annually \$50,000 or more (ex-vessel value) of seafood pay an assessment of 0.03 percent of their total purchases. These assessments are collected in the state's general fund and are appropriated annually to ASMI. The balance of ASMI's funding is derived from state general fund and federal appropriations. Table 1 shows funding sources and levels since FY 82.

According to an ASMI briefing paper, ASMI has spent nearly \$35 million in the domestic market since 1981 in their "generic" seafood marketing program. Since FY 88, an additional \$24 million was spent in foreign markets, using federal funds and small state general fund matching appropriations. *Federal funding, which has increased as a result of the TEA program, is restricted to international marketing efforts.* In contrast, state general fund appropriations have declined in recent years. In addition, because processor contributions are based on ex-vessel values, the industry assessment will decline approximately \$600,000 in FY 92. Given the outlook for Alaska salmon

ASMI FUNDING HISTORY

(in millions of \$)

<u>FY</u>	<u>GF</u>	<u>Ind.</u>	<u>Fed.</u>	<u>Total</u>	<u>Domestic</u>	<u>International</u>
1982	2.07	--	--	2.07	2.07 (-overhead)	
1983	5.66	1.15	--	6.81	6.81 (-overhead)	
1984	2.57	1.29	.10	3.96	3.1	
1985	2.57	1.04	.34	3.95	3.3	
1986	2.6	1.0	--	3.6	3.15	
1987	1.93	1.49	.25	3.68	2.7	
1988	1.63	2.65	2.2*	6.48	3.22	2.4
1989	2.1^	3.3	5.2*	10.6	3.9	5.3
1990	2.2^	3.2	4.5*	9.9	3.8	5.1
1991	2.45^	2.7	8.78*	13.93	3.6	9.5
1992	2.1^	2.6+-	?*	??	3.0+-	??

TOTAL 27.88 20.42 21.37 64.98 38.65 22.8
 ^ This general fund total includes general fund matching dollars for the federal funds. The general fund match is used in foreign markets and is not available for domestic marketing. In FY89 and FY 90 the match was \$495,000 each year, in FY91 it was \$750,000 and in FY92 it is \$750,000.

* The federal fiscal year is different from the state fiscal year so the figures for the federal funds are not available on the same cycle as the state dollars.

Prepared by the Alaska Seafood Marketing Institute, no date.

prices, industry contributions can be expected to remain below historic levels. *State general fund appropriations and industry contributions are used primarily to fund domestic marketing efforts. As a result, ASMI will have fewer resources for domestic marketing at a time when the domestic market has been identified by analysts as having the greatest potential for increasing sales of Alaska salmon.*

EFFECTIVENESS OF ASMI'S MARKETING PROGRAM

When ASMI was established, the Alaska salmon industry provided most of the U.S. production and about half of the world production from wild and ocean-ranched salmon stocks. As a major supplier, the generic marketing of Alaska salmon was relatively effective. A recent Legislative Audit report evaluated whether there has been an increase in awareness of Alaska seafood since ASMI's inception. The audit report analyzed ASMI effectiveness based on the following criteria:

- *Perception that Alaska is the best region for seafood.
- *Awareness of Alaska as a seafood-producing region.
- *Positive beliefs/attitudes toward Alaska seafood.
- *Awareness of Alaska seafood advertising.
- *Association of seafood species with Alaska.
- *Awareness of seafood species.

The Legislative Audit review of market research provided by ASMI, concluded that increases had occurred in consumers' perception of Alaska seafood. In addition, consumers are more aware of Alaska as a seafood-producing region.

Despite these overall improvements in consumer perceptions and increased consumption of seafood, Alaska has lost a significant share of both the domestic and international salmon markets as a result of the tremendous growth in world farmed-salmon production. The dramatic rise in production and growing acceptance of farmed salmon as a source of fresh salmon represents the single greatest threat to the Alaska salmon market. The consistent year-round availability and quality of fresh, farmed salmon has made wild (and ocean ranched) Alaska salmon, with its short fresh season and quality and supply inconsistencies, a secondary choice for a large number of buyers. United States and foreign markets generally prefer fresh over frozen salmon.

According to ASMI board chair, Bob Waldrop, the large farmed-salmon producer nation of Norway spends about five cents per pound marketing salmon, while only one cent per pound is spent marketing Alaska salmon. The new producers of salmon are out-competing Alaska producers in product preference, quality, availability, and marketing.

Another problem is the fact that canned salmon production represents 59 percent of all retail salmon volume. U.S. per capita consumption of canned salmon declined 60 percent from 1980 to 1989, at the same time that harvests of pink salmon--the majority of which is canned--increased approximately 50 percent. Canned salmon suffers from an "old-fashioned" image with most younger consumers. The bones and skin also result in the perception that it is

inconvenient and unappealing. In foreign markets, canned salmon markets have declined primarily due to price effects.

Analysts who are critical of ASMI's marketing programs maintain that the "generic" approach promotes all salmon, regardless of origin, because Alaska products are not clearly identified in the market. They argue that without brand identification and a quality assurance program to guarantee that Alaska salmon is superior, generic marketing may actually be helping Alaska's competitors.

LABELING OF ALASKA SALMON

A recent Consumer Reports article attacking the quality of seafood sold in the United States has caused considerable concern within the Alaska fishing industry. The industry already faces difficult marketing challenges in a changing competitive environment. Despite its flawed methodology and lack of specificity, the report's potential impact on Alaska must be taken seriously.

The Consumer Reports article also illustrates the problem of insufficient labeling of seafood products when sold in retail markets. The salmon samples tested in the report could not be identified by species, origin, or whether it was wild or pen reared. The Alaska Seafood Marketing Institute has recently developed a new U.S. promotion of Alaska salmon in order to meet increasing market challenges. This promotion is to emphasize the freshness and purity of Alaska's wild salmon. However, without specific labeling of salmon products as to species, state of origin, and identification as to whether wild or pen reared, the effectiveness of such marketing will be reduced.

To address the labeling problem, the Alaska State Legislature sent a letter to the Alaska Congressional delegation requesting that they introduce federal legislation requiring the labeling of seafood products. Proper labeling will ensure that consumers can identify and select Alaska salmon, and provide better information and clearer choices in the market place. It would also reward those states that maintain strict quality control programs, such as Alaska, and ensure that the benefits of promotional efforts accrue to Alaska.

It should be noted that Alaska does have a statute that requires that any farmed salmon sold in the state must be labeled that it is farmed and is from outside Alaska.

THE SALMON STRATEGY TASK FORCE RECOMMENDATIONS

The Salmon Strategy Task Force finalized its recommendations on January 24, 1992. The Task Force's provided immediate, mid-range, and long-range recommendations which are summarized below.

Recommendations for Immediate Action. 1) ASMI should develop a budget and strategy for selling the existing inventory surplus of Alaska salmon; 2) processors and fishermen should initiate price negotiations early; 3) The University of Alaska, DCED, and ADF&G should provide the best possible information to fishermen regarding world salmon markets; 4) DCED should review Prince William Sound processing capacity; 5) DCED and the Alaska Commercial Fishing and Agriculture Bank (CFAB) should provide loan extensions as needed.

Mid-Range Recommendations. The mid-range recommendations include actions for product and market development, salmon quality, and marketing and a review of ASMI's role.

Long-Term Recommendations. The long-term recommendations include the development of a strategic plan to help strengthen the fishing industry and its support sector. This includes an integrated marketing and production strategy, a review of loan and limited entry permit policies, a review of ASMI, a review of fish tax policy, and the reduction of regulatory burdens to lower costs. ASMI's Salmon Recovery proposal is included in the Task Force's long-range recommendations as well as its recommendations for immediate action. This proposal is discussed in the following section.

The ASMI Salmon Recovery Proposal

One of the recommendations of the Salmon Strategy Task Force is ASMI's Salmon Recovery Proposal. According to an ASMI briefing paper, the *goal* of the Salmon Recovery Proposal is to increase annual per capita U.S. salmon consumption from 1 to 1.5 pounds. This increase would absorb an additional 119 million pounds of salmon each year or about 15 percent of Alaska's annual production. Of the expansion, 60 percent would be frozen and 40 percent would be canned salmon.

The *strategy* of the program would be a combination of consumer and trade education and advertising, direct trade contacts, and other promotional methods used by ASMI over the last decade. Instead of patchwork, crisis-response marketing, this would be an integrative approach tying all marketing elements together. The basis for the marketing effort comes from a number of core issues identified by ASMI. These include:

- *trade and consumer preference for fresh salmon,
- *decreased consumer consumption of canned salmon,
- *low consumer knowledge and awareness of Alaska salmon products,
- *negative consumer perception of quality of frozen and canned salmon,
- *limited regional and seasonal purchases of Alaska salmon,
- *limited food-service use of Alaska salmon, especially canned,
- *fluctuating supply and prices of Alaska salmon, and
- *increased competition.

It is unclear from ASMI's information how consumer and trade preference for fresh over frozen and canned salmon is expected to be changed. It appears that efforts will be made to increase overall salmon consumption while convincing purchasers that Alaska frozen and canned salmon are also high quality products. To avoid merely expanding the farmed-salmon market, central to ASMI's recovery program is an Alaska salmon product identification promotion using a logo or seal of origin. This is similar to the "Alaska Made" program.

ASMI does have a record of success. As a result of direct marketing, Alaska canned salmon exports to the United Kingdom increased from 370,000 cases to 946,500 cases between 1989 and 1991. However, unless this product identification campaign is very successful and/or ASMI's generic marketing approach is modified, there is significant risk that the Salmon Recovery Program could benefit international farmed-salmon producers as much as it would the Alaska industry.

The *cost* of the proposal is \$10 million annually for five years, totalling \$50 million. A lower annual amount would be needed after the first five years to sustain the marketing effort. ASMI has identified some potential sources of funds as follows:

- 1) state general fund appropriations,
- 2) a raw fish tax credit,
- 3) an endowment from the *Exxon Valdez* settlement as part of the restoration agreement,
- 4) a redirection of salmon enhancement taxes paid by fishermen to regional aquaculture associations, and
- 5) a combination of the above sources.

In reality, a raw fish tax credit amounts to an indirect state appropriation because a small amount (0.03 percent) of the foregone general fund fish tax revenues would then be paid in the form of industry processor contributions. Unless the legislature deems that a well specified and directed raw fish tax credit is desirable public policy in and of itself, a direct state general fund appropriation to ASMI is a superior method for funding the proposal.

Regarding a redirection of the enhancement tax, ASMI states that Alaska does not have a salmon production problem but a salmon marketing problem. While this may be true, the pass-through salmon enhancement taxes pay for the operation and/or repayment of state loans for salmon enhancement projects. As a result, this funding source is also an indirect state appropriation---the funding the aquaculture associations would forego would reduce payments on state loans and/or require additional operating loans. In general, if the legislature supports the salmon recovery proposal, a direct appropriation would be the best fiscal approach for funding the program.

Senator Jones has introduced legislation to appropriate \$10 million to ASMI for domestic salmon marketing efforts during Fiscal Years 92 and 93.

ALTERNATIVE PROPOSALS TO INCREASE MARKETING EFFORTS

Proposed Changes to Alaska Statutes:

A number of pieces of legislation have been introduced to address the salmon marketing problem. The general intent of the legislation is to provide funding for the immediate increased promotion of Alaska salmon and to increase the voice of fishermen in those marketing efforts either through changes to ASMI or creation of a new salmon marketing association. Funding for increased marketing efforts would be provided through temporary marketing assessments.

- Representative Gene Kubina has proposed legislation to create six regional salmon marketing committees and the Alaska State Salmon Marketing Association. Two fishermen from each committee would sit on the association. Funding for marketing efforts would be provided through a 1 percent marketing tax on value of salmon landed.
- Representative Dave Choquette introduced legislation that would expand ASMI's statutes to allow for targeted development of Alaska salmon markets and product development.
- Representative Bill Hudson introduced legislation that would impose a temporary one percent (1%) marketing tax on the value of salmon landed and increase the ASMI Board of Directors by two positions that must be filled by commercial fishermen.
- Senator Dick Eliason introduced a bill that would establish a temporary one percent (1%) salmon marketing tax and a committee within ASMI to provide fishermen with control over how the funds would be expended.
- Representative Cliff Davidson and Senator Fred Zharoff have introduced legislation that would endow the Alaska Fisheries Development Foundation to fund fisheries development research projects.

Development of a Salmon Marketing Council

Under the federal Seafood Promotion Act of 1986, after rigorous fisherman and processor review and approval, a salmon marketing council could be developed to increase the U.S. marketing efforts of salmon. If properly organized and chartered, a "National Salmon Council" would have the power to assess industry participants for funds to be used for salmon promotion and marketing, product research, and consumer education. The council would also be able to develop and offer salmon quality standards for U.S. Department of Commerce approval.

Marketing Efforts by Groups Such as PWSAC

Recognizing the need to develop markets for their very successful salmon hatchery production, PWSAC has established a product development strategy.

As part of this development strategy, in the short-run PWSAC would like to: (1) pre-sell all 1992 cost-recovery fish, (2) ensure the utilization of all cost-recovery fish, and (3) negotiate one-to-three year contracts for the sale of fish. PWSAC does not intend to tie price contracts to anticipated ex-vessel prices and would like any contractual agreements to require primary processing in Alaska. *In the long term, PWSAC would like to facilitate pink salmon product development to provide price and supply stability and continuity, and to facilitate state research on new product forms.* PWSAC would use cost-recovery fish to achieve these objectives.

The primary marketing obstacle identified by PWSAC is processing capacity---getting the fish out of the water as whole frozen fish. While there is sufficient canning processing capacity in the Sound, the decline in canned salmon markets results in

little demand for the abundant pink production by canning processors. PWSAC has identified potential buyers of frozen pink salmon, but there is insufficient freezer processor capacity to ensure product delivery. PWSAC had hoped to utilize floating processors via the coordination of the groundfish trawl season regulated by the North Pacific Fisheries Council. While this will not occur during the 1992 season, it is an option PWSAC will continue to pursue for future seasons.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Review of the state's role in the marketing of Alaska seafood, and salmon in particular, including a review of the ASMI program.
- Given that ASMI's generic approach to marketing was statutorily established prior to the significant increase in world farmed-salmon production, expansion of ASMI's statutes to reflect changes in world salmon markets. In particular, ASMI's marketing efforts could be expanded to include new product and market development, including targeting and distribution of salmon products at the wholesale and retail levels.
- Providing funding for ASMI's Salmon Recovery Proposal.
- Supporting the Salmon Strategy Task Force's recommendation that ADF&G review the impact of fisheries management practices on fish quality, especially related to the quality of cost-recovery fish harvested in terminal areas.
- Conducting a comprehensive analysis of ASMI privatization including whether 1) privatization would provide greater flexibility and possibly more effective marketing and 2) privatization would result in the loss of control over marketing activities to the detriment of Alaska and Alaska fishermen.
- Encouragement of the development of a national salmon marketing council.

This page left intentionally blank.

Salmon Strategy Task Force Recommendations



**Walter J. Hickel, Governor
Commissioner Glenn A. Olds, Chair**

**State of Alaska
Department of Commerce and
Economic Development
Division of Economic Development**

JANUARY 24, 1992

This page left intentionally blank.

INTRODUCTION

Governor Hickel appointed the Salmon Strategy Task Force on August 15, to investigate the reasons for the 1991 salmon crisis and to review options for industry stabilization and recovery.

Alaskans should be proud of the courage of the people and companies that started this industry years ago. The people and lifestyle of the salmon industry are a fundamental part of Alaska's history, culture and way of life.

Alaska has been the world's leading supplier of salmon. The state's salmon industry now faces strong competition from many other sources and its dominant role is threatened. Traditional markets are no longer dependent on Alaska for their needs.

The entire world is producing salmon at a record rate. For many years, Alaska's salmon industry enjoyed a market strategy based on allocating scarce resources among competing customers. In less than a decade the entire system has changed. Now the competition in both traditional and developing markets is intense, and it's likely to stay that way.

In order to compete, and indeed survive in this new environment, it is essential that all participants in the industry recognize and accept the reality of these competitive changes. The industry is facing a crisis of considerable magnitude, requiring decisive short term action and long term action to prevent the crisis from recurring.

The 1991 salmon season has forced us to recognize that the Alaska salmon industry is at a crossroads. As with many other industries in America, we must recognize that traditional business practices are no longer adequate in the face of global competition. Reevaluation and action are required.

The Salmon Strategy Task Force has made several immediate and long-term recommendations which should alleviate the immediate crisis, help stabilize the industry, and plot a course to regain our leadership role in the marketplace.

The effects of the decrease in salmon prices are profound, putting at risk state loan programs, community stability, and tax revenues to all levels of government. The seafood industry is the state's largest private sector employer, with the largest resident private sector payroll. The failure of the state and the industry to take decisive action will result in continued weakness in this economic sector and put increased demands and safety net programs.

These will not necessarily be easy changes to make. It will take a substantial commitment of time, hard work, and money. We ask that the Administration, the entire salmon industry and the Legislature work together to support the implementation of these recommendations.

Charge to the Task Force

Governor Hickel's charge was to develop a strategy to generate maximum economic return to Alaska fishermen, processors, and the state as a whole, consistent with wise use and conservation of the resource. The Task Force is to make specific recommendations to the seafood industry, the Administration and the Legislature.

The group was to focus on methods to maintain existing markets, develop alternative markets and product forms, promote secondary processing, develop necessary infrastructure, coordinate production and marketing strategies, improve salmon quality control, optimize fish tax policies and improve fish harvesting and processing efficiency. The Task Force also delineated existing salmon markets and collected and distributed information to assist fishermen and processing companies in reaching agreement.

Conditions requiring study

The major factors distressing the industry are greatly increased competition, high inventory levels, low prices, and projections of continuing high production levels. The runup in prices 1986-1988 followed by declining prices since have left many fishermen with debt loads they cannot support. The declining markets have hurt processors, exporters, and end users holding product in a declining market as well. These factors led to serious price disputes and charges of price fixing in some quarters as the 1991 season developed.

The market outlook for the 1992 season may improve somewhat for sockeye, but extremely high inventory levels remain for pinks. These species represent the vast majority of Alaska production value and volume. The early, very tentative prognosis from Fish and Game is for another big production year.

Inventory of issues

An initial questionnaire went out to 350 recipients of the Alaska Fish and Game weekly catch reports in mid July. This was followed by a second mailing of 125 in late July that added all Alaskan salmon fishing organizations, processors and legislators. The mailing solicited opinion on the issues the Task Force should address. Some 70 responses (a 15% response rate) were received. Staff collated the responses and summarized them. These responses were then categorized under nine headings for presentation to the Task Force.

Selection of Task Force

The Governor announced the membership of the Task Force on August 15. It includes broad representation from the salmon industry, appropriate state agencies, and the general public. The group provides a good cross section of the industry and policy makers in state government, while main-

taining reasonable geographic balance and a practical size. The members are:

Honorable Richard Eliason of Sitka,
President of the Alaska Senate,
and a Southeast Alaska fisher;
Honorable Fred Zharoff of Kodiak,
Chairman of the Alaska Senate Rules
Committee and a Bristol Bay fisher;
Honorable Eugene Kubina* of Valdez,
Chairman of the House State Affairs
Committee;
Commissioner Glenn Olds,
Alaska Department of Commerce and
Economic Development;
Commissioner Carl Rosier*,
Alaska Department of Fish and Game;
Mr. Ed Crane*,
President of the Alaska Commercial
Fishing and Agriculture Bank;
Dr. Jerome Komisar,
President, University of Alaska;
Mr. Richard Lauber,
Vice President, Pacific Seafood
Processors Association;
Ms. Hazel Nelson*,
President, Becharof Corporation,
and Bristol Bay fisher;
Mr. Greg Seider*,
Executive Director, United Fishermen of
Alaska;
Ms. Sandra Tavanis*,
Co-owner, Sea Hawk Seafoods, Valdez;
Mr. Bob Van Brocklin,
Prince William Sound Aquaculture
Corporation; and
Mr. Robert Waldrop,
President of the Board, Alaska Seafood
Marketing Institute, and Vice President,
Silver Lining Seafoods, Ketchikan.

* Editorial Committee

Calendar of work

The Task Force met four times, August 29, October 7, November 1, and November 22. Agendas and summaries of the meeting minutes are contained in appendices to the full report.

At the first meeting, the Task Force selected which of the issues raised in the extensive mail-out solicitation to pursue. Five of the original nine survived; product and market development, reducing costs of production, getting reliable information, improving quality, and marketing salmon and ASMI's role. It also became clear there were several myths at work clouding the issues. Staff reworked the five issues passed by the Task Force in the first meeting into problem statements before the second meeting.

The second meeting started with presentations on various myths, including "everyone's making money but me," "it's all just a Japanese conspiracy," and "we should stick to business as usual, the customer just thinks they want something different.". The Japanese market, salmon prices, margins and costs at various points in the industry, and ASMI's mission were discussed. The Task Force made changes to the problem statements and staff followed up the second meeting with extensive interviews of Task Force members and other experts to lay out the facts and options available to address the problems. A sixth problem was isolated and addressed in this process, the need for strategic planning. The persons interviewed, the questions asked and the options identified are in the full report appendix.

The third meeting started with presentations of the interview results and options gathered. The interview results form the main body of the full report. The Task Force then ranked the options available at that time. Some options were dropped. Staff reworked the options into general, specific, and detailed lists, and prepared a draft outline for the report.

The fourth meeting consisted of preparing some new recommendations for immediate action, and reworking the options that passed muster at the third meeting into the recommendations that follow. Some items were dropped. An editorial committee was appointed to oversee production of the report (see footnote above), and a schedule established for completion of the report.

Recommendations

The Task Force recommendations take into account budget cycles and priorities. In many cases requiring state agency action, existing budgets are not adequate to perform the recommendations. Additional funding will be required, not reprogramming of existing budgets. The Task Force expects the relevant agencies to prepare the necessary budget information, and respectfully requests full and favorable consideration by the Administration and Legislature.

RECOMMENDATIONS FOR DEALING WITH THE IMMEDIATE CRISIS

1. The Alaska Seafood Marketing Institute (ASMI) should develop a budget for immediate funding to deal with the existing inventory surplus before the 1992 season and projected 1992 production. This must be implemented as soon as possible¹.
2. Processors and fishermen should initiate market discussions early. The Task Force recognizes that the market situation will be uncertain at that time, and that the risk involved will lead to low price suggestions from processors, but recommends early discussions to provide maximum information sharing and opportunity to reach agreement. The Department of Labor (DOL) should be prepared to bring in knowledgeable mediators if necessary.
3. The University of Alaska (U of A), Commerce and Economic Development (DCED), and Fish and Game (ADF&G), should initiate and/or support efforts to expose the broadest possible range of Alaska fishermen to credible and detailed information about recent and ongoing changes, including problems and opportunities, in the world markets for salmon.³
4. The DCED Division of Economic Development should review the processing capacity situation in Prince William Sound, taking into account the outcome of the 1991 season, and make preliminary findings available to the Governor (and the industry) as early as is practicable. The Task Force recognizes that the capacity problems that developed in Prince William Sound were the result of the fishery being late and very concentrated, and the fish being relatively dark and small.⁴
5. The DCED Division of Investments and Alaska Commercial Fishing and Agriculture Bank (CFAB) recognize the crisis caused by low prices and the effect this has on loan payments. The Task Force encourages them to actively seek out fishermen having problems and work with them on loan extensions and other measures to minimize foreclosures.⁵

-
1. The immediate ASMI program should be geared to long-term domestic market growth. The Governor could include this amount in his budget request, including a request for exemption from procurement codes for this emergency funding. The Legislature could pass this supplemental funding out as soon as possible in the session. ASMI could reprogram funds to initiate the campaign as soon as possible, prior to release of the funds, consistent with prudent financial management.
 3. Provide reasonably detailed but clearly written information on prices and markets for salmon for wide-spread distribution in the spring of 1992 and thereafter. The information could be updated in season. A goal should be to establish a clearer understanding of the effects of market conditions and dynamics on prices.
 4. DCED could prepare a supplemental budget to cover the costs of doing the necessary surveys for the PWS capacity determination.
 5. Reinstatement of state funding for the ABDC (Alaska Business Development Centers) program of outreach and business assistance in rural areas has been identified as an important component in dealing with financial hardship. This organization provides one-on-one assistance with loan workouts and dealing with the IRS that is not available elsewhere.

MID-RANGE RECOMMENDATIONS

General

1. The DCED, ADF&G, and Department of Labor (DOL) should consider promoting a closer and more trusting relationship among the interests involved in the issues concerning Alaska's salmon industry. This effort should be closely coordinated with other ongoing educational and consensus building efforts.¹

Product and Market Development

2. The Alaska Science and Technology Foundation (in fisheries area), and the U of A's Fisheries Industrial Technology Center, and Marine Advisory Program should be encouraged to expand their efforts in salmon product and market development and to coordinate their efforts in providing technical assistance and research and development in salmon products through the Alaska Fisheries Development Foundation (AFDF).²
3. The DCED's ability to provide international marketing information and sales assistance should be expanded. The Department's Division of Economic Development and Office of International Trade should work closely with ASMI and the Alaska Center for International Business (ACIB) to reduce risk and costs to the private sector.³
4. The DCED, ASMI and the Marine Advisory Program's ability to assist domestic marketing should be expanded. The Department's Division of Economic Development work closely with ASMI to reduce risk and costs to the private sector.⁴

-
1. In the consensus building efforts, the agencies could organize forums and/or participate in existing trade shows and conferences. The issues examined by the Salmon Strategy Task Force could be presented and discussed with the objective of developing a consensus about the direction the state should take in the future regarding the harvesting, management, promotion and marketing of Alaska's salmon.
 2. AFDF has in place a proven industry board and ability to perform, but will require administrative funding to continue operations. Salmon industry representation on their board should be expanded.
 3. Specific projects could include:
 - Work to reduce tariff barriers for Alaska seafood products overseas.
 - Encouragement to foreign reproducers to purchase or joint venture value-added production in Alaska.
 - Continuing investigation of new markets for salmon overseas where disposable income is high enough, and seafood is commonly eaten.
 4. These entities could reduce risk and costs to the private sector of expanding domestic markets through:
 - Working with food service entities in Alaska and other states to promote sales and distribution of Alaska salmon products.
 - Providing start-up technical assistance to new ventures.

Quality

5. The Department of Fish and Game should reexamine management practices with the goal of obtaining the highest quality pack possible without harming the stocks.⁵
6. The Department of Fish and Game should conduct a comprehensive study in Southeast Alaska and Prince William Sound, with the cooperation of fishermen and processors, to determine the degree of risk managers should take in managing for economic efficiency and fish quality. The goal would be to identify the optimum locations for harvest.⁶
7. Industry and the Department of Fish and Game should cooperate on a program to educate fisheries managers, fishermen and industry operators on the physiological changes that occur in salmon (and hence its marketability) to encourage management that provides for the optimum use of the resource.⁷
8. Hatcheries should conduct research to determine the cause for variations in sexual maturity and other quality factors for stocks returning to hatcheries. Based on the research, hatcheries should modify their stocks and practices to optimize quality.

Marketing and ASMI's Role

9. ASMI, the FITC and the Marine Advisory Program (U of A) should expand educational programs on fish handling, cleaning, chilling, and processing for virtually all parts of the industry. Such efforts should focus on providing hands-on training from the fishing boat to the market, and on meeting the needs of the consumer for quality seafood. The effects of quality handling on the ability to market the end product should be emphasized.

-
5. The reexamination of management practices could include changes in the length of openings and the timing of fisheries to optimize salmon quality. The Task Force recognizes that Fish and Game may need statutory and regulatory changes to incorporate such considerations in management decisions.
 6. A controlled set of experiments to determine the optimum points of harvest for top quality could include:
 - a. testing the condition of fish to determine rates of deterioration in terminal harvest and outer areas, throughout the duration of the run; and
 - b. identifying the optimum location which will provide the highest quality of salmon with an acceptable risk to the wild stocks.
 7. A study to examine the effects of sexual maturity on finished product quality could include the following:
 - a. samples in each of the categories in ASMI's Color Guide and hatchery broodstock would be collected;
 - b. portions of each category would be processed at least as headed and gutted, filleted and canned products; and
 - c. the end products would then be used in a workshop setting to educate managers on the various aspects of salmon quality.

The Task Force recognizes that a similar program budgeted at \$25,000 was considered and set aside by the ASMI board, and that it may be possible to achieve the same ends using commercially-processed products. ADF&G should prepare a budget item if necessary.

10. The Department of Commerce and Economic Development should initiate and/or encourage efforts to expose all salmon fishermen to organized, accurate and credible data concerning the salmon industry and markets in sufficient form and detail to permit fishermen's consideration of a national salmon marketing council chartered by the U. S. Secretary of Commerce under the Federal Fish and Seafood Promotion Act of 1986.¹⁰

LONG-TERM RECOMMENDATIONS

GENERAL GOAL

The state needs to develop a strategic plan for long term development of the salmon (seafood) resource, using recommendations of this task force as a starting point. This should focus on strengthening the support structure and sustainability of the industry. The goal would be a more rational and efficient system which is less vulnerable to market, production, and financial fluctuations. This would ensure an integrated and uniform state approach to the fishing industry.

OBJECTIVES:

- review and evaluate the institutions and relationships developed in the industry with an eye toward improving competitiveness and economic return to Alaska residents.
- bring together agencies and functions to affect a rational, consistent and sustainable program linking production, harvesting, processing, marketing and financing.
- determine the proper roles for the public and private components of the industry, integrating regulatory and developmental activities.

ACTION ITEMS

General

1. The Department of Commerce and Economic Development, in cooperation with other state agencies and the salmon industry, should organize a group with broad experience and understanding, in aggregate, of food and commodities industries, to:

-
10. The Federal Fish and Seafood Promotion Act of 1986 provides that species-specific councils (roughly parallel to the National Beef Council, etc.) may be formed only after a rigorous referendum process which must include all salmon harvesters and all primary processors or harvest purchasers and may include other industry participants. If properly organized and chartered, a "National Salmon Council" would have the power to assess the industry participants for funds to be used for salmon promotion and marketing, product research, consumer education, etc. It would also have the power to develop and offer, for Department of Commerce and Economic Development approval, salmon quality standards.

- a. review the functional and procedural workings of the Alaska seafood industry;
- b. identify areas of inefficiency, counter-productivity and resource waste.
- c. review and evaluate research and development capabilities.
- d. recommend what state resources, including statutes, regulations, prestige, etc., can and should be applied to address those areas.

Fish Production

- 2. DCED, ADF&G, and ASMI should develop an integrated production and marketing strategy, which would:
 - a. recognize marketability of the fish as an important management goal.
 - b. recognize that price will be set by overall supply and demand, including the production of farmed salmon.
 - c. coordinate production with wider economic goals, including processing, product development, and markets, based on dependable information and planning.
 - d. better coordinate wild and hatchery production, regionally and by species and market.

Harvesting/Processing

- 3. The Commercial Fisheries Entry Commission, DCED, and DF&G, should develop fishery management and regulatory measures aimed at reducing operating costs, more efficiently utilizing present investments, and promoting a rational sustainable industry. Investigate ways to retain permits in Alaska and rural areas in particular, provide greater stability and enhanced revenues to resident fishermen, and increased shoreside investment consistent with sound financial standards, through:
 - a. reexamination of loan policies and permit use limitations.
 - b. reexamination of Alaska's limited entry system.
- 4. To widen options for Alaskan fishermen, DCED, in cooperation with other state agencies and the industry should consider promoting Alaskan controlled joint venture processing developments linking present investors and industry participants with new technologies and capital, and Pacific Rim and lower 48 markets. Give special attention to rural communities dependent on the salmon resource, smaller plants, local consumption and market needs, infrastructure needs, and current economic development plans.

Marketing

5. DCED should contract a major marketing research firm with proven credentials in food marketing to develop and analyze the "facts" related to salmon market trends, opportunities and weaknesses in major and potential markets. The group should also evaluate the state and industry's marketing efforts, including consideration of changes in the ASMI statute or operations, to permit, if possible, a more effective approach to marketing Alaska seafood.⁵
6. The Governor and Legislature should consider funding ASMI's \$10 million per year proposal for an intensive 5 year domestic marketing campaign. The goal is to raise domestic consumption of salmon from 1 to 1.5 pounds per person annually.
7. DCED, in cooperation with ASMI and DEC, should conduct a study to find the most cost effective ways to improve consumer confidence in Alaska seafood products. The Task Force recognizes that the entire seafood industry must improve the inherent quality of the salmon it processes, the freshness and workmanship of the product, and the consistency of grading to remain competitive, particularly when competing with farmed salmon.⁷

Finance/Other

8. DCED, in cooperation with other agencies and the industry, should readdress the issue of infrastructure including but not limited to improving quality, providing cold storage capacity, and promoting value added production.
9. OMB, in cooperation with state agencies and the industry, should reexamine the policy and implementation of fisheries taxes, including the corporate income and marine fuels taxes. The State must first decide what it wishes to accomplish by taxation. While this is nominally raising revenues, any tax distorts the market in some way, and a review of the current tax structure and various proposed alternatives is in order. Of particular interest is whether targeted tax credits for research and development expenditures is feasible.

Reducing Costs and Regulatory Burdens

1. The Departments of Fish and Game and Revenue should consider combining the appropriate processor annual report forms to simplify reporting requirements for the industry. This should be done at an agency level with the agencies sharing information from each form or integrating them, and may require statutory changes.
-
5. The efforts should take into account what's already been done (Salmon 2000) and focus on those areas outside ASMI's assigned and traditional role, including new product and market development. The results must be produced in a form which will permit evaluation and initiation of strategies to further enhance and stabilize markets.
 7. A great deal of the input the Task Force received identified the lack of consistency in Alaska salmon products as a major marketing problem. Some Alaska product has been described as "low quality" compared to the competition. As Alaska's products become better identified in the marketplace, the Task Force recognizes that "Alaska brand" seafood must be of "good" quality, and meet the customers' expectations if customer satisfaction is to be achieved and advertising dollars well spent. Exactly how to determine those inherent quality standards, and how to ensure that the customer consistently gets the product they have purchased and expect could not be reconciled. The industry is divided on how large a role the state should play in determining quality, ranging from mandatory grading standards to no standards beyond wholesomeness.

2. The Department of Commerce and Economic Development, in cooperation with other affected agencies and the industry, should investigate ways to assist small operators in meeting the myriad regulatory requirements of various agencies. This might range from exempting processors under a specified size from filing certain forms to providing a central clearinghouse for permitting and filing information, technical advisory services and special loans for equipment such as computers and computer software.
3. The relevant state agencies should, in consultation with the Limited Entry Commission, collect child support payments from permit holders at the time of yearly permit renewal. Permit holders will be motivated to pay this fee and it will not unfairly burden processors.
4. The Departments of Revenue and Labor respectively, should relieve the burden of prepayment of the Fishery Business Tax and provision of Labor bond for companies with proven payment records and sufficient assets.

CHAPTER XI. OTHER ISSUES

A. USE OF HATCHERIES AS ENVIRONMENTAL MITIGATION

Hatcheries are sometimes built with the goal of mitigating environmental damage caused by such things as construction of dams and other projects, and water pollution. The goal of environmental mitigation has been a driving force in salmon hatchery development in the Pacific Northwest, particularly in association with dams on the Columbia River.

In contrast, Alaska's hatchery system has been developed for fisheries enhancement, mitigation of the effects of over-fishing, and the offsetting of reductions in fishing quotas for Alaskan fishermen negotiated as part of the U.S./Canada Salmon Treaty. However, Alaska law does contain several provisions regarding use of fisheries enhancement projects as a means of mitigating environmental damage. The primary one is the "Fishways Act."

Alaska Statutes 16.05.840 through 860, referred to as the "*Fishways Act*," gives the Commissioner of Fish and Game the authority to require the builder of a dam or other obstruction across a stream containing fish to provide and maintain a fishway or other device for fish passage. Where a fishway is not practical because of cost, the builder of the obstruction can choose among several other mitigation options with the approval of the commissioner. The options include:

1. Paying a lump sum to the state Fish and Game Fund;
2. Conveying land and funding the building, maintenance and operation of a fish hatchery, rearing ponds, buildings and other facilities; or
3. Agreeing to provide money (both initially and in annual payments) to expand, maintain, and operate additional facilities at existing hatcheries within a reasonable distance of the dam or obstruction.

The Fishways Act was passed in 1959. Since that time, other environmental protection laws and regulations have been enacted setting water quality standards and regulating the types, locations, designs, and allowability of development projects. The *Anadromous Fish Act* (AS 16.05.870) is especially important as it spells out requirements for pre-approval of any projects which could potentially impact fish or fish habitat. This Act and other environmental protection requirements work in conjunction with the mitigation requirements in the Fishways Act.

According to the Department of Fish and Game, the requirement to provide a fishway, either as a permanent structure or as a temporary one during construction, logging, or other work, is used frequently. The State often requires construction of spawning channels in streams that are being disturbed by such things as highway projects. *Although the other provisions of the Fishways Act which require construction of hatcheries or monetary compensation are rarely imposed, state officials believe their existence in statute encourages modifications in project plans that will avoid the actual stream obstruction and serious risk to fish that would activate these very expensive mitigation measures.*

Obviously, preventing damage to fish and fish habitat in the first place is the simplest and most practical means of ensuring the health and ongoing availability of fish. State and Federal officials are charged with making every effort to ensure that the siting, planning and construction of any development project is done in a way that avoids or minimizes potential damage. *Realistically, however, development will occur which will damage fish and fish habitat. In*

those cases where environmental protection methods, even fishways, cannot prevent that damage, mitigation of some sort is usually required by law. In other states and countries, hatchery production has indeed provided enough fish to keep some commercial and sport fisheries alive, at least for a time, that would otherwise have been curtailed due to a lack of fish. This is particularly true in areas where major dam projects or pollution have completely changed or destroyed salmon habitat and spawning patterns. To fishermen in an affected area, hatcheries seem better, at least initially, than no mitigation at all.

While salmon and steelhead hatcheries do produce fish to offset declines in natural runs, there is increasing concern among some scientists in the Pacific Northwest that under some circumstances hatcheries may actually cause the further depletion of already suffering natural stocks, even to the point of extinction. These concerns are further addressed in Chapter VII of this report, regarding biological and genetic issues.

It is important to note how the federal Endangered Species Act (ESA) relates to the matter of using hatcheries as a means of mitigating environmental damage. In the state of Washington, where hatcheries have been used extensively with mitigation as a goal, scientists and fishermen are concerned that regardless of how productive hatcheries might be, they cannot prevent the federal government from invoking the provisions of the ESA if particular stocks are declared endangered. Indeed, the National Marine Fisheries Service (NMFS), which has jurisdiction over endangered species, proposed in 1991 that one stock of Snake River sockeye be listed as endangered under the ESA, and that two stocks of Snake River chinooks be listed as threatened. Decisions on two more salmon stocks (in the Snake and Columbia Rivers) are expected soon.

The Washington Legislature is considering legislation to address issues which have arisen from the application of the ESA to Washington's salmon. These issues include salmon habitat, wild stock protection, tagging of hatchery stocks, and how to define "species" or "stocks" of fish. (See Attached information).

Declaration of a salmon stock as "endangered" can have enormous impacts on fisheries and local and state economies. Since salmon are migratory, any restrictions placed on fisheries to protect a particular stock could affect fishing hundreds or even thousands of miles from the spawning area of that stock.

The Endangered Species Act in effect sets the parameters within which hatcheries can be used to mitigate environmental damage. The Act does not recognize the creation of strong runs of one stock of salmon, through hatcheries or other enhancement efforts, as adequate compensation for the destruction of another stock. If a natural stock is at risk of becoming "endangered," the ESA will not allow for hatcheries to serve as a substitute for damaged habitat. The end result is that efforts to mitigate damage through hatcheries can backfire, closing down fisheries rather than enhancing them, if the hatcheries contribute to the further depletion of a stock. *Thus, to avoid the impacts of the strict protective measures which can be imposed under the ESA, primary concern must be focused on preservation of wild stocks.*

It should be noted however, that in some instances, such as where dams have irreparably destroyed the ancestral habitat of a particular salmon stock, a carefully designed hatchery or other enhancement project may represent the only hope for survival of that stock. For the purposes of ESA, federal law defines "conservation" as including "propagation" if it is necessary to help an endangered or threatened species recover. *Thus, while the ESA serves as a warning against hatchery development that could deplete natural stocks, it also recognizes the potential usefulness of hatcheries in the ultimate survival of an endangered stock.*

Judgement about how effective hatcheries can be for "mitigating environmental damage" must be made on a case by case basis and with a recognition that mitigation is just that, a means of minimizing or offsetting some of the change or damage. Hatcheries can produce new harvestable salmon, but they do not generally repair or duplicate a damaged resource. Hatchery production of fish is an expensive ongoing commitment. The use of hatcheries to mitigate damage must be employed with the understanding that salmon which have been provided "free" and perpetually by nature, are being replaced by salmon that will initially and continuously cost money to produce. This cost, along with the possibility that hatcheries may harm remaining natural stocks, must be realistically considered and weighed in each case, against what is to be gained through the project that will cause the damage and set the mitigation effort into motion.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Re-evaluation of the state Fishways Act and Anadromous Fish Act in light of the provisions of the federal Endangered Species Act.
- Evaluation of whether specific consideration of potential consequences of the ESA should be required before the commissioner can pre-approve a project (under the Anadromous Fish Act) or approve of mitigation measures (under the Fishways Act).
- Tracking the current and upcoming debate and actions occurring in other areas, particularly the state of Washington, regarding environmental mitigation of damage to fish habitat. Determine the relevance of findings to Alaska.

B. ROLE OF HATCHERIES IN INTERNATIONAL TREATIES

U.S./Canada Pacific Salmon Treaty

After many years of negotiation, the United States and Canada signed a treaty in 1985 regarding the interception of Pacific Salmon. *The primary goals of the treaty were to protect and rebuild depleted salmon stocks, assure the long-term viability of salmon stocks within the jurisdiction of the treaty, and bring equity by providing that each country receive benefits from the fisheries which are roughly commensurate with their respective production of salmon in the treaty area.* Fisheries management guidelines for the region covered by the treaty (Oregon, Idaho, Washington, Southeast Alaska and British Columbia, Canada) are provided in a series of annexes to the treaty which are renegotiated on a regular basis. The annexes establish baseline-harvest numbers for many areas but the authority over allocation of fish between user groups within specific areas is maintained by the respective states, provinces, and tribes.

In 1983, a tentative treaty agreement was reached, but Alaska fishing groups found the provisions to be unacceptable and the treaty was not signed. Concerns centered on the concessions to be made by Alaska in the treaty. The reduction in the level of chinook salmon that Alaska trollers would be allowed to harvest was especially controversial. Key to the eventual acceptance of the treaty by Alaska was an offer by the U. S. federal government to give Alaska approximately \$20 million for salmon enhancement to help offset impacts of the treaty. *This mitigation money was not part of the negotiated multi-party treaty. It was a separate agreement between Alaska and the U.S. federal government, offered fundamentally as an incentive to Alaska to agree to the treaty.*

Under the terms of the treaty, Alaska hatchery fish caught after 1985 were not to be counted as part of the negotiated quota of allowable catch, and could be taken in addition to that quota. *While everyone involved seemed to understand that the federal mitigation money was intended to replace what the Southeast Alaska fisheries groups had lost in the treaty settlement, the specific purpose of the money was not clearly spelled out at the time of the agreement. This lack of clarity and documentation has caused considerable confusion and controversy over the years.* Initially many fishermen and the Alaska Department of Fish and Game believed that the money was to go towards an annual production goal of 100,000 chinook for the trollers, 1,000,000 chum for the seiners, and 20,000 to 40,000 sockeye for the gillnetters. Although the state appears to have honored the general purpose of salmon enhancement with the mitigation funds, it has not spent the funds in accordance with the most widely-held understanding of the intent for those funds.

The governments of Washington and Oregon have not allocated any funds specifically for enhancement projects related to this treaty. British Columbia instigated a treaty-related enhancement project on the Fraser River, but has since run out of funds to continue it.

A computer model was developed to calculate the allowable catch of each of the parties to the treaty, and to update that quota annually. Information about hatchery-bred fish indicates the health and numbers of the natural stocks for the computer model.

Alaska fishermen agreed to the Pacific Salmon Treaty, despite the sacrifices it required in their allowable catch levels, because of guarantees that increased hatchery efforts and production would result in increases in these allowable catches. For reasons which may have included misunderstandings of original intentions, a lack of clear binding language in the treaty, or ineffectual negotiating at annual sessions to update agreements and re-negotiate treaty annexes, many fishermen are dissatisfied with what the treaty has accomplished. Hatchery efforts funded with mitigation funds have indeed produced salmon, but fishermen, particularly trollers, do not believe they have received the benefits they were promised from that production.

While fishermen may not have seen the specific benefits they had hoped for in the form of increased allowable catches, the state hatchery program has received more funding than it would have had without mitigation funds, and the Alaska Department of Fish and Game has been able to use mitigation money to supplement their budget for projects and personnel which are related directly or indirectly to the goals of the treaty.

Yukon River Treaty

Salmon restoration and enhancement have been discussed as part of the United States/Canada Yukon River salmon negotiations since 1985. The goal of the United States in these talks has been to ensure the long-term health of salmon stocks and assure consistency in harvest for both countries of the Yukon River system.

The U.S. proposal, agreed to by the Alaska Department of Fish and Game, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Yukon River Drainage Fisheries Association, includes:

- Restoration projects to increase production of transboundary stocks that do not respond to harvest management.
- Fisheries enhancement projects where appropriate, consistent with state genetics and disease policies.

- Planning strategies to allocate and manage restored stocks before the program starts.
- Operational plans for enhancement projects, with protection of wild stock genetic diversity as the paramount concern.

The FRED Division has developed a Yukon Fisheries Enhancement Initiative with its key components being overall design and planning work, expansion of the Clear Hatchery near Nenana, Alaska, and rehabilitation of natural salmon production. The cost of this initiative is estimated to be more than \$13 million.

Fishermen along the Yukon are primarily interested in bringing natural stocks back to historic levels. Rehabilitation projects and protection of wild stocks are their top priorities.

Some biologists believe that supplemental hatchery production on the Yukon River will only further complicate mixed stock fisheries management, and risk the reduction or elimination of small wild stocks. They are also concerned about the risks of genetic dilution of natural stocks, reduced stock fitness, and disease. The Alaska Chapter of the American Fisheries Society is currently considering a resolution to support setting aside the Yukon River drainage as a Wild Stock Management Zone (hatchery-free).

OPTIONS FOR POSSIBLE CONSIDERATION:

- Evaluation of the effectiveness of enhancement as an international treaty component.
- Requirement of a comprehensive feasibility and benefit-cost analysis of enhancement in treaty proposals prior to treaty agreements. Because state agency budgets tend to "benefit" from enhancement agreements, consider contracting these reviews to disinterested third parties.
- Development of an auditing mechanism to determine if enhancement benefits are realized by fishermen impacted by treaty agreements.

C. ENVIRONMENTAL REGULATIONS RELATED TO HATCHERIES

There are a number of environmental considerations involved in the siting, construction, and operation of hatcheries. In addition to the biological and genetics matters associated with the fish and eggs themselves, other environmental protection issues include the siting of hatcheries, their water usage requirements, the effluent they produce, and the disposal of fish carcasses (of broodstock or fish which are excess or diseased).

While Alaska law does not contain many environmental statutes and regulations which are specific to hatcheries, it does have a number of general provisions regarding protection of the environment which come into play during the planning, development, and operation of hatcheries. These include the Anadromous Fish Act which controls and requires approval for any construction projects or other action which might affect "rivers, lakes or streams or parts of them that are important for the spawning, rearing or migration of anadromous fish"; the Fishways Act which requires the construction of a fishway or hatchery construction if a dam or other obstruction will impact the passage of fish (see section on environmental mitigation); plus many laws and regulations about water quality and pollution.

protection of genetic purity of fish stocks (see chapter on biology and genetics), fish health inspections (AS 16.05.868), and siting of hatcheries.

A significant environmental protection issue associated with hatcheries is the discharge of waste into public waters. The procedures and permits required of hatchery operators in this regard have been confusing and in a state of flux for several years, but now seem to be headed for some resolution and streamlining. Part of the confusion stems from the fact that both the Federal Environmental Protection Agency (EPA) and the Alaska Department of Environmental Conservation (DEC) have some jurisdiction in this matter.

It appears that both EPA and DEC have been fairly lenient about requiring the various waste disposal permits that have technically been required. Even so, there have been very few complaints or problems regarding hatchery impacts on water. Hatcheries do discharge effluent which may contain organic fish waste, as well as some disinfectants or other chemicals used to prevent or control disease, but generally they discharge only very small amounts of pollutants. ***However, recent developments necessitating the disposal of large numbers of fish carcasses have raised the subject of waste disposal monitoring.*** These developments include 1) a joint decision by the Federal Food and Drug Administration and the Alaska DEC in 1990 that the carcasses of hatchery broodstock (mature fish used for the taking of eggs and milt) should no longer be sold for canning for human consumption, and 2) the recent huge returns of fish, particularly in Prince William Sound, which have resulted in the inability of hatcheries to sell large numbers of their "cost-recovery fish." Both of these developments demonstrated the need to establish procedures for hatcheries to dispose of large numbers of fish carcasses.

The federal Clean Water Act prohibits the point source discharge of pollutants by any person into the waters of the United States, except in compliance with the terms and conditions of a National Pollutant Discharge Elimination System (NPDES) permit issued by EPA. ***Under federal regulations, discharges of concentrated aquatic animal production facilities require NPDES permits.*** The regulations identify the annual level of production and feeding of a facility to require an NPDES permit, but also leaves to the EPA the discretion to require the permit of any facility it deems to be a significant contributor of pollutants.

In a January 1991 letter to all hatchery operators in Alaska, the EPA explained these requirements and noted that even if the regular operations of a hatchery did not fall under the NPDES permit guidelines, a permit would be required if the operator planned to dispose of fish carcasses in the water. It further explained that fish processors who dispose of greater than 1000 pounds of waste per day may be covered by the "Authorization to Discharge Under the National Pollutant Discharge Elimination System for Alaska Seafood Processors" general permit (the GP), and that for the purposes of carcass disposal, the EPA was willing to cover hatcheries under the same GP. The letter explained that this "greatly simplifies the administrative process and reduces the time frame in which a NPDES permit is obtained." The letter ended by asking that hatchery operators notify the EPA of their plans for fish waste disposal prior to the 1991 season.

In April 1991, the Anchorage EPA office sent another letter to all hatchery operators stating that many of the responses they had received to the January letter had raised a number of issues to be considered. Since resolving these issues is likely to take some time, the EPA established an interim policy to allow the hatcheries to operate and to provide for environmental protection in the interim period. The letter goes on to lay out three conditions under which the disposal of whole fish carcasses would be permissible. The criteria include 1) the depth of water where discharge may occur, 2) a requirement of pre-approval of the discharge site by EPA, and 3) a requirement that the skipper of the discharge vessel maintain records of each discharge occurrence, its location, and the date.

Alaska is currently operating under the interim criteria spelled out in the EPA's April 1991 letter. Many hatcheries, particularly state-run hatcheries, have submitted their applications for the NPDES permits to EPA. However, the EPA considers these state hatcheries to be minor dischargers and has agreed to turn over to the state the authority for permitting and monitoring of their waste discharge. EPA has forwarded copies to DEC of all the NPDES permit applications they have received from hatchery operators, and has asked that the state implement a hatchery waste permitting process.

Under current state law, hatchery effluent is covered under the DEC waste disposal permit statute (AS 46.03.100). DEC reports that few hatcheries apply for this permit but DEC has been comfortable with the situation, and has made permitting hatcheries a low priority, since hatcheries generally handle effluent in a manner that maintains acceptable water quality standards.

DEC has drafted a "General Waste Disposal Permit for Fish Hatchery Discharges," to be issued to hatcheries to fulfill the state waste permit requirement. Once the state has officially adopted this permit, hatchery operators will obtain waste permits only from DEC under the operating agreement between DEC and EPA. This state permit would in effect fulfill both state and federal waste permit requirements. This centralization and consolidation should simplify the permitting and reporting processes for hatchery operators, ensure more compliance, and improve uniformity in the monitoring and information available.

The state's draft permit contains a provision stating that the permit is effective until a specified date, "unless superseded before that time by a state certified EPA permit." This statement is included in order to provide for any potential situation in which EPA might require an NPDES permit, which would then supersede the state permit. The draft permit contains specific language regarding discharges, carcass disposal, drugs, chemicals and medications, operational, monitoring and reporting requirements, and so on. It lacks specific language to address disposal of diseased fish or eggs but other general provisions in the permit, or language in the hatchery operational permits from ADF&G may sufficiently provide for that circumstance.

Despite the lack of clear regulations and enforcement, and the confusion over federal and state requirements, there have been very few problems reported regarding such things as hatchery waste disposal in Alaska. Even during the situation in Prince William Sound during the 1991 season when processors would not buy many of the hatchery fish that later had to be dumped, both DEC and EPA report that their agencies worked very closely with the hatcheries to devise and carry out plans for large-scale carcass disposals, and things went quite smoothly. The Alaska Departments of Fish and Game and Environmental Conservation, and the federal Environmental Protection Agency, generally believe that for this aspect of environmental protection, current laws are adequate.

Other environmental issues related to hatcheries are covered in this report in the chapters on Biology and Genetics, Planning and Permitting, and Environmental Mitigation. The topics covered in those chapters appear to raise more serious and complex environmental concerns and questions, and need more extensive review, than the more direct environmental protection regulations discussed here.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Encouraging DEC and EPA to coordinate waste disposal permitting requirements to the extent possible.

- Ensuring that adequate direction is provided in regulation regarding the disposal of any diseased hatchery fish.

D. USE OF ENHANCEMENT AS TOOL FOR ECONOMIC DEVELOPMENT

The state's financial support of hatchery production and other enhancement efforts has focussed primarily on Southeast Alaska, Prince William Sound, Cook Inlet, and Kodiak. However, fisheries enhancement is increasingly being viewed in other rural areas of the state as a tool for local economic development. Potential benefits from enhancement activities include the increased number of jobs, the potential for attracting processors or other value-added businesses to the region, as well as increased harvest for fishermen.

In some cases, the regions interested in enhancement for economic development have small, localized commercial fisheries based on local stocks of fish which in many cases are depleted, and which local residents would like to see replenished. In other areas of the state, residents are interested in the potential of creating entirely new fisheries. For many rural areas of the state, fisheries development represents the most viable - and in many cases, perhaps the only - opportunity for economic development.

Some of the projects being discussed and planned include:

- **Sikusuilaq Springs Hatchery.** Residents of Kotzebue Sound are meeting with a planning core group that includes ADF&G, the National Park Service, and the Northwest Arctic Borough to develop increased production proposals as part of a basic management plan for this small state hatchery located on the Noatak River. A regional aquaculture association will probably be established in 1992, and a comprehensive salmon plan for the region should be completed in 1993.
- **Yukon Enhancement Initiative.** Residents of the Yukon River area are organizing an aquaculture association and seeking legislative funding so that regional enhancement planning can be reactivated and expanded. A draft comprehensive salmon plan could be completed by the fall of 1992. Enhancement efforts are also being considered as part of the U.S./Canada Yukon River treaty negotiations.
- **Western Alaska.** Feasibility studies are underway for potential fisheries enhancement projects in the Nelson Island/Chevak area. Local villages and the Bering Sea Fishermen's Association are contributing to the effort, with additional funding requested from the Bureau of Indian Affairs and the National Coastal Resources Research and Development Institute. Although there are no natural runs currently, fishermen in this region are interested in developing salmon returns in streams that are ice-free year round.
- **Norton Sound Economic Development Initiative.** Under this proposal, developed in February 1991, FRED Division is providing technical support in developing a fisheries enhancement program at Elim, including stream rehabilitation and a possible hatchery.
- **Port Graham Salmon Development Project.** The goal of this pink salmon development project is to create a local village economy based on high quality value-added salmon products. The goal of the hatchery is to produce fish for the processing plant.

•**Kake Nonprofit Fisheries Corporation.** This southeast Alaska community proposes to expand its Gunnuk Creek Hatchery with the express goal of contributing to the economic development of the village. Kake has historically been a fishing village, but in recent years saw logging replace fishing as the major form of employment in the community. Logging is now on the decline, and the village wishes to expand its fishing industry.

It should be noted that these enhancement proposals are subject to the same concerns and conflicts generated by enhancement projects elsewhere in the state. The continued interest in enhancement and in hatcheries however, should be a prime reason for addressing the issues highlighted in other chapters.

OPTIONS FOR POSSIBLE CONSIDERATION:

•Evaluation of how much weight to give the need for local economic development when considering a new hatchery permit application.

E. IMPORTANCE OF HATCHERIES TO SPORT FISH

While the Senate Special Committee on Domestic and International Commercial Fisheries initiated the Legislative Review of Alaska's Fisheries Enhancement Program to evaluate the contribution of the program to commercial salmon fisheries, the role of the program in sport fisheries warrants attention. This section summarizes information provided by a FRED Division report attached to this chapter.

Many projects in the statewide enhancement program produce fish, primarily chinook, coho, pink, sockeye, and chum salmon, steelhead, rainbow trout, grayling, and Arctic char, that are highly valued by sports fishermen. Fish targeted for sport fisheries are released in over 350 locations around the state. Many of the projects operated by the FRED Division are entirely dedicated to improving recreational fishing opportunities.

Sport fishing has been growing in Alaska as evidenced by the increase in the number of licensed anglers from 1977 (200,000 total license sales) to 1990 (425,000 total license sales). This dramatic increase in sport fishing participation can be attributed to many factors, including changes in population, real per capita income of residents and non-resident visitors, and the opportunities for quality sport fishing experiences. A major component of a high quality fishing experience, especially for resident anglers, is the probability of catching a fish during the fishing experience (called the harvest per angler day). According to ADF&G, the economic value of fishing experiences are directly related to higher harvests per angler day. The statewide enhancement program has been a key factor in maintaining and augmenting these harvests despite increasing fishing effort.

The statewide salmon enhancement program has grown to the point of supporting a significant portion of total sport and commercial fishing harvests. For example, total 1990 recreational harvests of salmon, trout, grayling, Arctic char, and steelhead was approximately 1.3 million fish. The enhancement program is estimated to have contributed 28 percent of the harvest. State facilities provided 73 percent of the enhanced harvest while PNPs provided 27 percent.

According to recent studies completed by the ADF&G, sport fishing provides significant economic benefits in Alaska.

OPTIONS FOR POSSIBLE CONSIDERATION:

- If the Legislature initiates an on-going enhancement program review similar to Canada's, include sport as well as commercial fishing aspects of the program in order to achieve a more comprehensive performance report.
- Increasing the sport fish license fees to pay for a larger portion of the enhancement projects that benefit recreational fisheries.
- Encouraging Congress to increase Dingle-Johnson funds provided to Alaska to support increasing sport fishery enhancement and rehabilitation efforts.

F. CONTRIBUTION TO SUBSISTENCE FISH

In addition to commercial and sport fisheries, there is increasing demand for the state's enhancement program to provide fish for subsistence and personal use fisheries.

Sikusuilag Hatchery on the Noatak River provides a substantial number of chum salmon for subsistence gillnets in Kotzebue Sound and on the Noatak. Subsistence users in southern Southeast harvested 5,000 sockeye salmon produced from the McDonald Lake fertilization project. Production from the Klawock Hatchery, located on Prince of Wales Island, is extensively used by subsistence fishermen.

OPTIONS FOR POSSIBLE CONSIDERATION:

- If the Legislature initiates an on-going enhancement program review similar to Canada's, include subsistence and personal use as well as commercial and sport fishing aspects of the program in order to achieve a more comprehensive performance report.

G. ENHANCEMENT OF OTHER SPECIES

In addition to its work on such sport fish species as grayling, rainbow trout, and arctic char, FRED Division is also exploring king crab rehabilitation in a cooperative effort with Kodiak fishermen and the Kodiak Island Borough. Additional funding is being requested from the Alaska Science and Technology Foundation in order to examine shellfish rehabilitation projects in other countries and states.

Currently, research and production of non-salmon species is done almost entirely by the FRED Division. If private entities became interested in taking on such efforts, statutory changes would be required since the entire PNP program is based on salmon production.

OPTIONS FOR POSSIBLE CONSIDERATION:

- Amending statutes to allow the private sector to enhance non-salmon species.
- Taking action to encourage the production of non-salmon species.

BACKGROUND: DECLINING SALMONIDS IN WASHINGTON

Columbia River Salmon and the Endangered Species Act (ESA)

In April and June of 1990 petitions were filed by the Shoshone-Bannock tribe in Idaho, Oregon Trout and five other organizations, under the federal Endangered Species Act (ESA) to list five wild stocks of Columbia River salmon as threatened or endangered. These stocks were: Snake River sockeye, Snake River spring, summer, and fall chinook, and lower Columbia River coho. The National Marine Fisheries Service (NMFS) is the federal agency with jurisdiction over endangered fish species. In April and June of 1991, NMFS proposed that three of the five stocks of salmon be listed under the Endangered Species Act. These stocks are the Snake River sockeye salmon (proposed as endangered), the Snake River fall chinook (proposed as threatened) and the Snake River spring/summer chinook (proposed as threatened). On November 14, 1991, NMFS officially listed the Snake River sockeye as endangered. Decisions on the other two stocks are expected shortly.

Wild Stocks Under the Endangered Species Act

An important part of the NMFS decision was their determination of what the definition of stock would be that would constitute a "species" for purposes of the ESA. The agency determined that an "ecologically significant unit", or ESU, would constitute a species for the purposes of the ESA. Another key point in application of the ESA to fish is that the wild stocks were recognized and being genetically and biologically important and merit protection, or stocks that have not been intermixed with hatchery stocks and that still spawn naturally, are considered.

Salmon in the Columbia River System and Reasons for Decline

Approximately one-third of the Columbia River drainage that historically supported salmon populations is not currently accessible to these fish because of dam construction without fish passage facilities. Alterations in river flow and velocity, adjacent habitat changes, irrigation diversions, commercial and recreational harvest, and hatchery practices have resulted in fewer "returns" of spawning adults from the ocean than historically. In the mid-19th century, anadromous fish runs in the Columbia River basin numbered up to 16 million adult fish. Anadromous fish include salmon, steelhead, and sea-run cutthroat trout. Juveniles migrate from freshwater to the ocean, where they take between one and five years to mature. They return as adults to their streams of origin to spawn. Salmon and steelhead numbers on the Columbia have been reduced to about 15 percent of historic run sizes.

Dams: The U.S. Army Corps of Engineers, the U.S. Bureau of Reclamation, and the state's public utility districts operate water projects in the Columbia and the lower Snake Rivers. The Bonneville Power Administration, part of the U.S. Department of Energy, markets the power generated by these hydroelectric facilities. There are hindrances to both upstream and downstream fish migration that can occur because of dams. The impoundments that are associated with dams alter natural water flow, sometimes preventing downstream migration of juvenile fish. Power turbines without adequate screening can cause fish mortality when fish do attempt to migrate downstream. Five of eight Army Corps of Engineers projects have juvenile fish bypass systems. Facilities at the Lower Monumental, Ice Harbor, and the Dalles dams are not yet in place. For successful upriver migration of adult salmon, dams are equipped with fish

ladders. There are no ladders at the Chief Joseph or Grand Coulee Dams, blocking upstream spawning in the Columbia River at Bridgeport.

Habitat Alteration Out of River: Activities such as timber harvest, mining, agricultural drainage, livestock grazing and point source pollution can alter fish habitat conditions. Increased sediment, increased water temperatures, loss of riparian (adjacent to the watercourse) habitat, and reduced oxygen can negatively affect fish.

Harvest: Both recreational and commercial salmon fishing occur on the Columbia River. Salmon fishing in Washington and Oregon state waters is regulated by the Washington Department of Fisheries and by the Oregon Department of Fish and Wildlife, respectively. The two states coordinate their commercial fishing regulation development through the Columbia River Compact. Recreational fishing is regulated by the Washington Department of Wildlife (steelhead trout and resident game fish), Washington Department of Fisheries (salmon and marine fish), and the Oregon Department of Fish and Wildlife (all species of fish).

Fish Production: 80-90% of salmon returning to the Columbia River from the ocean are produced in hatcheries. There is an ongoing debate over the role of hatchery practices in preservation of wild stocks of fish. Deterioration of wild stocks of salmon and steelhead can occur through poor hatchery management practices. Hatchery practices have begun to explore the use of wild stock in breeding programs, to avoid deterioration of hatchery stocks.

Water Use: There are several large users of water in Washington, including municipal, industrial, irrigation, hydroelectric generation, and instream. Municipal water use includes water supplied by public water systems for domestic, commercial, and fire protection. Industrial use includes process and cooling water. Irrigation accounts for the majority of water use in Washington. Water is diverted from water sources. Diversions must be screened to prevent fish from entering the irrigation system, unless the area of the diversion is under the management authority of the Department of Wildlife and the diversion existed prior to 1947. Water storage for irrigation, power production or flood control affects timing of peak flows that under natural conditions coincide with juvenile anadromous fish migration downstream.

The American Fisheries Society Endangered Species Committee Report

According to a report by the Endangered Species Committee of the American Fisheries Society, entitled *Pacific Salmon at the Crossroads*, 214 stocks of wild salmon, steelhead, and cutthroat trout are in decline in the Pacific Northwest. 52 of these are in the Columbia River basin. In the coastal and Puget Sound areas of Washington, outside of the Columbia River basin, 41 stocks are in jeopardy. There are currently no mandated recovery efforts for these stocks, other than for the Snake River sockeye salmon.

Other Efforts to Recover the Columbia River Salmon

Columbia River Salmon Flow Measures

The Army Corps of Engineers, Bureau of Reclamation, and the Bonneville Power Administration are conducting an Environmental Impact Statement (EIS) to examine water management actions to help both juvenile and adult salmon. These actions will be taken in 1992, for a one year period, on an experimental basis. The alternatives include various combinations of reservoir drawdown and flow augmentation to assist juvenile salmon migration.

The final EIS is expected to be released in March of 1992.

The Salmon Summit

The Salmon Summit was convened at the urging of Senator Mark Hatfield by agencies and organizations in the Pacific Northwest to develop a management and recovery program for the Columbia and Snake River salmon. This effort concluded in March 1991 and the participants failed to reach a consensus on major recovery methods. However, the task of continuing these efforts was subsequently undertaken by the Northwest Power Planning Council (NWPPC).

The Northwest Power Planning Council Amendments

In 1980, Congress passed the Northwest Power Act. The Act created the NWPPC and directed it to determine how much energy the region would require over the next twenty years and to develop an electric power plan to meet those needs; and to develop a program to protect, mitigate, and enhance fish and wildlife and related habitat in the Columbia River basin. The NWPPC develop a Fish and Wildlife Program (FWP) to accomplish this. In response to the declining salmon on the Columbia and Snake Rivers, the NWPPC is amending its FWP. The amendments are in four phases. Phase I identified immediate measures to assist in salmon recovery. Phase II, completed on December 12, 1991, recommends the following actions, as well as many others not listed below:

- mainstem passage improvements on the Snake and Columbia by increasing flows for juvenile salmon migrating downstream and by improving screens so that juveniles don't experience as much mortality in dam turbines;
- reductions in commercial harvest;
- implementation of a temporary commercial salmon license leaseback program;
- adoption of water conservation measures including the placement of instantaneous flow meters on all diversions from anadromous fish streams tributary to the Snake and Columbia;
- improvement of hatchery management practices;
- development of habitat management standards for salmon protection.

NMFS will use this Phase II Amendment as the basis for their recovery plan for the endangered sockeye salmon. Phase III and IV are watershed level planning, and resident fish and wildlife protection, respectively. The NWPPC has just begun to develop these phases.

HOUSE BILL ANALYSIS

HB 2626

AN ACT RELATING TO WILD STOCKS OF SALMONIDS

Brief Description: Conserving and enhancing wild stocks of salmonids.

Committee: Fisheries & Wildlife

Sponsor(s): Representatives R. King, May, Orr, Rust, Belcher, Fraser, Hochstatter, Horn, Morris, R. Meyers, Basich, Jones, Sheldon, Leonard, Franklin, Zellinsky, Valle, Pruitt, O'Brien, Nelson, Bowman, Brough, Jacobsen, Haugen, Rasmussen and J. Kohl

Background:

Recovery Planning

The Northwest Power Planning Council, in their Phase II Amendment process, developed a management plan for salmon on the Columbia and Snake Rivers, which will be used by the National Marine Fisheries Service as a basis for their recovery plan for sockeye salmon. The Snake River sockeye salmon was listed as endangered under the Endangered Species Act in November of 1991.

There is currently no mandatory or ongoing recovery effort for wild stocks of salmon, steelhead and cutthroat trout that have not been petitioned for listing under the Endangered Species Act. There are many other wild salmon, steelhead, and sea-run cutthroat trout stocks that have been identified as declining by the American Fisheries Society. Forty-one of these are in Washington, outside of the Columbia River Basin.

Management Techniques for Increasing Wild Fish Runs

The Department of Wildlife regulates the recreational harvest of resident fish including steelhead trout and sea-run cutthroat trout. The Department of Fisheries regulates the harvest of the commercial and recreational salmon fisheries for non-treaty fishers. Both agencies coordinate with the tribes in developing commercial harvest regulations. Regulations are designed to provide harvest opportunities and sustain fish runs.

The Northwest Power Planning Council, in their Phase II Amendment, proposed a reduction in harvest of fall chinook in the Columbia river. Part of the mechanism for accomplishing this will be by providing for a commercial license leaseback program. The federal government will assist in paying to temporarily lease back commercial fishing licenses. Current Washington law requires that a commercial fisher, in order to renew a salmon license, catch one fish. The director of the Department of Fisheries has the authority to waive this requirement if the fisher has not had the opportunity to catch fish, such as would occur if a fisher participated in the leaseback program.

Marking and Catch and Release

Where a distinction between wild and hatchery stocks needs to be made for the purpose of allowing wild fish, if caught, to be released, the hatchery fish may be marked by clipping the adipose fin, using a coded wire tag, or using a newer ocular marking technique. The Department of Wildlife has marked most of its hatchery raised steelhead and sea-run cutthroat trout and is therefore able to implement catch and release regulations for recreational fishers. For almost all of the steelhead and sea-run cutthroat stocks identified by the American Fisheries Society as stocks of concern, these regulations are already in place. The Department of Fisheries has not marked all hatchery fish. Even if all were marked, the utility in returning wild fish caught commercially with current techniques is low, since these fish, caught in nets are usually dead shortly after the nets are hauled in. The recreational fishery could be managed for catch and release if all hatchery raised salmon were marked.

Hatcheries

The Department of Fisheries operates 39 major hatcheries and 19 satellite facilities. The Department of Wildlife operates 32 hatcheries. The tribes and the U.S. Fish and Wildlife Services also operate hatcheries, and there are hundreds of cooperative production facilities operated by volunteers and coordinated by the state Departments of Fisheries and Wildlife.

Captive Broodstock and Wild Stock Supplementation:

Wild salmonids spawn in river gravel. Their progeny reside in freshwater until ready to go to the ocean, where they mature. As adults, they return to their natal streams to spawn. Fish produced in hatcheries are artificially spawned by removing eggs from the female and raising the young fish and releasing them to travel downstream as smolts. New technologies are being developed to use artificial production means to supplement wild populations of salmonids with fish that are genetically of the same wild stock. One technique, called captive broodstock rearing, raises the fish from egg to mature adult, rearing in saltwater if necessary by using saltwater net pens. That adult is spawned artificially. Wild stock supplementation is the process of using eggs from the wild stock that one wants to supplement, by taking the fish out of the wild, rearing the progeny, and releasing the progeny back into the natal stream from which the parents originated. The Department of Wildlife has sea-run cutthroat captive broodstock programs in Shelton and Aberdeen, which have been implemented in the last five years. Many stocks of sea-run cutthroat on coastal streams have been identified by the American Fisheries Society as being stocks of concern.

Summary of Bill:

The Departments of Fisheries and Wildlife are directed to establish a review and recovery team to recommend recovery methods for salmonid stocks outside of the Columbia River Basin. The review and recovery team is to develop a definition of the term "stock", determine the status of all wild salmonid stocks in Washington, set escapement objectives for these wild stocks, and where escapement objectives are not currently being met, develop a recovery plan for each subbasin containing the wild stock. Priorities for recovery are to be, in descending order, natural production, supplementation using hatcheries, and captive broodstock technology. The team shall evaluate the role of existing hatcheries in recovery, and shall evaluate methods of

harvest that have less impacts on wild stocks. The recovery plan shall be submitted to the appropriate legislative committees by June 30, 1993.

By January 1, 1993, the Department of Wildlife is directed to implement an experimental captive broodstock program on a coastal river to be selected by the Department for wild sea-run cutthroat trout.

The Department of Fisheries, by December 31, 1992, is to determine the cost of marking all hatchery fish at all Department operated hatchery facilities.

The director of the Department of Fisheries is directed to use authority granted under existing law to waive requirements for commercial fishing license renewal, in order to accomplish the goals of the license leaseback program of the Northwest Power Planning Council, described in the Council's Phase II Amendment.

*Prepared by Keithlyn Watson, Research Analyst (786-7310)
House Fisheries and Wildlife Committee
Office of Program Research
January 23, 1992*

SECTION BY SECTION SUMMARY: H-2626
Conserving and enhancing wild stocks of salmonids

Section 1. Legislative findings.

Section 2. The Departments of Fisheries and Wildlife are directed to establish a review and recovery team to recommend recovery methods for salmonid stocks outside of the Columbia River Basin. The review and recovery team is to develop a definition of the term "stock", determine the status of all wild salmonid stocks in Washington, set escapement objectives for these wild stocks, and where escapement objectives are not currently being met, develop a recovery plan for each subbasin containing the wild stock. Priorities for recovery are to be, in descending order, natural production, supplementation using hatcheries, and captive broodstock technology. The team shall evaluate the role of existing hatcheries in recovery, and shall evaluate methods of harvest that have less impacts on wild stocks. The recovery plan shall be submitted to the appropriate legislative committees by June 30, 1993.

Section 3. By January 1, 1993, the Department of Wildlife is directed to implement an experimental captive broodstock program on a coastal river to be selected by the Department for wild sea-run cutthroat trout, using existing facilities where possible.

Section 4. The Department of Fisheries, by December 31, 1992, is to determine the cost of marking all hatchery fish at all Department operated hatchery facilities.

Section 5. Amends existing law to require the director of the Department of Fisheries to use authority granted under existing law to waive requirements for commercial fishing license renewal, in order to accomplish the goals of the license leaseback program of the Northwest Power Planning Council, described in the Council's Phase II Amendment.

HOUSE BILL 2626

State of Washington 52nd Legislature 1992 Regular Session

By Representatives R. King, May, Orr, Rust, Belcher, Fraser, Hochstatter, Horn, Morris, R. Meyers, Basich, Jones, Sheldon, Leonard, Franklin, Zellinsky, Valle, Pruitt, O'Brien, Nelson, Bowman, Brough, Jacobsen, Haugen, Rasmussen and J. Kohl

Read first time 01/22/92. Referred to Committee on Fisheries & Wildlife.

1 AN ACT Relating to wild stocks of salmonids; amending RCW
2 75.30.120; and creating new sections.

3 BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF WASHINGTON:

4 NEW SECTION. Sec. 1. The legislature finds that wild stocks
5 of salmonids in the state of Washington are in a state of decline.
6 Stocks of salmon on the Columbia river are proposed for listing as
7 threatened and endangered, the Snake river sockeye has been officially
8 listed as endangered, and the American fisheries society has indicated
9 that there are two hundred fourteen other stocks of salmonids in the
10 Pacific Northwest that are in decline or possibly extinct. Many of
11 these are within Puget Sound or the coast, and therefore are not within
12 the jurisdiction of the Northwest power planning council. The
13 legislature recognizes that to lose these wild stocks would be
14 detrimental to the genetic integrity of the fisheries resource and the

1 econo d will represent the loss of a vital component of
2 Washington's aquatic ecosystems. The legislature further finds that
3 to postpone the recovery of stocks that are on the decline but that are
4 not yet listed as threatened or endangered is short-sighted, and that
5 it will be less costly to act now to save this important resource.

6 NEW SECTION. Sec. 2. (1) The departments of fisheries and
7 wildlife shall establish a wild salmonid review and recovery team
8 consisting of fisheries biologists and geneticists. The purpose of the
9 team shall be to review and recommend recovery methods for salmonid
10 stocks outside of the Columbia river basin. The departments shall
11 invite representatives of the Northwest Indian fisheries commission and
12 the national marine fisheries service to participate on the team.

13 (2) By June 30, 1993, the review and recovery team shall:

14 (a) Develop a meaningful definition of stock. The definition shall
15 be formulated to allow preservation of genetic integrity of the wild
16 fish resource and to avoid future federal listings under the endangered
17 species act. The team shall consider the national marine fisheries
18 service's species definition as well as the American fisheries society
19 definition of stock;

20 (b) Determine the status of all wild salmonid stocks in Washington;

21 (c) Set escapement objectives for all wild salmonid stocks in
22 Washington; and

23 (d) Where escapement objectives are not currently being met,
24 develop a recovery plan for each subbasin containing the wild stock,
25 attempting to achieve escapement objectives within two generations.
26 The recovery plan shall identify baseline conditions as well as
27 recommend actions. Priorities for recovery shall be, in descending
28 order, natural production, supplementation using hatcheries, and
29 captive broodstock technology. The recovery plan shall include an

1 evaluation of the role of existing hatcheries in wild salmonid
2 recovery, as well as of methods of harvest that have less impact on
3 wild stocks.

4 (3) By June 30, 1993, the review and recovery team shall provide
5 a recovery plan to the appropriate legislative committees. The plan
6 shall include:

7 (a) A definition of stock;

8 (b) A state-wide list of wild stocks, with status of and escapement
9 objectives for each;

10 (c) A summary of data management needs; and

11 (d) A range of recovery alternatives for wild stocks outside of the
12 Columbia river basin, with accompanying time frames for implementation,
13 time frames for expected recovery, costs, and risk assessments.
14 Alternatives shall consider actions in the areas of water quality and
15 quantity, flow management, hatchery management, captive broodstock
16 programs, harvest, and land management. Costs shall be developed in
17 consultation with an advisory committee of appropriate membership to
18 be appointed by the departments.

19 (4) This section shall expire January 1, 1994.

20 NEW SECTION. Sec. 3. By January 1, 1993, the department of
21 wildlife shall implement experimental captive broodstock programs on
22 a coastal river to be selected by the department, for wild sea-run
23 cutthroat trout. Existing facilities shall be used where possible.

24 NEW SECTION. Sec. 4. By December 31, 1992, the department of
25 fisheries shall determine the cost of marking all hatchery fish at all
26 department of fisheries operated hatchery facilities.

1 Sec. 5. RCW 75.30.120 and 1983 1st ex.s. c 46 s 146 are each
2 amended to read as follows:

3 (1) A commercial salmon fishing license issued under RCW 75.28.110
4 or salmon delivery permit issued under RCW 75.28.113 may be issued only
5 to a vessel:

6 (a) Which held a state commercial salmon fishing license or salmon
7 delivery permit during the previous year or had transferred to the
8 vessel such a license, and has not subsequently transferred the license
9 or permit to another vessel; and

10 (b) From which food fish were caught and landed in this state or
11 in another state during the previous year as documented by a valid fish
12 receiving document.

13 Where the failure to obtain the license or permit during the
14 previous year was the result of a license or permit suspension, the
15 vessel may qualify for a license or permit by establishing that the
16 vessel held such a license or permit during the last year in which the
17 license or permit was not suspended.

18 (2) The director may waive the landing requirement of subsection
19 (1)(b) of this section if:

20 (a) The vessel to which an otherwise valid license is transferred
21 has not had the opportunity to have caught and landed salmon; and

22 (b) The intent of the commercial salmon vessel limitation program
23 established under this section is not violated.

24 (3) The director shall exercise his or her authority under
25 subsection (2) of this section to accomplish the goals of the Northwest
26 power planning council's phase two amendment to its fish and wildlife
27 program, dated December 11, 1991, concerning a temporary commercial
28 salmon fishing license leasing program. The director may adopt rules
29 to accomplish the goals of the leasing program.

- 1 (4) Commercial salmon fishing licenses and salmon delivery permits
- 2 are transferable.

Draft

**The Scope, Importance and Economic Value of the Fishery
Enhancement Program to the Recreational Fishery in
Alaska**

Edited by
Jeff Hartman

Alaska Department of Fish and Game
Division of Fisheries Rehabilitation,
Enhancement and Development

Carl L. Rosier
Commissioner

J. P. Koenings, Ph.D.
Director

P.O. Box 25526
Juneau, Alaska 99802-5526

February, 1992

This page left intentionally blank.

The Scope, Importance and Economic Value of the Fishery Enhancement Program to the Recreational Fishery in Alaska

Introduction.

The importance of enhancement program to the recreational fishery.

Many projects in the statewide enhancement program produce fish that are highly valued by sports fishermen, primarily chinook, coho, pink, sockeye, and chum salmon, steelhead, rainbow trout, grayling, and arctic char. Fish targeted for sport fisheries are released in over 350 locations around the state. Many of the projects in the state operated portion of the program (FRED Division) are entirely dedicated to improving recreational fishing opportunities.

This chapter summarizes the size and distribution of enhanced harvests, type of economic effects that result from the harvests, other non-market values associated with tourism, and to the extent possible, magnitude of these effects on Alaska's economy. Additionally, a discussion of some of the issues and conflicts relevant to the enhancement of recreational fisheries are presented.

Sport fishing has been growing in Alaska since Statehood. This is evidenced by the increase in the growth in the number of licensed anglers fishing in Alaska from 1977 (200,000 total license sales) to 1990 (425,000 total license sales) (Mills 1991).

The explosive growth in sport fishing participation in Alaska can be attributed to many factors, including changes in Alaskan population, real per capita income of resident and non-resident visitors, and the opportunity to have a good quality fishing experience. A major component of a high quality fishing experience, particularly for resident anglers is the probability of catching a fish during an angling experience (called the harvest per angler day) (Jones and Stokes 1991). The economic value of fishing experiences are directly related to higher harvests per angler day. The statewide enhancement program has been a key factor in maintaining and augmenting these catches in the presence of increasing fishing effort.

Magnitude of recreational fishing from the Enhancement Program.

The statewide salmon enhancement program has grown in recent years to the point of supporting a significant portion of the total Alaska fin fish harvest. Total finfish harvests in 1990 in the Alaska Recreational fishery were 1,995,360 (Mills 1991)¹. Total finfish harvest of trout, salmon, grayling, and arctic char and steelhead was 1,341,741. The enhancement program contributed over 28 percent of the harvest of salmon, trout, grayling, arctic char, and steelhead (Table 1)(Fig. 1)(McKean 1991 and Mills 1991).

The state operated enhancement program produced 270,983 salmon, trout, grayling, char and steelhead in 1990, while PNP operators contributed 98,910 salmon to the recreational harvests for a Total of 369,893 fish (Table 1) (Fig. 2). The total recreational harvest from enhancement in 1991 is estimated to be 357,370 (Holland and McKean 1992).

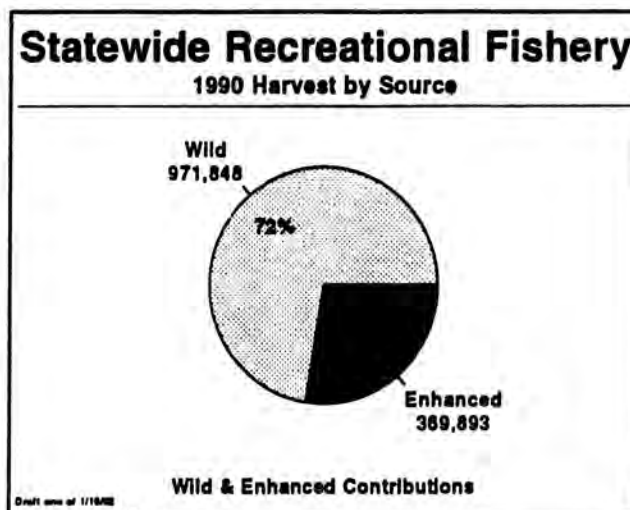


Figure 1

Table 1. Number and Percent of Enhanced Salmon, Trout, and other enhanced species harvested in 1990 in comparison with total harvest in the recreational fishery.

Species	king	searun cobo	sockeye	pink	chum	landlocked cobo/chin	rainbow	other	total
FRED harvest	16,100	33,447	3,550	3,900	0	37,831	170,283	5,872	270,983
PNP harvest	1,517	34,754	0	54,867	7,772	0	0	0	98,910
Enhance total	17,617	68,201	3,550	58,767	7,772	37,831	170,283	5,872	369,893
Wild totals	106,291	257,735	235,568	146,835	6,753	0	21,526	197,140	971,848
Grand Total	123,908	325,936	239,118	205,602	14,525	37,831	191,809	203,012	1,341,741
% harvest enhanc	14.22%	20.92%	1.48%	28.58%	53.51%	100.00%	88.78%	2.89%	27.57%

¹ Over 1 million razor clams were also harvested in 1990 in non-finish fisheries.

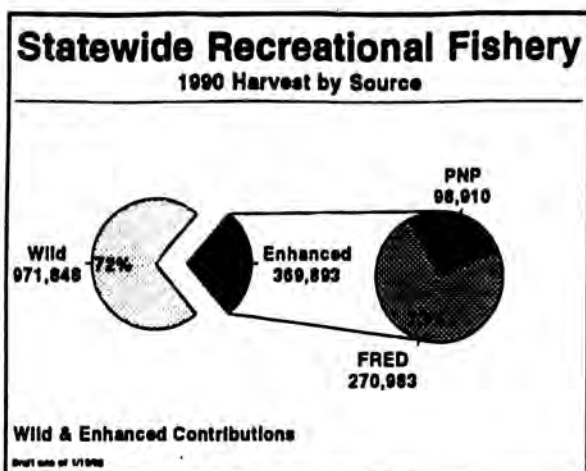


Figure 2

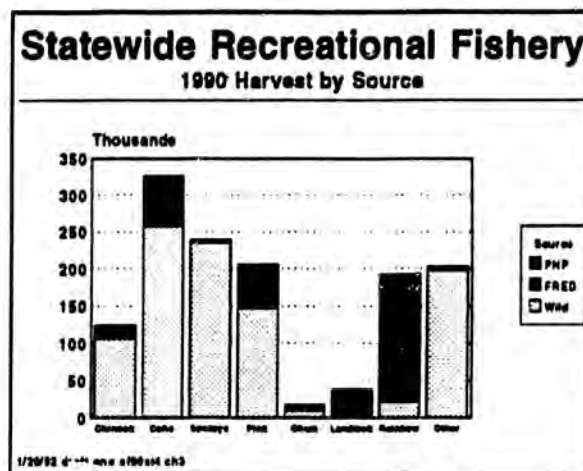


Figure 3

List of selected enhancement projects that have dramatically increased recreational catches.

- o Eighty nine percent of the 192,000 rainbow trout harvested by sport fishermen in Alaska in 1990 originated from state operated hatcheries (Fig. 3)(McKean 1991, and Mills 1991)².
- o Of 37,831 coho and chinook landlocked sport harvests, 100% were produced by state hatcheries in 1990 (McKean 1991, and Mills 1991).
- o Between 1987 and 1990, 47% of the coho salmon harvested in the popular Resurrection Bay sport fishery originated from enhancement projects at Elmendorf Hatchery, Trail Lakes Hatchery, and Bear Lake rearing Facility. The average sport harvest of enhanced fish was 9,910 (McKean 1991).
- o Harvests of coho salmon from enhancement projects in the Juneau area increased by 21 fold (2,166%) between 1990 and 1991 from 1,174 to 21,664 fish (McKean 1991). Most of the increased harvests in 1991 were estimated to originate from Gastineau Hatchery operated by Douglas Island Pink and Chum (Holland and McKean 1992).
- o In 1991 the Homer Spit recreational fishery produced 10,000 coho salmon, 3,500 chinook salmon, and 500 pink salmon entirely from enhancement releases from Crooked Creek Hatchery.

² While enhanced harvest statistics are available for recreational fisheries in 1991, statewide harvest statistics for wild and enhanced fish are produced on a one year lag, so 1990 is the most recent year that total and enhanced harvests may be contrasted.

- o Southeast chinook salmon production in 1991 totaled almost 38 thousand adult fish returning with another 5 thousand pan-sized fish harvested in stocked lake fisheries. Over six thousand adults and 5 thousand sub-adults were harvested in marine and freshwater sport fisheries.
- o The Elmendorf and Crooked Creek Hatchery increased the harvests of king salmon by 4,800 and coho salmon by 1,655 in the 1990 Kasilof River Recreational Fishery.

Contribution of enhancement program to community fishing derbies.

Dozens of fishing derbies are conducted each year in Alaska. Fishing interest groups and vendors, and municipalities are the major organizers of these events. Approximately one dozen of these derbies produce large harvests of fish into the recreational fishery (Table 2). The major reason that communities hold derbies is to increase the amount of economic activity in an area or to collect revenue for charity.

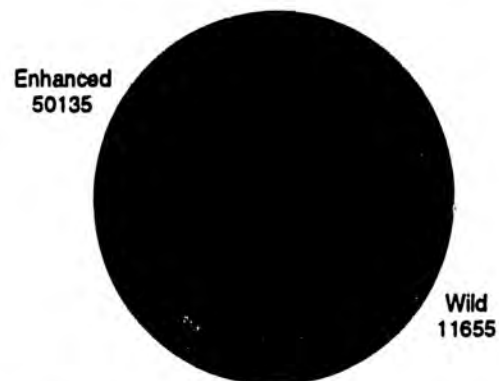
Retail businesses in some communities depend upon the angler related spending that occurs during a derby to sustain a large portion of their annual gross receipts. The ability of a derby to attract the angling public depends largely on the ability of the fishery to supply a good fishing experience with acceptable catch levels.³ The enhancement program augments catch opportunities and in some cases is the primary source of fish harvested during the derby. In Alaska some derbies would not be able to exist without fishery enhancement (i.e. Valdez coho derby pers. comm. Paul McCollum) others would not attract nearly as many participants without the acceptable catch rates offered by fishery enhancement. Approximately 82% of the salmon harvested in Alaska's major fishing derbies have originated from the statewide enhancement program (Fig. 4).

List of major fishing derbies in Alaska, augmented by enhancement

1. Juneau sport fish Derby
2. Ketchikan sport fish Derby
3. Wrangell/Petersburg
4. Sitka Derby
5. Seward Coho derby.
6. Valdez Derby
7. Big Lake Derby
8. Seldovia
9. Community of Houston
10. Assorted Kodiak derbies

³ Weather conditions, income, and substitute recreational activities, and the opportunity to compete for prizes, are also known to affect participation in fishing derbies.

Statewide Recreational Fishery Fishing Derby Harvest



Wild & Enhanced Contributions

Figure 4

Table 2. Fishing Derby Harvests, including numbers of enhanced fish by species, percent of enhanced fish by species for 1991 and other selected years.

Derby Name	Species	Location	Enhanced Harvest	Wild Harvest	% Enhanced
Golden North(1991) ^a	Chinook	Juneau	136	522	26.0%
	Coho	Juneau	173	2,567	15.8%
Petersburg(1991) ^a	Chinook	Petersburg	228	422	35.1%
Wrangell(1991) ^a	Chinook	Wrangell	48	173	21.7%
Sitka(1991) ^a	Chinook	Sitka	270	980	21.6%
Seward(1989) ^c	Coho	Seward	9,280	5,581	62.4%
Valdez(1991) ^d	Coho	Valdez	10,000	500	95.2%
Valdez(1991) ^d	Pink	Valdez	30,000	500	98.4%
Total			50,135	11,655	81.7%

^a Memo from Paul Suchanek to Fred Gaffney 12/05/91

^b Karen Crandall, Pers Comm. 1-15-91

^c Doug Vincent-Lang Sport Fish Division Anchorage, pers comm. 1-91

^d Paul McCollum, Valdez Fisheries Development Corporation, pers comm 1-91

Valuation and economic impacts of the recreational fishing that result from the statewide enhancement.

How are recreational benefits measured, and how does it differ from an expenditure and an economic impact?

The salmon, steelhead, trout, grayling, and Dolly Varden resource in Alaska provides at least two distinct forms of recreation. It provides an extensive saltwater and freshwater sport fishery, as well as non-consumptive recreation such as watching a run of salmon migrate and spawn. The same basic economic principles apply to determining the value of both forms of recreation in terms of how benefits are generated. However, the data bases differ for each kind of recreation and the methodologies developed for the sport fish evaluations will not be suitable for evaluating the non-consumptive forms of recreation.

Consumptive values from harvests and catches of fish could be likened to property values, in that they vary from location to location. Also, they vary in quality, just as a piece of property with a beautiful view or superior amenities may have a higher market value than an equal sized piece of property with a view of a city dump, and poor amenities.

In the context of a salmon or trout fishery, enhancement changes these consumptive values by increasing the abundance of fish available to anglers. This results in a larger catch which increases the harvest expectations of both current and prospective anglers. This will either cause a greater number of fishermen to go fishing, the current number of fishermen to spend more time fishing, or cause fishermen to receive a higher valued experience for the current amount of fishing effort. Since these angler decisions can occur simultaneously, economic models that estimate the value of these experiences may be quite complex. This chapter includes a short discussion of the methods used for valuing sport fishing benefits from enhancement projects and some analytical results of economic studies on enhancement.

When anglers expend more effort catching fish from an enhancement project they may spend a greater portion of their income in harvesting. For policy makers and fishing interest groups, expenditure data reported by anglers is frequently mistaken for the "value" of recreational fishing. The net economic value of a recreational fishing experience is what fisher's are willing to pay over and above their costs. These expenditures, however, are a "cost" to the consumer and must be subtracted from the total consumer surplus. While these expenditures are an unambiguous cost, they do produce economic activity in communities. This economic activity is referred to as "indirect effects" ⁴ in economics, and is further discussed in the impact section of this chapter.

Consumptive Values and economists use of the term "value".

Given the virtual free and open access to fisheries that are augmented by enhanced fish, the largest part of the incremental recreational benefits generated by FRED Division and the PNP program will accrue directly to recreationists in the form of consumer surplus. **Consumer surplus is a measure of the satisfaction people enjoy from their consumption of a commodity.** It is defined by what they would be willing to pay for it.

If charges could be levied for the rights to harvest enhanced fish, each individual would be willing to pay some maximum fee for the opportunity to participate in any particular type of fishing or other recreational opportunity. Further, the angler would choose to buy a certain number of units of that recreation at each unit price below that maximum. Of course recreationists do not buy angler days or days of salmon viewing as they do other commodities. None-the-less, this price quantity relationship does exist for each individual and forms his or her demand curve for fishing, viewing etc. The sum of all the individual demand curves forms the aggregate demand curve over all those willing to pay to participate in the recreation (Fig. 5).

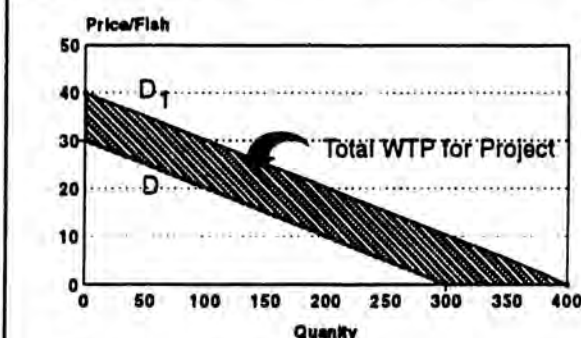
⁴ Also, they are referred to as secondary effects, secondary impacts, and regional economic impacts.

In Fig. 5, the line D represents the aggregate demand curve for some particular recreational activity associated with the salmon, trout or other resource. The area under the curve is the total willingness to pay of all recreationists. It is a measure of the total satisfaction gained from consumption of the recreation if it is offered at no charge. This demand curve is influenced by many factors such as the price of complementary goods, by incomes and by the expectations and perceptions of those who participate. The availability of more fish as a result of the enhancement program causes the quality of the product to change, thus, shifting the demand for salmon and steelhead recreation from D to D1. The expectations of fishermen are raised over the prospect of improved catch success and this, in turn, improves what they are willing to pay for the experience. This increase in willingness to pay results in the consumption of more fish at each price. The shaded area between D and D1 is the increase in consumer surplus that results from an enhancement project.

The total willingness to pay differs from the net willingness to pay in that net WTP considers the additional cost of catching fish. In (Fig. 6), the net willingness to pay for a recreational experience is demonstrated by the difference between the total willingness to pay and the cost of fishing at a given price per fish. The consumer surplus is the shaded area above the price line and below the demand curve. This graph represents the net willingness to pay for a project that creates a new fishery, and does not represent an increment in catch for an existing fishery.

In addition to generating consumer surplus by increasing the abundance of fish in existing fisheries, the statewide enhancement program can generate consumer surplus by opening new sport fisheries. Enhancement projects which rehabilitate a diminished stock have been credited with re-opening sport fishing areas, and with expanding bag limits in a recreational fishery. The reopening of a sport

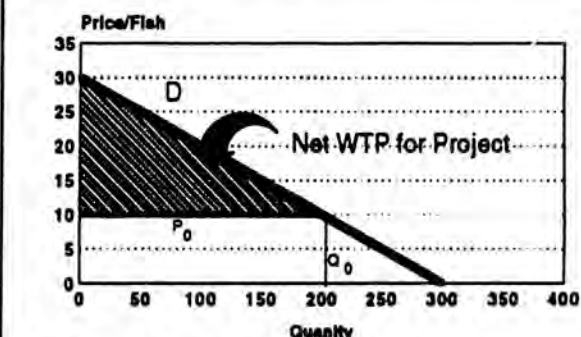
Total Willingness To Pay (WTP) For An Enhancement Project



Draft of 1/22/92 SF901n1.ch3

Figure 5

Net Willingness To Pay (WTP) For An Enhancement Project



Draft of 1/22/92 SF901n2.ch3

Figure 6

fishing statistical area, or relaxing of bag limits will often produce greater consumer surplus values than simply increasing catch rates during an existing opening.

Finally, there may be non-consumptive and nonuse values associated with the fishery. These values include existence, option or bequest values. People may gain satisfaction from the fishery not because they make use of it, but for other reasons. Viewing and education associated with fishery enhancement projects motivate tens of thousands of visits to state and PNP facilities each year. A discussion of some of the tourist visitation statistics are included in this chapter. Persons who never fish may still place a value on the continued existence of the fishery. Fishery rehabilitation projects have been applied to several streams with salmon populations that would be otherwise too small to sustain themselves in the future. Although nonuse values associated with fisheries in Alaska may be significant, they are not treated here.

Valuation Statistics on Enhancement of Recreational Fisheries

The State of Alaska is fortunate to have some of the finest economic models in the North America for valuation of recreational fishing. Three studies by the consulting firm of Jones and Stokes, have been carried out since 1986 (Jones and Stokes 1987, 1989, and 1991). The work, which clearly represent the state of the art in recreational demand modeling cover the regions of South Central Alaska, Juneau, and Southeast Alaska. Areas not covered by the analysis include the Arctic, Yukon, Kuskokwim regions, Alaska Peninsula, Kodiak, and Bristol Bay. The State of Alaska has expended over \$600,000 in the development of the current models. The two valuation techniques applied in these studies are (1) a modified travel cost model approach and (2) contingent valuation procedures. While the methods for these two techniques cannot be described in detail here, some of the major findings of the studies, as well as difficulties with the models are summarized.

While enough cannot be said about the analytical quality of the three Jones and Stokes studies, several obstacles exist in actually applying some of the models to policy questions related to the Statewide fishery Enhancement Program.

1. The report for the South Central studies, and Juneau area studies do not include an analysis of current enhancement projects. Some net willingness to pay values are cited in the reports that are unfortunately, not relevant to evaluation of enhancement projects. The economic models created for the studies must actually be operated on a computer program to precisely estimate sport fishing values for policy analysis (unless a relevant policy analysis simulation was carried out under the contract). In fact, the estimates of average value for a day of fishing effort will be overestimates of the marginal value of an enhanced fish by a few percent to more than an order of magnitude. This is demonstrated in the Southeast economic study where average angler willingness to pay per king salmon harvested of \$616 was nearly three times the marginal angler willingness to pay

per fish of \$210 from a king salmon enhancement project (Jones and Stokes 1991). Thus, use of the average willingness to pay figures from the reports, could produce grossly distorted and spurious results when applied to policy questions requiring marginal or incremental values.

2. The South Central Economic Study (Jones and Stokes 1987) is extremely complex, and the models created in this study required initial calibration on a Cray super computer, during their formulation. The cost of carrying out simulations on the mainframe computer is prohibitive for day to day policy analysis. Furthermore, only the staff at Jones and Stokes and a few other economists in the U.S. are capable of operating the South Central Region discrete choice models.

3. Even if the computer simulation models were operated in their current state, many of the site/species statistical areas, that are sampled in the studies are not the sites in which enhanced fish are produced. Enhanced sites must be matched with similar site/species combinations in the surveys to approximate the value of a project. This would require some ADF&G Sport Fish Division staff time to carry out the site/species matches.

4. Applied cost benefit analysis with the Jones and Stokes models require the projection of some fairly detailed catch and effort information from the Department of Fish and Game. The logit Travel Cost models and Contingent Valuation models require detailed information on probable harvests and fishing effort (angler days) for each proposed project. This information must be projected by specific statistical area and by week of harvest.

5. The Jones and Stokes models produce valuation estimates for years between 1986 and 1988. To run simulations on present day policy questions requires some updating of the models. These updates would require some ADF&G staff time and some contractual resources for economic analysis.

For the proceeding reasons (1-5), a comprehensive study of the net benefits of the statewide fishery enhancement program to the recreational fishery has not been carried out. Such a study would be of critical importance for investment and allocation purposes and would complement the economic modeling that the Legislature is now undertaking on the value of enhancement to the commercial fishery. The costs of creating the necessary software to evaluate all projects in South Central region, would require approximately \$20,000. Additional running of simulations would require approximately 1 full year of work in a cooperative effort with FRED Division and the Division of Sport Fish. The simulation of the net benefits for projects in Southeast Alaska could be undertaken with fewer resources, since the computer software was produced as part of the contract. Both the South Central and Southeast Region fishery enhancement could be evaluated with an additional \$30,000 in contractual services, and with the better part of

a year of staff time from the FRED Division economist and 1/3 year of staff time from the Biometrics section of the Division of Sport Fish.

Selected statistics for the enhancement produced Southeast Alaska king salmon fishery.

The Southeast Alaska Sport Fishing Economic Study (Jones and Stokes, 1991) does produce some analytical results that are applicable to estimating the value of proposed king salmon enhancement actions.

- They are:
- (1) An estimate of the net willingness to pay estimates for a proposed increase in hatchery operations for king salmon enhancement of 20%, and
 - (2) A policy analysis question involving the estimation of an increasing in the opening for the Juneau Statistical Area for Chinook salmon fishing.

In brief, the first analysis applies direct survey questions about what amount anglers would be willing to pay for a fishing stamp to charge for improved chinook salmon fishing from the hatcheries in Southeast Alaska. The survey relates these proposed access fees to a 20 increase in production costs from the enhancement facilities. This in turn, was estimated to yield approximately a 30% increase in the average sport harvest of Chinook salmon in Southeast Alaska. While the production costs are not exact estimates, a special simulation of the models revealed that the increase of 8,900 harvests would result in an annual net willingness to pay of approximately 1.9 million dollars annually (1988 dollars) (Table 3). The average value for a chinook salmon in this scenario is approximately \$210 per harvested adult.

Table (3) Total Annual Willingness to Pay of Resident Angler Households in Southeast Alaska for a 20% increase in the King Salmon Harvest from Hatcheries

Harvest Area	Hatchery Operations
Ketchikan	\$380,688
Prince of Wales	340,958
Kake/Petersburg/Wrangell/Stikine	352,287
Sitka	362,983
Juneau-Haines/Skagway	<u>439,104</u>
Total	\$1,876,020

The second economic statistic results from a proposed opening of the Juneau statistical area for King salmon fishing during the months of April, May, and June. This policy question focuses on a recent decision to open a portion of the Juneau Statistical area to early season king salmon fishing (from April 24 to June 18). During a previous opening of this statistical area over 1,130 king salmon were harvested, and a large increase in the number of days of effort were recorded. Angler net willingness to pay for this alteration was estimated using the travel cost, and contingent valuation methodologies. The change in the willingness to pay for the increased catch for this management action was between \$303,500 (from the results of the logit model) and \$398,000 (from results of the CV model) annually and from \$268 to \$352 per harvested fish respectively.

This simulation is similar to the approach that would be applied to computing the value of a Chinook enhancement project that increased the abundance of fish sufficiently to extend the length of the opening in a prime fishing area. For several reasons, the net willingness to pay for an identical increment in chinook harvests from a typical enhanced chinook fishery may be less than the WTP amounts cited in this example⁵, but they are probably within a similar magnitude.

While these valuation results must be offered with a note of caution, they probably provide an upper bracket for the marginal value of a Chinook salmon, produced by enhancement, and caught by recreational fishers in Southeast Alaska. The lack of updated computer software, designed to apply the Jones and Stokes models, is the major restraint to a comprehensive economic assessment of recreational net benefits for the statewide enhancement program.

Visitation Statistics for Hatcheries.

In aggregate, State and PNP hatcheries generate **nearly one half million visitor days from resident and non residents per year**. Visitation statistics have been compiled for the following hatcheries.

Table (4) Public and PNP facilities with visitor facilities and visitation records.

	Visits
Deer Mountain	150,000
Elmendorf	65,000
Ft. Richardson	1,200

⁵a. Most enhancement projects increase the catch per unit of effort in an established fishery opening, but do not result in outright extensions of area/time openings.

b. Harvests in this example consist of both enhanced and non-enhanced salmon. The Jones and Stokes models have demonstrated a small WTP premium for wild fish in the Southeast marine chinook salmon fishery.

Gastineau Hatchery (DIPAC)	100,000
Trail Lakes Hatchery (CIAA)	25,000 (20,000 to 30,000)
Bear Lake Rearing Facility (CIAA)	12,500 (10,000 to 15,000)
Crooked Creek Hatchery	80,000
Valdez Hatchery (VFDA)	8,541
Total	442,241

The tourism generated by hatchery visitation is one example of a non-consumptive value that is created by the statewide enhancement program. Non-consumptive recreational benefits generated by the enhancement program are in many ways more difficult to estimate than the benefits of sport fishing itself. Baseline information on the demand for such forms of recreation is scarce, but visitation itself is an indicator that people derive consumer surplus from these experiences. The value of a visit to a salmon enhancement facility can be compared with the value of visits to attractions such as Aquaria or a private zoo. The willingness to pay for entrance to the facility is a proxy for the minimum consumer surplus derived.

The visits vary in quality and time from facility to facility. Some facilities have extensive visitor amenities and visitation may consist of an hour or more in length. Other facilities have minimal visitor amenities and visitation may consist of a few minutes of viewing of migrating and rearing of salmon. The states largest and most extensive hatchery visitor center is at Gastineau Hatchery, in Juneau. In 1991 the facility charged \$2.25/visit (walk in fee) and recorded nearly 100,000 visits.

While a total value cannot be computed from the existing visitor information available from these facilities, total visitation suggests that benefits to Alaska are on the order of hundreds of thousands of dollars annually.

Indirect economic effects of the statewide enhancement program (employment and income effects from tourism and resident expenditures)

As previously explained, an enhancement project that increases non-market benefits of a fishery will often compel anglers to spend additional fishing effort and make additional expenditures to compete for improved fishing. Thus, fishery enhancement can compel anglers to pay more for boats, moorage, lodging, transportation, food and beverages, guiding, and other fishing related items. It is these out of pocket expenditures that lead to "economic impacts" and result in increased employment and income in the Alaska economy. Businesses that provide goods and services to anglers hire and pay employees and buy inventory from other businesses, which in turn hire and pay employees and buy from still other businesses. Multiplier effects turn these expenditures into gross business revenues in Alaska. The magnitude of these revenues can be projected with economic impact models.

Two economic impact models exist in Alaska that are suitable for computing changes in changes in expenditures and employment resulting from fishery enhancement of recreation. One is an input-output model developed for Jones and Stokes 1987, 1989, and 1991). The second is a model called SALMOD, developed by the Institute of Social and Economic Research. In the Jones and Stokes, I-O models angling expenditures are computed for anticipated change in fishing effort (angler days), and in turn, the direct, indirect, and induced economic impact for a fishery may be estimated. A major advantage of this model is that short run expenditures for a given project are empirically estimated in the behavioral models. Thus, the expenditure estimates conform more closely to the amount of additional spending resulting from a management, or enhancement action. Many impact models must use average expenditure data which can produce greatly overstated estimates of marginal expenditures.

As in the case of the Jones and Stokes non-market models, economic impacts for the statewide enhancement program could not be estimated without the creation of practical computer software, and additional fishery effort projections for enhanced sites (for South Central Alaska). Impact assessments would be possible for enhancement projects in Southeast Alaska with the soon to be completed computer software, and with additional ADF&G staff projections on fishing effort estimates for all enhancement projects. An example of an employment and personal income estimate is provided in Jones and Stokes (1991) for an expansion of recreational fishing opportunities for chinook salmon fishing in the Juneau area. An additional catch of 1,130 harvested adults is estimated to produce approximately \$13,000 in personal income and less than 1 full time job (Jones and Stokes 1991).

Results of Economic impact Assessment of Statewide Enhancement program with ISER Model.

Estimates of employment in the Alaska economy can also be made with SALMOD, an economic impact model created by the Institute of Social and Economic Research (ISER). This model was created specifically for the evaluation of the state wide enhancement program. Several revisions of the economic base model have been completed between 1986 and 1990. The model produces estimates of the expenditures of recreational fishing created by the enhancement program. Employment is expressed in full and part time jobs. The documentation for this model is in progress through a contract with Scott Goldsmith of ISER (pers comm Jeff Hartman FRED Division 1991).

The preliminary results of the FRED recreational impacts, from SALMOD, project personal income to Alaska residents of \$2.0 million to \$7.0 million annually, with a point estimate of \$4.3 million⁶. The full time employment that would result from this

⁶ Income and employment impacts vary greatly depending on what assumptions are used in this model for the expenditures that would occur in the absence of the recreational fishing

increased personal income is approximately 150 jobs. The PNP hatchery personal income impacts from recreational fishing are estimated to be approximately \$400,000. These impacts result from the eggs taken in broodyear 1988, that were projected to return between the years 1990 and 1997 (Hartman, 1988) Memo of July, 20, 1988, to Distribution. These employment and income impacts occur primarily in the Cook Inlet region, Southeast, and Kodiak regions (Table 5) (Fig. 7).

Table 5 Personal Income and Employment Impacts from 1988 simulation of SALMOD impact model for FRED Division enhancement projects by region of impact.

	Total Statewide Impacts	South east	Prince Willia Sound	Cook Inlet Mat/Su	Kodiak AK. Pen.	Interior
Personal Income (\$ 1,000'S)	\$4,309	\$731	\$59	\$2,786	\$37	\$696
Employment	148	25	2	96	1	24

Issues and Conflicts relating to Enhancement of Salmon, Trout, and other species.

1. Allocation between competing users.

Intense competition between users exists for most of the salmon fishery in Alaska as is the case in most of the salmon fisheries in North America. This competition is observed by the Alaska Board of Fisheries, and ADF&G fisheries managers who are under constant pressure to deliver more fish to each of the various interest groups in the state. Within the commercial fishery, sport fishery, personal use and subsistence fisheries of Alaska, there are a multitude of insistent claims to enhanced fish, all asserting equal validity but in total, exceeding the available supply.

Statewide Recreational Fishery

Full Time Jobs From Enhanced Sport Fish

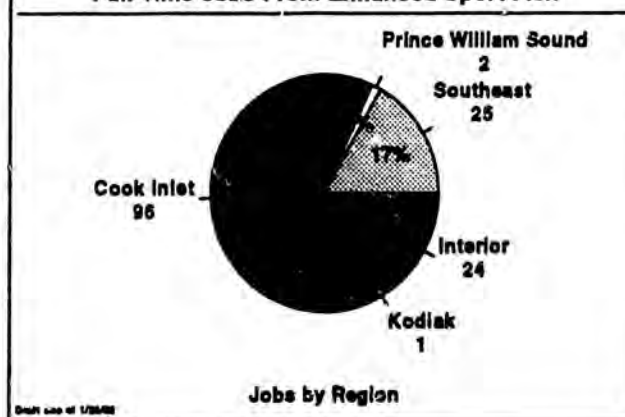


Figure 7

opportunity. Net expenditures in this simulation are equal to 1/2 of the average expenditures for an angler day, as approximated from Jones and Stokes (1987) and Mike Mills pers comm 1988.

The source of the conflict and divisiveness over allocation of enhanced fish is often misunderstood. The primary reason for the competition for these resources lies in the large economic value of the salmon resource that has been created in Alaska. If the resource created by enhancement were of little economic value, fishers would not spend so much of their time trying to seek out larger shares of the available harvest.

Since enhanced fish are often harvested along with wild stocks, allocation conflicts involving recreational fish are complex and intertwined. In Southeast Alaska, the allocation conflicts are additionally complicated by U.S./Canada treaty constraints. This treaty sets strict limits on harvests of non-enhanced chinook salmon in the region. Reduced quota's for chinook salmon, along with increased harvests in the recreational fishery, have generated a recent Board of Fish decision to hold special hearings that consider a range of restraints on the sport harvest of chinook salmon.

Examples of the types of fishing restraints that managers have applied in recreational fisheries include, bag limits, reduced area/time closures, gear restraints, increased user fees, and limited access for charter fishing operations. Most of these techniques reduce fishing effort, and may also reduce the quality of a recreational fishing experience, which in turn can actually decrease the economic value of fishing. The economic costs of some types of restraints to the recreational fishery can be greater than the economic costs of producing additional chinook salmon to targeted commercial or recreational fisheries through enhancement. While there is no substitute for careful management of salmon stocks, the fishery enhancement program may be a tool to help reduce conflict in these types of allocation disputes.

2. Funding of enhancement for recreational fisheries.

While anglers in Alaska have clearly become dependent on the statewide fishery enhancement program for sustaining a valuable fishing experience, the prognosis for sustained financing of fishery enhancement in the state is much less certain.

The existing funding for statewide fishery enhancement program is highly dependent on the continuation of Federal funding through an excise tax and distribution program called Wallop-Breaux. This amendment in the federal Register, represents somewhat of a windfall for Alaska. Alaska fisher's contribute a trivial amount the tax receipts to the total fund in comparison with other states. The current funding formula provides an amount to the State of Alaska which is not commensurate with population or the number of licensed fishermen in Alaska. Should the funding formula for distributing tax receipts to Alaska change, most of the states enhancement production would be affected.

Additionally, in the FY 93 Governor's Budget, two state owned hatcheries that produce important recreational fisheries, are not funded. They are Deer Mountain Hatchery in Ketchikan, and Big Lake Hatchery in Wasilla. Deer Mountain Hatchery produces several hundred chinook salmon harvests in the recreational fishery, and over 1,000 chinook harvests annually in the commercial fishery. It also produces a significant harvest of coho salmon in the recreational fishery. Big

Lake Hatchery plants coho salmon into lakes and streams in the Sustina drainage that are harvested in the sport fishery. While the economic value of the permanent loss of the production from these hatcheries has not been computed, it would be possible to produce an estimate by creating a simulation from the newly completed Southeast Economic Study.

3. Management Implications and Issues related to Enhancement of Recreational Fisheries

It is a statutory obligation of ADF&G to manage fisheries populations in order to maintain a "sustained yield" in the common property fisheries.⁷ Other references to wild stock protection and maintenance of healthy wild stocks are also important parts of the title 16 statutes. There is, however, no specific formula in the statutes for determining the exact population size for a stock of wild fish that is "sustainable". Fisheries managers determine escapement goals for stocks and populations of fish and corresponding catch levels that can be sustained, with a variety of techniques. These sustainable catch levels may vary from year to year based on the expectation of run strength prior to and during the fishing season. Often, there is a great deal of uncertainty over the escapement level that must be maintained to sustain a healthy population of salmon.

What a sustainable wild stock is, and what population size it corresponds to, is of importance for the State and PNP enhancement program. Enhancement projects targeted to commercial, recreational, or subsistence fisheries may increase or decrease populations of wild fish.

In so called "mixed stock" fisheries, an enhancement project may increase the probability of harvesting wild stocks. The probability of wild stock interception increases where information on the temporal and spacial mixing of the enhanced and wild population of salmonids is poor. This potential is generally thought to be of greater concern in commercial salmon fisheries where a great deal of intense fishing power may occur during an opening. Most recreational fisheries, in Alaska represent a small portion of the total salmon harvest, and as such do not contribute as acutely to unwanted interceptions. Possible exceptions to this general rule in anadromous fisheries include (1) Kenai River chinook salmon, where a conservative approach to enhancement has been applied, and (2) Southeast region recreational chinook fisheries where the resident and charter fishing fleet is catching an increasing portion of the allowable chinook harvest. There is no empirical evidence that larger catches of enhanced fish in the recreational fisheries would reduce escapements of wild stocks even in these fisheries.

Enhancement projects may also decrease the probability of over-harvesting wild stocks by drawing fishing pressure to an opening which is composed entirely of enhanced fish. Some evidence exists that demonstrates the ability of an enhancement project to reduce pressure on wild stocks in fresh and salt water fisheries.

⁷ Maintenance of a sustained yield for fish and wildlife resources also has a basis in the Alaska Constitution.

An example of this approach has occurred on the Kenai River, where fishery managers have occasionally restrained sport fisheries in an effort to control excess fishing pressure on chinook salmon. These actions have been taken to reduce the probability of over-harvesting a unique stock of large chinook salmon, that are highly valued by anglers (Jones and Stokes 1987). This stock of salmon, however, is also subjected to fishing pressure in commercial fisheries, which incidentally harvest the large fish while seeking sockeye salmon in Cook Inlet. In 1991, an adjacent chinook salmon enhancement project, in the Kasilof River provided an alternative fishing opportunity that removed fishing pressure from the Kenai (Harrington, 1991, Homer News, July 25, 1991, "Enhancement is favored way to protect sport fisheries"). Catches of enhanced chinook salmon from this project have dramatically increased in recent years (Holland and McKean 1992).

A second example of stock protection through enhancement exists in the urban rainbow trout fishery that is maintained by FRED Division in the Anchorage and Matnauska and Susitna areas. In 1990 89% of the rainbow trout harvests resulted from enhancement projects in road access fisheries. Many of these projects, which produce high catches per angler day, occur in close proximity to wild populations of trout, which are not able to sustain heavy fishing pressure. The opportunity for a higher catch per angler day of effort, undoubtedly draws fishing pressure away from alternative wild fish stocks.