# ALASKA LEGISLATURE COMMITTEE FILES, 1989-1990

6589 SENATE RESOURCES

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# A M E N D M E N T

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Page 2, line 13 after "program;":

Insert "and

WHEREAS, through the Saltonstall-Kennedy grants program, the Alaska marine safety education program has developed a volunteer network of marine safety instructors available throughout Alaska to give safety and survival workshops to commercial fishermen and has become a model for marine safety education programs in other regions of the country; and

WHEREAS the Alaska Vocational Technical Center in Seward has established a vessel crew member training program with the help of Saltonstall-Kennedy grant funds and offers an intensive course in marine safety; and

WHEREAS the cooperative efforts of the Alaska marine safety education program and the Alaska Vocational Technical Center in marine safety training represent a major effort to reduce the number of casualties in the commercial fishing industry;"

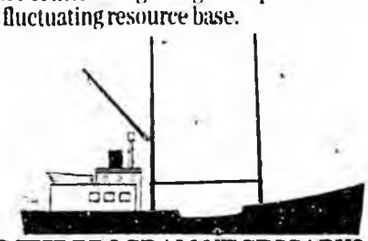
# S-K Review

AN OVERVIEW OF THE U.S. SEAFOOD INDUSTRY 1987

## WHAT IS THE S-K PROGRAM?

The Saltonstall-Kennedy (S-K) program is a grants program, established to fund the development and promotion of the U.S. seafood industry and fisheries products.

The S-K program was initiated to strengthen the U.S. fishing industry in the face of increasing foreign competition and a fluctuating resource base.



### IS THE PROGRAM NECESSARY?

Yes.

The U.S. seafood industry is comprised of a diverse group of individuals and small, independent companies who have neither the resources nor the financial clout to engage in research and development or consumer education programs.

(According to *Seafood Business* magazine, less than 1 percent of U.S. harvesting and processing companies had sales over $50 million in 1984.) The S-K program was designed to serve the seafood industry as a source of funds for industry research and development as well as consumer education.

The S-K program was also developed to help remedy the growing trade imbalance for seafood and fisheries products. In 1985, the U.S. imported nearly *$4.1 billion in edible seafood products, resulting in a trade deficit of $3.1 billion.*

### HOW IS THE PROGRAM FUNDED?

S-K funds are derived from tariffs on imported seafood and seafood products, *not from taxes.* Under the S-K program, 30 percent of all import tariffs on seafood products must be turned over to the U.S. Secretary of Commerce "to provide for the development and promotion of the U.S. fishing industry and fisheries products." *(American Fisheries Promotion Act.)*

These funds are made available through regional and national offices of the National Marine Fisheries Service and awarded on a competitive basis to the Fisheries Development Foundations and industry groups served by the Foundations.

### HOW DOES THE PROGRAM WORK?

The S-K program is set up to be responsive to the industry it serves. S-K program funds are channeled where they will do the most good, according to priorities set up *by* industry *for* industry.

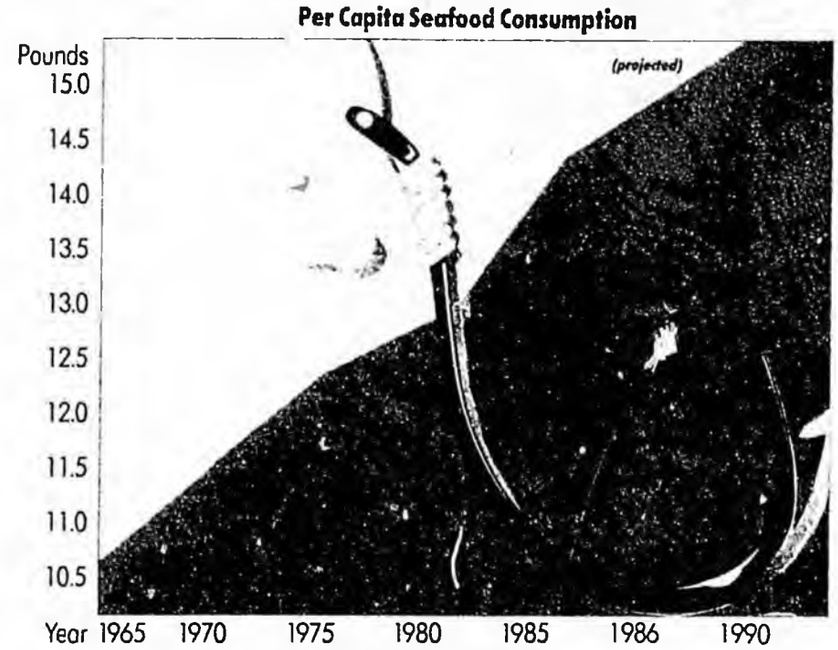
### HAS THE PROGRAM WORKED?

In the six years since the grant program was initiated, the S-K program has benefited both the seafood industry *and* the U.S. consumer in a number of significant ways.

Not only has the S-K program been responsible for improving harvesting technologies, seafood quality and utilization, but the program has helped educate the American public about seafood.

## SEAFOOD CONSUMPTION REACHES ALL-TIME HIGH IN U.S. S-K PROGRAM CITED AS 'CATALYST FOR CHANGE'

**Per Capita Seafood Consumption**




*Source: National Marine Fisheries Service*

Americans are becoming a nation of seafood lovers, and a unique fisheries development program has been given much of the credit for helping fuel a record 6 percent jump in U.S. seafood consumption in just one year.

According to the U.S. Department of Commerce, Americans consumed 14.5 pounds of seafood per person in 1985, up from 13.6 pounds the previous year. Many observers predict that per capita consumption will reach 15 pounds for 1986.

Why the sudden increase in demand?

It's simple, says economist Martha Blaxall, President of BBH Corporation of Washington, D.C.

Blaxall, former Director of the Office of Utilization and Development for the National Marine Fisheries Service in Washington, D.C. (1979 to 1982), believes the recent increase in seafood consumption and overall awareness of the variety of seafood products available in the U.S. can be attributed in part "to an effective, successful, and much-needed fisheries development program: the Saltonstall-Kennedy Fisheries Development Program (S-K).

Under the S-K program, 30 percent of the tariffs on imported fisheries products are turned over to the U.S. Secretary of Commerce for "the development and promotion of the U.S. fishing industry and fisheries products."

According to Blaxall, the S-K Program has, in just six years, made a lasting and positive impact on all aspects of the seafood industry—fishing, on-board handling and storage, product utilization and development, distribution, marketing and consumer education.

*"I think the most important thing to realize is that the S-K program provided the monies for an applied R&D program in the development of the U.S. fishing industry, and that it provided the mechanism by which those funds could be gotten out,"* Blaxall *argues.*

"The second, and more substantive, point is that the promotion end of the program has focused the public's attention on the benefits of eating more seafood—not just more as in quantity, but more as in variety. I'm not at all convinced that we'd see the public's attention focused on the benefits of eating seafood without the S-K program."

Blaxall, whose office was responsible for implementing the S-K program when it was first established, notes that the program accomplished several critical objectives:

- It is in part responsible for increased consumption of, and familiarity with, seafood in the United States, thanks to nationwide initiatives such as the "Catch America" program.
- It focused the industry's attention on seafood quality, and provided research and development funds to improve quality.
- It targeted early on the importance of the developing Alaska pollock fishery by providing the seed money to get people focused on pollock, leading to the implementation of joint ventures and shoreside processing, and—ultimately—the Americanization of the whitefish industry, "the most important fishery resource we have."

# ALASKA POLLOCK RESOURCE, S-K FUNDS CRITICAL FACTOR IN SURIMI EXPLOSION

Surimi-based products, virtually unknown in this country a few short years ago, have—in less than six years—come of age in America.

Americans now consume an estimated 120 million pounds of surimi-based crab, up from zero pounds six years ago. The good news is that U.S. producers are gaining a toehold in an industry once dominated by the Japanese. In the past three years alone, 15 surimi-based seafood analog plants have begun operating in the United States.

Nowhere is the Americanization of the surimi industry more evident than in Alaska, where 10.6 million pounds of surimi have been produced in just two years.

All this spells economic revival for the Western Alaska fishing industry, which faced a downturn when king crab stocks declined several years ago. And the revitalization, according to people like Alaska fisherman Oral Burch, is being felt throughout the state.

"What's happening today is just wonderful," argues the 67-year-old Kodiak fisherman. "If I had five more trawlers I could put them all to work today."

Much of the credit for this growth goes to an ambitious market development project, funded by a Saltonstall-Kennedy grant administered by the Alaska Fisheries Development Foundation (AFDF).

This project, which linked AFDF with Alaska Pacific Seafoods (APS) of Kodiak, accomplished in just a few short years what it might have otherwise taken many years to perfect: a technology for processing Alaska pollock into the refined, shelf-stable protein material known as *surimi*.

So successful was the project that Alaska Pacific Seafoods has added equipment to double the capacity of its plant.

Three shore-based surimi plants and one floating processor are now in operation in Alaska, with a half dozen floating processors expected to be producing surimi in 1987.

Most industry observers agree that this development would never have occurred, or at least not as quickly, without Saltonstall-Kennedy funding. S-K grants benefited the entire industry, which learned from the experience of APS how to produce and market high-quality surimi.

According to Sharon Gwinn, AFDF's acting executive director, "The development of such sophisticated processing technologies was not something processors could have done on their own; the costs were just too prohibitive."

Instead, S-K funds helped APS learn state-of-the-art technologies needed to manufacture high-quality surimi. In exchange, APS agreed to provide the Foundation with nearly one million pounds of surimi, which were then sold at minimal cost to food companies who agreed to develop end uses for the product. APS also maintained an open-door policy so other companies could learn from APS's experience.

**The Developing Alaska Pollock Market, 4-Year Growth Chart**

| | 1982 | 1986 |
|---|---|---|
| POLLOCK CATCH, U.S. VESSELS | 131,000 metric tons | 1,077,000 metric tons |
| POLLOCK PROCESSED BY U.S. FIRMS | 2,352 metric tons | 169,000 metric tons |
| CATCH VALUE EX-VESSEL | $14.5 million | $118.5 million |
| U.S. FACTORY TRAWLER PROCESSORS | 2 | 20 |
| PROCESSED VALUE, EX-PLANT | $830,000 | $59.5 million |
| POLLOCK PRODUCT SALES | ??? | $100 million |
| U.S. SALES OF SURIMI/KAMABOKO | 19 million lbs. | 120 million lbs. |
| U.S. ANALOG MANUFACTURERS | | 14 |

According to APS Plant Manager John Sevier, the arrangement suited everyone. Not only did it provide APS with the tools necessary to continue producing surimi after the grant period ended, but it spurred other companies to act.

"We were able to make mistakes and learn along the way," he points out. "The S-K grant enabled us to make some mistakes without being subject to horrendous costs. We couldn't have afforded the learning curve as an unaided private company."

How has the S-K project affected Alaska?

Like Burch, Sevier believes it has had a "major, major impact, not only on the city [of Kodiak], but on the entire fishing industry." For starters, Sevier says, the growth of Alaska's groundfish industry has, for the first time, provided year-round employment for Alaska's processing workers—who have been dependent upon seasonal employment until now. Sevier says APS expects to employ approximately 200 people during the winter and spring months, where just a few years ago, nobody would be working.

As Gwinn sees it, "We've developed the capacity to produce a raw material that is a food ingredient rather than a finished product. That's an important distinction, because surimi as a food ingredient is so versatile. It can be used profitably in many different kinds of finished products. Now our seafood producers can have access to a wide range of customers in the international food industry.

"This is particularly important for Alaska because traditionally we've been shackled by the limitations of a few market alternatives. The beauty of the S-K program is that it allows us to focus on Alaska's particular situation."

## S-K REVIEW

An overview of the Saltonstall-Kennedy Fisheries Development Program

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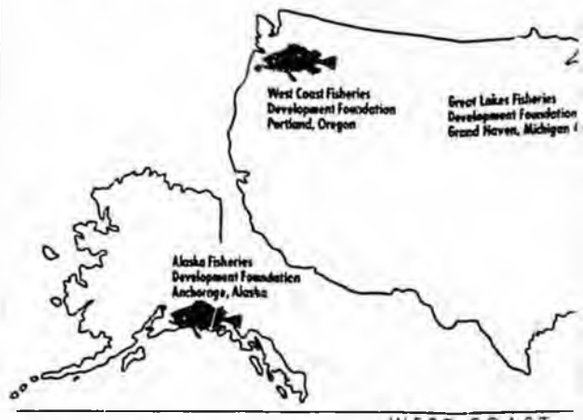
# National and I Update

## NATIONAL AND REGIONAL FISHERY DEVE




WEST COAST

## IT'S UNCANNY! WEST COAS FRESH/FROZEN ALB

The albacore fishery on the West Coast has long played a vital role in the region's heritage and economy.

Since 1982, however, the West Coast offshore albacore troll fleet has suffered economic hard times because of a major influx of imported foreign-caught fish, causing major canneries such as Bumble Bee, Van de Camp, and StarKist to experience disruptions in their normal operations. This, in turn, has left albacore fishermen without an outlet for their product.

In the face of such circumstances, representatives from the albacore fishery worked hand-in-hand with the West Coast Fisheries Development Foundation in a pilot project to develop both alternative market forms and alternative markets for Pacific albacore.

The project, which used Saltonstall-Kennedy Fisheries Development funds, was designed to produce a high-quality fresh/frozen product using techniques very different from those used in fish destined for the cannery.

These procedures included bleeding immediately after bringing the fish on board, heading and gutting it, washing, then vacuum-packing it. Vacuum-packed fish were placed in the hold where they were blast frozen and kept at −22 degrees F. until unloading.

The result: a seafood product that elicited positive comments among buyers. Even more important, the S-K project helped create a market for albacore where none before existed. Three additional boats have become involved in on-board processing and vacuum-packing albacore, and participating fishermen are getting almost double the price for their quality product.

Through the course of the project, S-K funds were used to refine on-board handling techniques and procedures that have been made available to other albacore fishermen interested in producing a high-value species. But project participants also learned valuable information about meeting the demands of the marketplace.

"It was a real learning experience to meet people in the food business who are looking for quality," states the project's marketing coordinator Kathy Vanderpool.

She also points out that albacore must be handled properly on-board the vessel, and held at proper temperatures, or "the quality will turn away all future consumers."

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In the course of the project, Vanderpool also learned that the on-board handling techniques used upon the F.V. "Pursuit" helped insure as high quality a product as fresh, even when thawed months later.

MID-ATLANTIC

## MID-ATLANTIC REGION EMPHASIZES 'HOW TO' OF SEAFOOD COOKERY: OVER ONE MILLION RECIPES GIVEN AWAY

The Mid-Atlantic region is home to more seafood consumers than any other region in the country.

That's why the Mid-Atlantic Fisheries Development Foundation has spent the past six years educating consumers about familiar and unfamiliar seafood species in the heavily-populated states of New York, New Jersey, Delaware, Pennsylvania, Maryland, and Virginia.

Using Saltonstall-Kennedy grant funds, the Foundation has conducted a number of educational events, including:

- Educational seminars for teachers, home economists, extension agents, and retail meat managers.
- Television and radio appearances.
- Seafood demonstrations and cooking classes.
- Recipe give-aways.

Because of the S-K funding, the Foundation was able to leverage its appearances to more than **$20 million worth of free publicity for seafood.**

How have these efforts benefited the industry in the region?

According to Oscar Nelson, General Manager of Kennerly/Booth of Nanticoke, Maryland, producers and distributors of oysters and clams, "The S-K program has *definitely* helped make people aware of seafood, especially our underutilized fish like monkfish, for example."

Nelson points out that the S-K program has helped large seafood distributors such as Booth Fisheries, because it has provided a climate of awareness and interest that makes seafood an easier "sell."

According to Nelson, the S-K program has provided the materials and the awareness needed for the distribution segment of the seafood industry to work with both foodservice and retail buyers.

As a result, "The way fish is handled and presented today is far superior to anything in the past. Fish today is presented in a much more palatable way, and quality is a prime interest."


GULF & SOUTH ATLANTIC

## GULF REGION USES S-K FUNDS TO IMPROVE OYSTER INDUSTRY

Over 70 percent of the oysters consumed in the U.S. are produced in the Gulf and South Atlantic region, with a dockside value of more than $50 million.

One of the most labor-intensive industries in the region, the oyster industry has long been plagued with problems regarding closures of oyster beds because of bacteriological contamination, along with resulting delays in interstate shipment during product testing—a procedure which could cost five or six days' delay and a loss over time of millions of dollars in revenues.

Faced with this recurrent problem, Gulf oyster producers joined forces with the Gulf and South Atlantic Fisheries Development Foundation to develop a more efficient and effective test for shellfish sanitation.

Their research efforts were funded by a Saltonstall-Kennedy grant, research which yielded a vastly improved, more effective assay procedure which drastically cut the amount of time needed for results: from five days to just 24 hours.

According to Mike Voisin of the Louisiana Oyster Dealers and Growers Association, "This situation really typifies the value of our Foundation to the industry. When we've got a problem in a particular area which we don't have the resources to tackle individually, the S-K program provides a unique vehicle for immediate response."

For Mike Voisin and other oyster growers and dealers in the region, the S-K grant provided invaluable benefits:

- It improved the efficiency of shellfish testing, while maintaining the credibility of previous testing methods.
- It expedited the approval of shellfish shipments.
- It reduced by 80 percent losses resulting from shipping delays.

Equally important, the economic benefit from such research was felt in rural areas in the region, where many Gulf oysters are produced.

NEW ENGLAND

## QUALITY BEGINS AT SEA, SAY NEW ENGLAND FISHERMEN: BLEEDING, BOXING YIELD HIGH PROFITS

How has the Saltonstall-Kennedy program contributed to the success of the New England seafood industry?

"It's one of the few programs that works," insists Jerry Knecht, President of the Portland, Maine-based North Atlantic, Inc., the largest fish boxer in the country.

North Atlantic, which harvests, packs and markets such species as haddock, cod, pollock, hake, ocean perch and gray sole, was one of the participants in an innovative quality program offered by the New England Fisheries Development Foundation.

The program involved 28 New England draggers who learned state-of-the-art techniques for bleeding fish, boxing them on board, along with improved fishing methods. Such techniques have long been in use by Icelandic, Norwegian and Danish whitefish producers, helping them produce a high-quality product and thereby to dominate the U.S. market for whitefish fillets—until now.


The New England fishermen who participated in the S-K program found that the quality techniques they learned dramatically increased yield and shelf life of their catch, and improved profits significantly. They learned that:

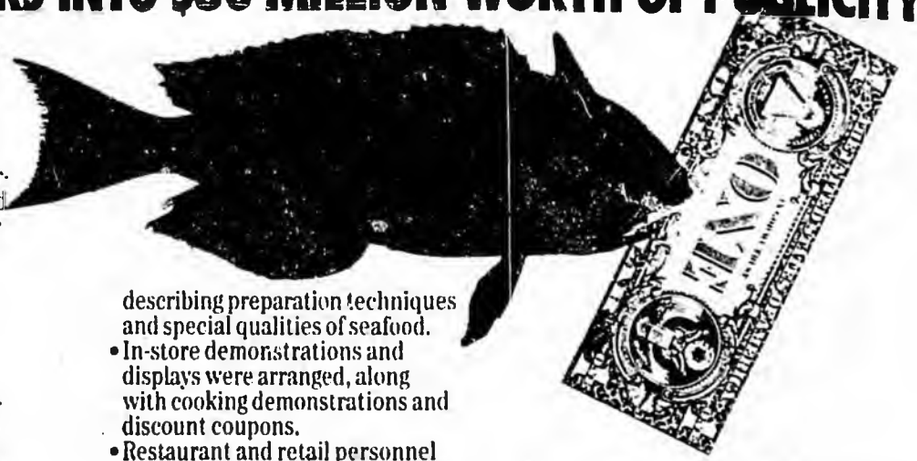
- Boxing at sea helped reduce compression loss, thereby reducing fish weight loss by as much as 14 percent.
- Shelf life was dramatically increased and cutting yield improved by 8 to 12 percent by leaving the collar and nape areas intact and usable.
- Higher quality brought higher profits: North Atlantic's gross dollar revenue improved by 18 to 20 percent.

As New England Fisheries Development Foundation Executive Director Kenelm Coons notes, everyone who participated in the innovative program emerged a winner. The New England Foundation never had to pay vessel subsidies. The fishermen invested the extra labor and equipment modifications required and the market paid a premium for the better quality fish.

For Jerry Knecht and other New England draggers, the S-K quality program provided the information and technology needed to compete in a highly competitive market. Most important, it provided a way to add value to whole product, the primary *raw material*. "This helps us immeasurably in the face of a dwindling resource," Knecht notes.

"Without S-K funds," Knecht points out, "we wouldn't have been able to accomplish this, because the investment would have been too high."

# "CATCH AMERICA" CAMPAIGN CATCHES AMERICANS; S-K FUNDS HELP NATIONAL FOUNDATION TURN A FEW THOUSAND DOLLARS INTO $30 MILLION WORTH OF PUBLICITY



Although the U.S. seafood industry lacks the "beefy" promotional budget of other commodity groups, over the past six years, a unique consumer education and promotion program has parlayed a few thousand dollars' worth of S-K fisheries development money into an estimated $30 million dollars worth of publicity for fish and seafood products.

The program, known as "Catch America," was coordinated by the National Fisheries Education and Research Foundation in conjunction with the U.S. regional foundations.

"Catch America" has enabled industry and government to join forces to educate the consumer about a wide range of seafood products, and, ultimately, to expand domestic consumption of fishery products.

Consumer education efforts included the following:

- Public service announcements on the merits of seafood were created for television and radio.
- Newspaper editors were sent information on selecting and preparing seafood.
- Workshops were held to educate food professionals.
- Brochures, recipe cards and informational booklets were produced, describing preparation techniques and special qualities of seafood.
- In-store demonstrations and displays were arranged, along with cooking demonstrations and discount coupons.
- Restaurant and retail personnel were taught the best ways to select, handle and merchandise seafood.

In the first year alone, media broadcast coverage reached an audience of over 100 million on an estimated 3,000 radio and television stations—exposure that would have cost close to $4.5 million. Newspaper coverage in over 4,000 newspapers was estimated to be worth about $1 million.

In 1984, public service announcements developed through the national foundation reinforced the seafood and health message under the theme "Your Heart Will Love You For It." This television exposure in conjunction with print materials provided the industry with approximately $14.5 million in media coverage. Much that was generated in this period was featured in national network programs such as the CBS Morning News. With relatively small funding from the S-K program, the industry has been able to generate national exposure worth an estimated $30 million. The return to the U.S. industry in terms of advertising time alone is almost 20 times the original level of federal support—a success story the S-K program can claim without reservation.

## MILESTONES

### 1954

**Saltonstall-Kennedy (S-K) Act is passed to make available to the U.S. Secretary of Commerce 30 percent of import tariffs on seafood and seafood products.**

### 1978-79

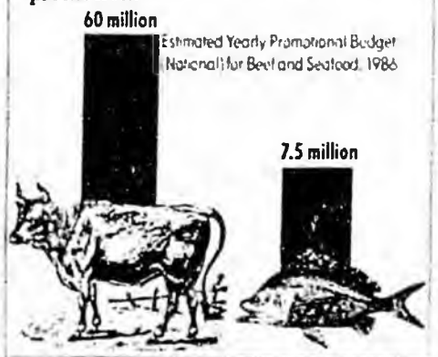
**National Marine Fisheries Service identifies S-K program as primary vehicle to achieve objectives of Magnuson Fishery Conservation and Management Act (MFCMA).**

### 1980

**American Fisheries Promotion Act (Public Law 96-561, December 22, 1980) is passed into law, requiring that portions of S-K funds be used for U.S. fisheries development and promotions.**

### 1980-86

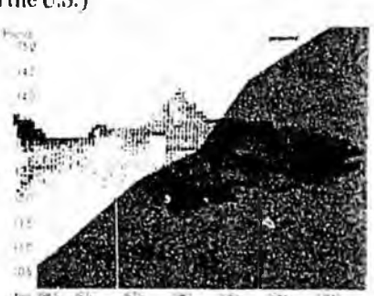
**Over a six-year period, less than $60 million has been made available through S-K grants program for promoting American fisheries. In comparison, cattle producers will have an estimated $60 million per year for promotion.**




# HEALTH BENEFITS OF SEAFOOD FUELING PER CAPITA CONSUMPTION

Seafood has become widely recognized as a *healthy food*, and Americans have begun to make dietary changes that are just starting to make themselves felt within the seafood industry. Many observers believe that as the seafood and health story continues to unfold, seafood consumption could rise to 20 pounds per capita by 1990.

The good news, according to clinical research, is that eating seafood as little as twice a week can indeed reduce the risk of coronary heart disease. (Coronary heart disease still ranks as the nation's number one killer, killing some 300,000 people per year in the U.S.)



According to a study published in the May 9, 1985 *New England Journal of Medicine*, as little as two seafood meals per week significantly lowered the risk of heart attack among middle-aged men living in The Netherlands.

Other research is now underway linking omega-3 fatty acids to: the prevention of certain forms of cancer, notably cancer of the colon, prostate, and breast; the alleviation of symptoms of rheumatoid arthritis; a reduction in the severity of symptoms from asthma; mild improvement in lesions associated with skin conditions such as psoriasis; the normal development of the retina and the brain.

Many public health experts, nutrition educators and journalists consider the links between seafood in the diet and the reduction of risk of a number of diet-related diseases to be the most significant and promising public health stories of the decade.

They also credit the Saltonstall-Kennedy Fisheries Development Program with helping make available much of the scientific and clinical research findings—which might have otherwise been buried in scholarly journals.

The S-K program has funded a number of national and regional consumer education programs and research efforts, including the national "Catch America" program which was launched in 1981. The S-K program also funded, in part, the pioneering research efforts of William E. Connor, M.D., whose clinical trials featuring salmon, whitefish, and shellfish pointed the way to the triglyceride and cholesterol-lowering effects of seafood omega-3s on humans.

S-K funds also made possible a landmark conference on seafood and health held in Seattle during November 1985.

That conference, funded by a Saltonstall-Kennedy fisheries development grant awarded to the West Coast Fisheries Development Foundation, brought together—for the first time ever—key researchers and clinicians studying the beneficial effects of seafood on human health, along with nutrition educators, dietitians, journalists, and representatives from the seafood industry. Even the researchers are excited.

To quote pioneering researcher William E. M. Lands, Ph.D., head of biological chemistry at the University of Illinois, "The excitement we feel about the possible uses of seafood is balanced by a rather sobering awareness of our ignorance."

the Lodestar

Alaska Fisheries Developm

# Special Issue: AFDF at ten

This special 10th Anniversary Celebration issue of The Lodestar tells the story of Alaska Fisheries Development Foundation.

It recalls the beginnings of AFDF, its first board of directors, its struggle for life, and its first projects. It tells the tale of efforts successful and frustrated, of people coming and people going. Even if The Lodestar were more than eight pages, there would not be enough room to tell all the stories, to introduce all the characters, and to remember all the moments that were turning points in the Foundation's history.

But this is a start. It will help acquaint newcomers to the Foundation and its beginnings. It will stir long-time associates to remember things they might have forgotten. It will possibly encourage more people to join the Foundation and be involved in its projects in the coming ten years.

This issue of The Lodestar not only celebrates the achievements of the Foundation; it also celebrates all the people who have been associated with AFDF through the past decade. There won't be room to mention them all, though their names and efforts are inscribed on the inner halls of the Foundation's collective memory.

And what a collective memory it is. Just for starters, we thank our 1988 board of directors.

**President**
Al Burch, Alaska Draggers Assoc.

**1st Vice President**
Steve Smith, Kemp Pacific Fisheries

**2nd Vice President**
Phil Hanson, UniSea

**Secretary/Treasurer**
Rod McLachlan, Trident Seafoods

John Sevier, Alaska Pacific Seafoods
Oscar Dyson, All Alaskan Seafoods
Henry Mitchell, Bering Sea Fishermen's Association
Hank Eaton, F/V Skagit Bay
Phillip McCrudden, McCrudden Fishing Ventures
Rae McFarland, McFarland Foods
Gil Gunderson, Northern Fury Seafoods
William Reinke, Van Camp Seafood

In addition to the board of directors, AFDF relies on and gains much from the direction of Carl Rosier, Chief of Industry Services at National Marine Fisheries Service Alaska Region in Juneau.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By Krys Holme

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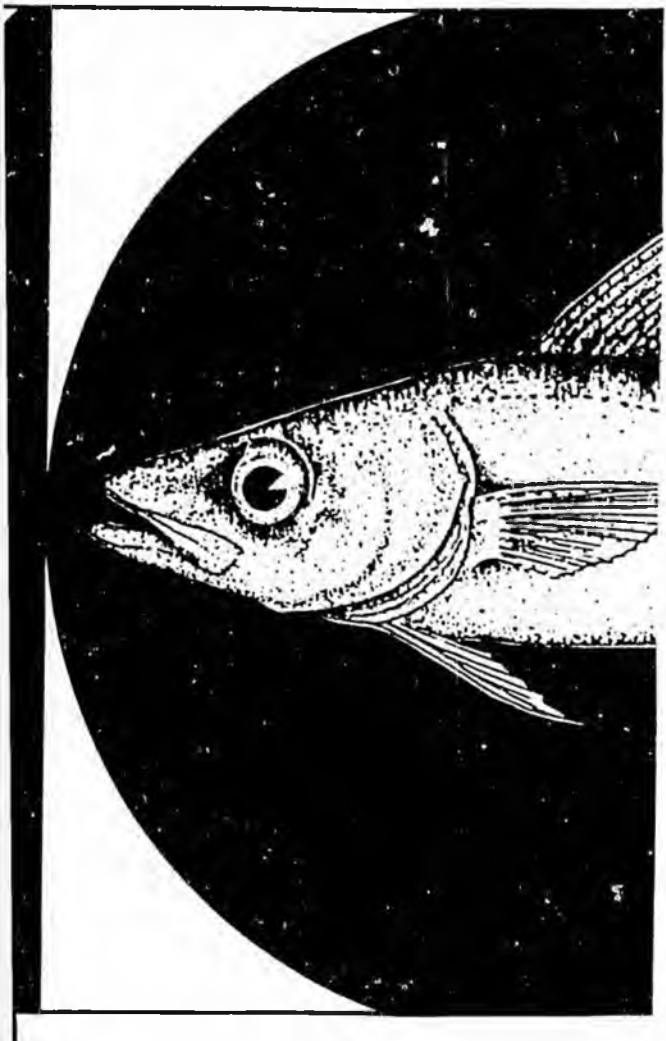
Volume VI Number 4, Autumn 1988



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act, and that

we should set up some organization that could funnel the Saltonstall-Kennedy money to the industry," Hemphill said.

Almost twenty months later, the Alaska Fisheries Development Corporation, with $100,000 startup money from the state of Alaska and Sara Hemphill as executive director, embarked on its first white fish development project, a $1.475 million demonstration of the economical and technical feasibility of Alaskan fishing vessels and processing plants going after the foreign-controlled Alaskan white fish industry.

The Saltonstall-Kennedy fund was created by a 1954 act of Congress to devote one-third of all revenues from import tariffs on marine products, including coral, pearls and seafood products, to the U.S. seafood industry. The money was to be used for fisheries development projects, and its application was to be industry-directed.

"That first project had something for everybody," Hemphill said. The project was segmented to include activities from all parts of the state and to include fishing, processing

and marketing. It included shrimp boats, longliners, crew training programs and processing demonstrations. It touched on pollock, cod, sablefish, and black cod.

## 1978

Alaska Fisheries Development Corporation was formed, the first organization in Alaska to include both fishermen and processors, and to span all industry interests. Ron Jensen was the president of the board of directors. Other board members were: Patrick Pletnikoff, Pete Harris, Connie Taylor, Al Burch, Larry Painter, Jim Ferguson, John Enge Sr., Robert Morgan, and Jim Marr. Hemphill was Acting Executive Director, and was soliciting applications for the permanent post until the board convinced her to stop fooling around and apply for the job herself. She did; she was Executive Director until 1982.

> "After many months of careful planning and preparation, the public trust in fisheries development is now an active, tangible reality."
> —AFDF Bulletin August 1980

Through the first year of AFDC, members were most concerned with increased foreign allocations of bottomfish under the one-year-old 200-mile limit law. A November 10 AFDC newsletter quoted attorney Ed Furia speaking to a U.S. bottomfish workshop: "We found out this morning ... that the State Department is considering increasing the allocation of Alaska bottomfish to Korea and to Poland so that they can sell those bottomfish in the United States....We think this is incredible."

The goal seemed clear to membership: to capture the profitable fishing and processing activity that was then given to foreign companies. The methods seemed less clear. The Alaskan fishing industry was segmented, with many separate groups representing gear types, regions and activities.

The same AFDC newsletter of Nov. 10, 1978 tells a story of two boys trying to balance on railroad tracks. Neither could make it far, until they discover that by holding hands across the expanse they could keep each other balanced. "AFDC symbolizes the hands held across the track," wrote editor Connie Taylor.

## 1979

After riding a "rollercoaster on the funding issue" through the winter of 1978-79, Sara Hemphill announced in the spring of 1979 that Congress had finally approved $1.445 million, promised the year before. But it would take until September to see the first dollar of S-K money. In the meantime, the board updated its white fish development project proposal, and prepared for some smaller projects.

> "Government must recognize that its agencies are not experts; the expertise resides in the private sector. Government must assist without interfering, challenge without destroying and encourage without building a false foundation."
> -The Lodestar Autumn 1983

In October, bids were solicited for a bottomfish trawler, a shrimp trawler and a longline vessel, and for shore-based or floating processors who would handle the product harvested by the project's boats. It was a small step toward Americanization of Alaska's bottomfish resource.

Also in 1979, the board of directors decided one change had to be made to ensure the organization of its non-profit status, and to underline the philanthropic purpose that characterizes the organization: they changed its name to Alaska Fisheries Development Foundation.

## 1980

"Working to meet the diverse self-identified needs of the Alaskan industry is a monumental task," wrote Sara Hemphill in February 1980. As a first step, the AFDF board drafted a mission statement, affirming that the Foundation's purpose was "to encourage the full and viable domestic utilization of all Alaskan fisheries consistent with wise resource management and healthy development of Alaska's fishing communities."

By this time AFDF had developed a reputation as the only arena in which fishermen and processors, on-shore and off-shore, Southeast to the Bering Sea, could communicate needs and cooperate in solutions.

AFDF's 1980 projects included helping create a shore-based white fish processing plant, originally sited at Alaska Food Company at Gibson Cove, in Kodiak; and equipping a 124-foot combination crabber/longliner called the *Aleutian Mistress* with a Mustad auto longlining system. Both projects would see plenty of changes before they were finished. The *Aleutian Mistress* was the first of many projects in which Baader North America contributed technology, time and expertise to an AFDF project.

AFDF also arranged to place U.S. observers aboard the German factory trawler *Friedriche Busse* to collect harvesting, processing and economic data. Participants confirmed that the North Pacific bottomfish learning curve was indeed very long, and that the market had no patience for those who were still on it.

Ron Jensen resigned from the board in 1980 and was replaced by Bob Anderson. AFDF hired Sharon Gwinn as assistant executive director; she was with the Foundation until 1985 and returned in 1986 as acting executive director. Betttymae Jones was hired as office manager.

## 1981

"U.S. development of an Alaska pollock fishery will probably not be viable until we develop successful methods of using minced pollock either as an export commodity or in products acceptable for domestic consumption," said Dick Nelson of NMFS in 1981. His comment solidified ideas AFDF had been tossing around that fisheries development would not depend solely on fishing and processing Alaska's bottomfish, but on developing new, marketable products from Alaska's most abundant raw material.

A huge slate of 17 projects received $1.9 million in S-K funds for fiscal year 1981-82. They included shore-based and at-sea cod, salt cod and pollock processing, demonstrations of longline gear, baiting systems and fishing, a fish waste recovery project, several small fishery studies, a fishing vessel safety project, a study of cold storage and transportation needs in Alaska, and several marketing and informational projects.

In November 1981, AFDF sponsored a conference entitled, "Alaska Pollock: Is it a Red Herring?" The meeting would finally set fire to Alaska's bottomfish development;

The AFDF board of directors in 1981 included Bob Anderson (as president), Al Burch, Jesse Foster, Greg Favretto, John Enge, Hank Eaton, Dan Flynn, Richard Pace, Ken Allread, and Jake Phillips. Charlene Wilson and Michael Broili joined the staff in this year.

## 1982

Greg Cushing and Bill Woods joined the AFDF board of directors; Sara Hemphill resigned, citing a need for "new blood"—she may have felt she'd already spilled enough of her own—and Christopher K. Mitchell was hired as AFDF's second executive director. In an *Anchorage Times* interview, Hemphill said she favored hiring Mitchell because "he asked harder questions of us than we asked of him."

In 1982 the Model White Fish Processing Demonstration Project was moved from Kodiak to Akutan, on the Aleutian Chain 700 miles west of Anchorage. There Trident Seafoods had built a 100,000 square foot plant dedicated solely to white fish processing. The Trident plant, the first of its kind ever built in Alaska, could handle more fish than Oregon's entire annual harvest. The project would begin with a target production of split, salted Pacific cod in March, and frozen fillets later.

AFDF circulated 400 questionnaires to Alaskan fishermen and processors to help identify future projects that might have a significant impact on the future of Alaska's fisheries economy. The Foundation received 42 project proposals that year.

"Our most important mission," reads a newsletter from early 1982, "is to accelerate the growth and diversification of Alaska's seafood industry." With that goal in mind, the AFDF staff applied another year of S-K funds toward enhancing shore-based white fish processing at Akutan, completing the *Aleutian Mistress* project, demonstrating the quality and preservation of Alaskan ground-fish, and exploring the feasibility of several new fisheries targeting on pollock, Atka mackerel, razor clams, sablefish and octopus.

By 1982 it was clear that developing the pollock fishery would depend on developing products to make from pollock—primarily surimi. A May/June AFDF Bulletin brings surimi to the Foundation forefront for the first time. "Seafood Alchemy: Turning croaker into crab legs" reads the headline; the story told of Nichibei Fisheries in Alabama,

the company where AFDF would later find surimi technician Billy Thrash, who aided AFDF in its first tentative months of surimi production.

By 1982 the Foundation staff had increased to include Anita Murphy, Sharon Tyone, Linda Allen and Florence Scott. Late in the year, Ellen Wilson was hired as secretary. And on March 1, a day that will live in infamy for both AFDF and the pyrotechnics industry nationwide, (he once set fire to a stack of old Wall Street Journals on his desk while negotiating fantasy stock deals with Doug Humes) Chris Riley joined the staff as project manager.

## 1983

Throughout the history of AFDF run several common themes: creating opportunities for fishermen, filling the gaps in U.S. seafood processing technology, and exploring new uses for Alaska's seafood products. But in 1983, under the direction of Chris Mitchell and the nervously supportive eye of Carl Rosier of NMFS, AFDF took a dramatic turn: the Foundation moved away from its "scattershot" projects, planted most of its resources behind one concentrated, multi-year project, and dedicated itself to discovering and developing new methods of producing surimi from Alaska pollock.

"We're looking for a few greedy people," read a brochure AFDF produced that year. To succeed in a risky project like the surimi program—going against the political tides and certainly against the Japanese interests now very powerful in the Alaskan seafood industry—it would be necessary to make sure everyone had something to gain from the project. In 1983, AFDF submitted its surimi project proposal to NMFS, and began to lay groundwork for the project that would put AFDF on the map.

The staff contacted 500 U.S. companies—suppliers of ingredients, equipment, materials and knowledge—and sent out samples of Japanese surimi for product development purposes. Within months, companies across the country were twisting, poking, flavoring, coloring and tasting surimi.

The staff, hoping that at least some of these companies would find surimi profitable, pumped out as many samples and as much information as they could get hold of. And in the interests of better communications, The Lodestar was born.

In December 1983, AFDF selected from among five bidders one plant to conduct its surimi production project. After hours of proposal review, analyses and deliberation, a specially-selected board of advisors awarded the project to Royal Alaskan Seafoods in Dutch Harbor. The plant would be shut down within a year; and the deliberations would have to be repeated the following year. But, Chris Mitchell was quoted as saying, the level of knowledge demonstrated by the companies proposing for the project indicated "a growing strength of knowledge and commitment" to building an Alaskan surimi industry.

In early 1983, Barbara Culver joined the AFDF staff as accountant.

Also in 1983, the Trident Seafoods plant in Akutan—after only one year of operation—burned to the ground.

## 1984

If 1983 was AFDF's Year of the Pollock, 1984 was the Year for Surimi. AFDF published "Hooked on Surimi," a directory of companies offering services and equipment to the surimi industry. The staff continued to investigate uses for surimi. The Foundation and National Food Processors Assoc. held a surimi conference in Washington, D.C. that drew 200 people and seemed to set fire under each of them.

But primarily, the energy of AFDF and its associated companies was toward building the first commercial surimi plant in Alaska. With Bob Ryan as chief engineer and Billy Thrash as surimi consultant, Royal Alaskan began small-scale surimi production on May 4. The quality was low, but excitement was high. Despite much talk to the contrary, Alaska had proved that it could make good surimi..

That summer, Royal Alaskan was shut down, the surimi project halted, and AFDF issued a second RFP for shore-based surimi production. This time, rather than a pilot-scale plant, AFDF went for full-scale commercial production of surimi. Alaska Pacific Seafoods of Kodiak was the winner this time, and late in the year all the surimi equipment was moved to Kodiak.

## 1985

"Surimi: It's American Now," announced The Lodestar in January 1985, under an illustration of the Norman Rockwell Thanksgiving table spread with surimi-based products. The illustration has become one of AFDF's trademarks. The message was twofold: Not only was it proven than Americans could make high-quality surimi on shore in Alaska, but the surimi was made with a combination of traditional Japanese and modern American and European technology.

Two hundred people came to "White Gold," a grand opening of the surimi plant, to get their shoes wet and see American surimi made. Once onshore, surimi began to capture the imagination of food executives and technologists. One company experimented with a surimi-based cheese log; another with surimi in cake mix; another with baby food. The potential value of an Alaska pollock industry profiting from waste, mince, meal, oil and surimi was estimated above $6 billion per year.

Knowledge about the pollock market coincided with the opening of the rebuilt Trident Seafoods plant. Owner Chuck Bundrant had turned disaster into an opportunity, and had included in his rebuilt plant design for pollock and cod processing equipment. With the new plant, Bundrant was set up to process 52,000 lbs. of pollock per day, worth over $1 million per month, which at capacity would pay fishermen about $260,000 per month.

In 1985 the pollock biomass seemed unending. Yet it became clear, from a standpoint of economics, efficiency, and resource management, that a successful pollock plant would have to fully use every ounce of protein an Alaska pollock has to offer.

With nearly a million pounds of surimi on their hands, the AFDF staff turned their attention to market development. How to create entirely new markets and uses for a material few knew very much about? A few analog plants were springing up in the Lower 48. AFDF concentrated on working with food developers, those who would create products beyond the imitation seafood market. It was the beginning of an endeavor still continuing, though today the effort centers not only on surimi but on all seafood forms.

## 1986

A good year for the product development effort for surimi at AFDF. The year dawned with a new line of health food products including a granola bar and a powdered protein drink, all using surimi.. Next, Lynda Nestelle created a moisturizing cream using surimi as the binder. The trend continued with AFDF's first visit to the Western States Meat Association convention, where the little fisheries booth was nearly bowled over by eager meat packers who were either checking out the opportunity or the competition—even they may not have been sure which.

AFDF had achieved three important goals in its surimi project: it had successfully produced surimi in the U.S.; it had proven that existing technology could be improved upon using existing American equipment and techniques; and it had marketed the surimi in the U.S. and Japan.

And so, AFDF began the process of stepping back from the forefront of surimi industry development. By this time there were two other surimi plants on shore in Alaska and several floating processors being built. Work was being done independently of the AFDF project that indicated the surimi industry was on strong footing. It was time to start looking to the future.

In the spring of 1986, Chris Riley left AFDF and the surimi project he had devoted himself to. In the fall, Chris Mitchell resigned to start his own company in Seattle. In September Sharon Gwinn, who had left in 1985 to start a business with Richard Rhoda, returned to fill in as acting executive director.

## 1987

Ten years after that first December meeting that sowed the seeds that would become AFDF, foreign fishermen harvested Alaskan white fish in U.S. waters for the last time.

The new year brought high prices for U.S. pollock fillets and blocks, and doubled production of surimi for Alaska Pacific Seafoods. The economy of Alaska was deep in a recession but Kodiak boomed from bottomfish activity. AFDF started a project to enhance fish waste processing technology, and focused on gaining USDA approval for surimi as an ingredient in meats.

In March, AFDF published *Surimi: It's American Now*, the first compendium of surimi knowledge in the U.S.

On April 1, Mel Monsen joined the staff as executive director. Soon after, he hired Loretta Lure and Peter Moore, who had been temporary contractors to AFDF during the transitional period

The effort to move AFDF from its surimi project toward the future began with a flatfish demonstration project, a new seafood product development contest, and a study of pollock liver oil and its potential uses. The Foundation had moved from the uncertainty of its start through the process of proving itself by aiding different segments of the industry, into a very focused project that was planned to benefit the entire Alaskan seafood industry directly or indirectly—and now began broadening its vision again to encompass the areas that still needed the unique kind of activity only the Foundation can conduct.

## 1988

In its tenth year, the Alaska Fisheries Development Foundation enjoys the stability that comes with having a history. Not everyone has supported AFDF or its projects, or agrees with the directions it has taken. Many agree the Foundation has been a force of change and growth in the industry; some think it hasn't done enough to benefit small Alaskan operators.

There were a few successes in 1988. Surimi gained approval from the USDA as a processed meats ingredient; The tenth U.S. surimi factory ship has been launched; a salmon chili that resulted from the Foundation's new product contest is entering commercial production; Koriak Reduction, Inc. added a dryer to its meal plant and the flatfish project at Eagle Fisheries is moving piecemeal toward profitability.

AFDF celebrates its tenth anniversary with a taste of uncertainty flavoring the punch. The S-K Program funneled less money to fisheries development projects this year than ever before. Some member companies are beginning to question if the priorities outlined by NMFS speak to the needs of the industry. But a few things are clear. AFDF was set up as a catalyst for public funds directed toward private industry, to benefit the greatest number of people with the smallest amount of bureaucracy. Members agree that, whatever direction the Foundation takes in the future, its role as high-risk catalyst will continue.

# Back to the Future:
## What's AFDF up to now?

*Alaskan flatfish impresses the U.S. market; a new surimi product–possibly for fast food; and the search is on for oil processors*

Alaskan flatfish is attractive to the domestic market because of its reasonable price and high quality, but bad weather and scattered stocks make it a questionable wintertime fishery.

Those are some preliminary conclusions from the Eagle Fisheries flatfish demonstration project, where Eagle has produced mechanically-processed fresh and frozen filiets and frozen fillet blocks from the region's flatfish resource since February of this year.

In their November monthly report, the Eagle staff wrote, "A major national restaurant chain has tested Alaska's flatfish and accepted them for a test marketing program to place Danish flounder. The reason? The price is low and the quality is high."

Most high-quality flounder produced in the U.S. is generally siphoned off to pricey fresh markets; the rest are frozen, Eagle said. Asia exports a more reasonably-priced IQF yellowfin sole produced at-sea, but quality of that product ranges from "OK to awful," Eagle reports.

"Like many other Alaskan products, it appears that a niche between the two extremes of low-priced seconds and high-priced fresh is the ultimate direction for IQF Alaskan sole."

In most developing fisheries, the assumption has been that, if there's a market for the fish, the fishermen will be able to deliver. However, Eagle is the first shore-based flatfish plant to remain operating through the winter, and the plant is learning some unique lessons about Gulf of Alaska flatfish.

The many species of Alaskan flatfish, which congregate during the warmer summer months, moved out of their traditional grounds in the fall and now, when they can be found, they're less concentrated than before. As a result, landings in September and October were far lower than the million-plus-pounds monthly landings in July and August. October brought only 390,507 lbs. in flatfish landings at Eagle. Rex sole comprised 36% of the catch, Dover sole 33%, rock sole 20% and flathead 11%. All species were in varying stages of roe development.

To maintain production consistency for the one Baader 175 flatfish filleter at Eagle, the plant established a 70,000 lb. trip limit for its boats. It has been a moot point: average deliveries in October were 24,000 lbs., and the largest single delivery was 50,000 lbs.

"Though the fishery has indications (that it can) support a substantial fleet, weather limitations in wintertime still may not allow a plant to work at capacity," Eagle's report said. "Regardless of a vessel's size, it appears that mixtures of marketable soles with other, perhaps unmarketable species, make this wintertime fishing for sole only a 'scratch' proposition at best. The offshore location of stocks does not make fishing impossible, apparently, but it does make proper sorting and icing at sea of the delicate sole unlikely during periods of bad weather."

Production yields continue to increase over yields attained early in the project. Yields to trim weight in October averaged 29.3%, and overall plant yield after packaging was 27.1%. Yields by species were: Dover, 31%; rex 30.3%; flathead 26.9%; rock sole 26.2%.

One of the goals of the project is to compare yield averages of the Baader 175 to those of experienced hand filleters. In October Eagle hired two hand filleters. A preliminary production test run showed the hand filleters attained yield figures averaging about 1% higher than the Baader 175 for each species. However, in controlled tests the Baader 175 and the hand filleters achieved the same yields.

The goal of AFDF's flatfish demonstration project is to investigate the technical and economic feasibility of a shore plant entering into Alaska flatfish production. The cornerstone of this project is the Baader 175 flatfish filleting machine, which is in use on flounder and sole worldwide. However, it has been discovered during this project that some Alaskan flatfish species are physiologically different from their Atlantic or European brethren, and some adjustments to the filleting machine, and to the Baader 52 skinning machine, have been made for applications in Alaska.

Baader North America donated the use of its 175 filleter and its 52 skinning machine for the flatfish project. The Baader 52 was removed from Eagle last summer to make adjustments for Alaskan fish; it will return to the plan in the upcoming weeks.

Trio Industrier of Norway also contributed use of its Trio Skinner, which now is in operation behind the Baader 175, and reportedly is an excellent machine for Alaskan flatfish. Eagle has also acquired a Scanvaegt automatic sorting machine, which weighs and sorts the frozen fillets into boxes for shipping.

AFDF publishes a monthly newsletter called "Sole Source" that covers the progress of the flatfish demonstration project. It is available free of charge. For more information about the flatfish project, call Peter Moore at AFDF.

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*Will surimi be used in formed steak? Could be at a fast-food restaurant someday*

"Nobody offers a steak sandwich in the fast food business," a meat processor said at the Western States Meat Association Expo in November. "They can't afford to make it. But if they had surimi, maybe they could."

As part of the Expo, Dr. John Carpenter of the University of Georgia in Athens presented findings from a study of surimi as a binder in restructured steak. His study was part of AFDF's New Product Development Contest, which began last summer and was designed to encourage development of new commercial non-analog products from surimi, minced pollock and minced salmon.

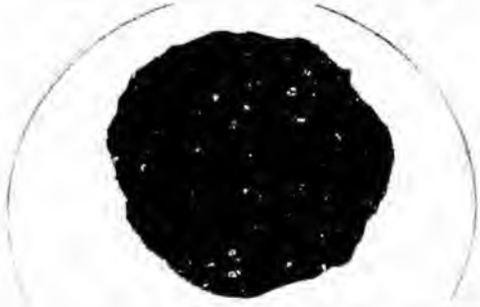
Dr. Carpenter's study centered on developing restructured beef steaks using available plant machinery. He purchased fresh beef knuckles from a local butcher, removed all the fat, connective tissue and muscle sheaths, and cut the muscle meat into cubes measuring either 1x1x1" or 1x1x2" (to test the effect of meat particle size.) The surimi, with 0.5% sodium chloride and 5% sodium tripolyphosphate added, was added to the meat in a mixer by extruding the surimi from a syringe with the tip cut off, a method that allowed very easy blending of the surimi and meat. The mixture was then stuffed with a vacuum stuffer into bologna casings, allowed to set at 4°C and then sliced into 3/4-inch steaks.

Dr. Carpenter wanted to find out two things: first of all, would a restructured steak using surimi have an acceptable texture, flavor and moisture? And second, how much surimi should be added, and how would the level of surimi used affect the overall characteristics of the product?

Taste panelists in Athens and in Anchorage agreed that the product was acceptable. The restructured steaks rated high in taste, mouthfeel, texture and juiciness. Even one sample that was deliberately overcooked came out no worse than any normal beef steak cooked too long.

But how much surimi should be used? Dr. Carpenter experimented with levels from 0.5% to 3%, including one sample with 1% surimi and 1.5% sodium caseinate. He evaluated the products at 0, 7, 14, and 20 days, and found that there was a marked deterioration of aroma and texture by the seventh day, though flavor and mouthfeel were not affected. But by 14 days the scores were back up again. Panelists did find some overall differences in aroma and flavor after the product had been stored 20 days. And one experiment revealed a preference of 1% surimi over 1.5% surimi levels used in the product. The product with sodium caseinate was not preferred by any of the panelists.

Dr. Carpenter also conducted studies on the relative binding of surimi at different levels, and of the microbiological differences of product using different levels of surimi and at different time intervals. His results are



*Dr. Carpenter's reformed steak with surimi as a binder. Good bind, good bite, good idea.*

charted in progress reports; AFDF will publish his final report early next year.

"Surimi structured steaks have the unique potential to be marketed in the fresh state," Dr. Carpenter reported. "There existed a protein/protein interaction between the beef and surimi that further accommodated the binding effect. From these results, it was determined that much less surimi could be used and that larger meat pieces could be successfully bound in the raw state. It appears that 1% is the best level of surimi to add."

For more information call Loretta Lure at AFDF, or Dr. Carpenter, University of Georgia College of Agriculture, Athens, GA 30602; (404) 542-2286.

## *At last: Some real economic data on the Alaskan seafood industry*

A cooperative venture by several public and private organizations will result in three related documents that will provide for the first time information about the economic importance of Alaska's seafood industry.

The three reports are all due out within the next six months, and together will give public and private interests alike the kind of industry-wide information on which decisions can be made about investment, community development, infrastructure needs and business development plans.

The first report out will be "A Comprehensive Fisheries Economic Development Plan," published by the Southwest Alaska Municipal Conference from data collected by Graystar Pacific Seafood, Ltd. and Coopers & Lybrand. This study will involve analysis of trends in fishery resources, industry activity, and markets in the Southwest Alaska region. It will also outline the area's requirements for development and an economic development plan for the region.

The plan is scheduled to be published in December 1988. For more information call John Levy, Southwest Alaska Municipal Conference, at (907) 274-7555.

A cooperative study sponsored by the Alaska Seafood Industry Study Commission, in which AFDF is a participant, will evaluate the value and economic importance of the seafood industry to the economy of the state of Alaska.

This study is being conducted by The McDowell Group of Juneau, through surveys of processors, fisheries organizations and fisheries-related agencies, and through intensive data collection from the Commercial Fisheries Entry Commission (CFEC), the Alaska Department of Labor (ADOL), and National Marine Fisheries Service (NMFS). From ADOL, the McDowell Group is collecting employment and payroll data; from CFEC, regional and statewide summaries of seafood processor production and wholesale value statistics by species and product. NMFS will help compile data on joint venture and foreign catch statistics from 1977 to 1987, and domestic catcher/processor and mothership production statistics for 1986-87.

The Alaska Seafood Industry Study also includes regional and statewide seafood catch statistics from the Department of Fish & Game; fish tax and license revenue data from Department of Revenue, and other related information such as processor permits, seafood exports, investment history, employment levels, budgets of public agencies, and net earnings by species, gear type and area. The Alaska Seafood Marketing Institute, Alaska Factory Trawlers Association, the International Trade Administration, and several other companies and agencies are participating.

The final report, scheduled to be completed in January 1989, will be the first compilation of such information yet to be made available. Copies will be distributed through AFDF, and through some of the other participating firms. For more information call project coordinator Loretta Lure at AFDF, or Eric McDowell at The McDowell Group, (907) 586-6126.

## *...And a new white fish oil study begins*

One of the primary goals of the fisheries development community in Alaska is to learn how to make better use of the material now wasted in seafood processing.

AFDF issued bid solicitations on November 21 for processors interested in trying out hydrolyzing equipment on white fish processing waste for use in pet foods, animal and aquaculture feeds, protein supplements and protein blends for institutional use.

Interested processors must handle at least three groundfish species (cod, pollock, sablefish, flatfish, etc.) and be willing to produce samples from other species as well. The demonstration will run from January to March 1989, and AFDF will provide a hydrolyzer from Advanced Hydrolyzing Systems along with appropriate technical training.

This pilot-scale project will help train processors in handling and production, and marketing to some degree, of white fish oils and hydrolysate. AFDF plans to set up a full-scale commercial demonstration of hydrolyzing technology next year.

The deadline for submitting proposals is December 15, 1988; a processor will be selected on January 2, 1989. For a copy of the request for proposals or for more information, call Loretta Lure at AFDF.

# READ OUR FINE PRINT

**"Hazard Analysis Critical Control Points: An Outline for the Surimi Industry,"** 53 pp. The first comprehensive safety assurance program for surimi producers. This document outlines critical points in the production process where microbiological problems are most likely to arise, and presents a program to prevent all potential safety hazards. Compiled through much industry input by Manning, Batson & Assoc., it includes a plant sanitation program, quality assurance, physical/chemical hazard prevention, microbiological safety, and how to document and audit programs once they're in place. Available from AFDF at no charge.

**"Partial Quality Control: Surimi/Meat Products,"** 7 pp. Any shore- or ship-based surimi producer interested in supplying surimi to meat processors will want to know what quality control procedures to follow to satisfy the needs of this new market. Compiled by Manning, Batson & Assoc., free of charge from AFDF.

**"Product Development: Surimi and Meat,"** 16 pp. Creative minds in both the surimi and the meat business will want to read this practical how-to for developing new products combining meat and surimi. It covers the characteristics of surimi, technical data, general guidelines for its use, a liquid cookout chart and some generic surimi/meat nugget formulations. Compiled by Manning, Batson & Assoc., free of charge from AFDF.

**"Salmon Oil Recovery at North Pacific Processors,"** 7 pp. An interim report of the progress being made at North Pacific Processors, where AFDF is sponsoring a project to recover salmon head oil using hydrolyzing equipment designed to digest 500 lbs. of salmon heads per hour. Project is to test the feasibility of producing salmon head oil and hydrolisate paste from the waste stream of salmon processing. Project is ongoing. Copies are free from AFDF.

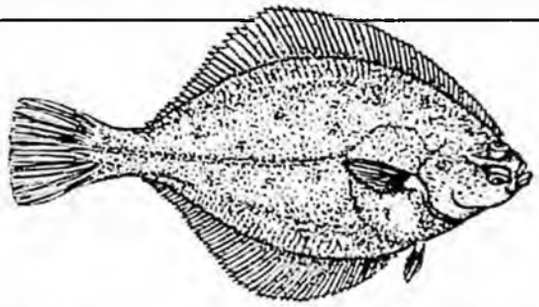
**"New Zealand's ITQ Program,"** 46 pp. The Alaska Commercial Fisheries Entry Commission has produced a detailed review of the decision in New Zealand to begin individual quotas, the means of distributing them, and the nature of the market in which quotas are traded. This issue is of interest to Alaskan companies looking toward the future, when the North Pacific will see some dramatic changes in its fishery management programs. Copies available from the Commission; call Ben Muse, (907) 465-4081.

### *Free product samples from our store....*

Samples of high quality pink salmon head oil from North Pacific Processors are now available from AFDF free of charge to companies conducting product development with such materials. Those interested may arrange with AFDF for shipment of 4- to 5-gallon samples of the oil.

AFDF also is offering samples of flatfish fillets to companies who would like to become familiar with the high-quality flatfish species produced at Eagle Fisheries in Kodiak. Sample packs include frozen fillets of varying sizes for each species.

**For sample shipments, contact Barbara Culver at AFDF.**



*"The person who thinks he can survive in constant change is a threat to all those who think they can only survive in safety."*
*—A. Rae McFarland 1988*

# GUEST Editorials

## *If we had known more, we'd have attempted less*

By Sara Hemphill
AFDF Executive Director
1978-1982

Ten years ago this month I was packing my children into what little space was left in my 1972 Toyota to head north to Alaska to an adventure that was to prove to be the most rewarding and challenging I've ever had.

We left Seattle in a downpour and rocked leisurely to Juneau on the *Matanuska*. Ben woke me the third day with, "Mom, Mom, come and look. It's just like a Christmas card!" And it was. Juneau was dusted with snow, the sky was overcast and looked like evening rather than sunrise, with a few lights twinkling among the dark green trees. It promised good things.

This adventure had begun a year earlier in Anchorage during a special meeting called by National Marine Fisheries Service following the December North Pacific Council meeting. Few of us present suspected that the seeds for AFDC (later to become AFDF) had been sown. It was three months and many drafting sessions later that a proposal was forwarded to Washington, D.C. requesting $2.8 million in S-K funding to launch the U.S. groundfish effort. Few knew, or cared, what we were about. Indeed, the most frequently asked question was, "What's groundfish?"

It was another year and then some before final approval for the funding was a reality. The Christmas card promise seemed to have become a blistery wind from Scrooge's Christmas Past. The in-fighting and struggle for control that ensued were energy-sapping and expensive. Nonetheless, they forced a consolidation of participants and a honing and refining of the individual projects and budgets that served us well in the long run.

Finally, in October 1979, we had operating funds for specific programs, the "queen pin" of which was the longline large boat project—later awarded to Sea West and the *Aleutian Mistress*. Darryl Petersen, then President of Sea West, deserves special recognition for the outstanding contribution he made to the industry.

There was relatively little public enthusiasm for the AFDF undertaking. Without the dedication and support from key individuals, the program would have floundered. In addition to the staff, Board members and especially Ron Jensen who served as president, Pete Harris, Sig Jaeger, Walt Jones, Lee Alverson, Steve Hughes, Linda Chaves, Keith Specking, Jim Branson and the NPFMC, Wesley Johnson, Jim Hemming, Bert Larkins, Dick Reynolds, John Schmiedtke, Barry Fisher, NMFS staff, Dana Besecker, Bob Balkovic, Peter Barlindhaug, Bill Phillips, Steve Perles, Rod Moore and, of course, the NMFS contracts officer John Hinman were unsung heroes who deserve applause for their invaluable help shepherding AFDF through its childhood.

The task of balancing what the public sector wanted to fund with what the private sector was prepared to (or interested in) undertake was a challenging one. Certainly the perception of which projects were effective and which were not ran the gamut from disaster to raging success, depending upon who was doing the perceiving.

Our goal initially was simply to get the ball rolling, or as Sig Jaeger said, "Prime the pump." Yet it was critical to have not only successful projects but ones that the industry felt were worthy. Choosing those first projects was tough; there were so many opportunities and needs. For the most part the processing sector was not interested in investing in a fishery before the harvesting capacity was proven. Likewise, the fishermen were not enamored with the idea of spending hundreds of thousands on trawl gear when there was no market for the product they would be trawling.

Fortuitously, Wally Peyreyra and Marine Resources Company were just breathing life into joint ventures, the shrimp resource was declining, Al and Oral burch had both the vision and the fortitude to commit to a risk, and then the demise of the crab resource got everyone's attention; AFDF was out of the starting box.

In those days there always seemed to be more skeptics than enthusiasts for the program. Most people with whom I spoke during the start-up phase said fishermen and processors would never work together; we proved them wrong and set an example that was later followed by the creators of Alaska Seafood Marketing Institute. offshore, big boat projects were suspect in the eyes of many; yet the information that developed through these projects proved invaluable to small and grand alike.

Finally in 1981, Pete Harris saw the processing plant project he had shepherded for many years implemented, and the second phase of AFDF was born. Chris Mitchell, my able successor, stepped in to write the second chapter.

Reflecting back, I think of AFDF as a work horse rather than the sleek race horse some thought we had acquired. The endless hours of research and preparation, deliberation and argument spent by thousands of committed folks over the years will never fully be credited. Certainly, we never enjoyed any glory. I trust, however, that they, like I, gained from the experience and are as proud to have been a part of this most significant chapter in the evolution of our industry as I am. I thank you, one and all.

## *The Old Map-Makers used to say, 'Beyond this place there be Dragons'*

By Chris Mitchell
AFDF Executive Director
1982-1986

Dragons, dragoons, dollops, doubloons, dollars and a decade of development....While ten years may seem like a long time in passing, it's but a brief moment on the horizon of time. But in that ten years Alaska has taken over the entire harvesting, and large portions of the processing, of more than 2 million metric tons of American fishery resources from foreign fleets. At the dawning of the last decade, the U.S./Alaskan fishery was only targeting a few very specific, high-valued species.

We thought we could not afford to bother, care nor compete on the rest of that other "trash fish." Isn't it interesting how a lot of trash fish became a lot of cash fish in that time? Why did it happen? How did it happen? And how can we continue to make similar things happen in the next ten years?

Development of Alaska's fisheries to this point didn't occur calmly or at an evenly measured pace. In fact, for the first few years, little progress was visible. The industry was still fat and sassy on King Crab, shrimp and salmon...so what else did they need? There was no way Americans could afford to catch, process and market all the low-value fish. Where to begin?

Since good questions outnumber easy answers, the industry and all its players, most especially AFDF, began searching high and low for that magic potion or solution. For most of the first half of the decade, we asked a lot of people a lot of questions. We poked and prodded in countless directions. But when we reeled in our line, alas, there was little on it. We learned through this process what DIDN'T work. And sometimes that's more important than success.

A lot of people got discouraged, but the sheer magnitude of the "pot of gold" that would come with development of these fisheries was so great that others, including the Foundation, persevered. These positive thinkers believed the answers were there. There was a destiny to be reached if we could but pull together in the same direction just once.

That pulling together of one's failures and successes toward a common goal began to occur in the early 1980s with the creation of the Foundation's multi-faceted surimi project. Surimi brought together for common benefit fishermen, processors, equipment manufacturers, food scientists, reprocessors, government bureaucrats and politicians, among others. The result is that just four years later the Alaskan pollock industry is a blossoming reality producing in excess of 40,000 metric tons of surimi and pot-loads of fillets and blocks. Not only has the import hemmorhaging stopped but pollock has become an export star.

While the Foundation has some minor mopping up to do on the surimi question, it has moved on to other needs, concerns and opportunities. It has approached its next major undertaking, Alaskan flatfish, with a methodology not too dissimilar to that used on pollock. From what I've seen and heard so far, flatfish from Alaska will, one day in the not too distant future, be another feather in AFDF's cap.

So where does the Foundation and its partners in development go from here? Certainly I have no answers. One can but "point one's sails into the wind and aim for landfalls over the horizon."

The Lodestar and the Lodestar Update are published by Alaska Fisheries Development Foundation, 508 West Second Avenue, Suite 212, Anchorage, Alaska 99501, (907) 276-7315.

Subscriptions are $20 per year U.S., $30 per year outside the U.S.

Krys Holmes, Editor

# Director's Log

## Never our potential so high; never our funding so low

**By Mel Monsen**
**Executive Director**

My first memory of the Foundation is nearly nine years old. Though I had no idea then how it was organized and what it did, I stopped in as I made the rounds looking for a job. Little did I know that my visit would lead to a relationship that has culminated in my current position as executive director.

The Foundation has accomplished a lot in these first ten years, taking a new program from infancy into maturity. Initial power struggles and direction-finding have been overcome, and the Foundation has been able to participate in and positively affect many projects that have benefited the seafood industry. The results, though directed at the Alaska industry, have had national, even international ramifications.

By now readers must be aware of the Foundation's biggest success, the multi-year surimi project. The results of that effort are mind-boggling. The surimi production off of Alaska for 1989 has been estimated at an incredible 100,000 m.t., requiring a pollock harvest of 500,000 m.t. There are four shore-based surimi production plants, and (so far) ten surimi factory ships operating in Alaska. Of course, the Foundation can't take all the credit for these accomplishments. The number of contributors is immense, but the system that allowed the Foundation to identify and take action on an unrealized opportunity deserves credit.

Projects of the kind the Foundation conducts depend on private industry for their direction and most of their activity. Most of the projects, including those at Trident Seafoods, Alaska Pacific Seafoods, and the *Aleutian Mistress*, have left in their wake some real successes: There are four shore-based surimi plants and 10 surimi factory trawlers operating in Alaska today; most of Alaska's plants process white fish of some species. The Foundation has helped set the stage for significant profits in the private industry.

This success would lead one to believe that the Foundation has a bright future. But it may not be so. As you may know, the funding source for the Foundation is very unstable and is constantly under attack.

The 1989 Saltonstall-Kennedy appropriation (funded from U.S. tariffs on imported seafood products) is only $5 million for the entire country. This is the lowest appropriation level in the ten years AFDF has been operating. In addition, there are rumblings about using less of the allocation for industry-directed projects

This is all happening at a time when the industry is expanding into new fisheries at an incredible rate, creating research and development needs that S-K projects should be fulfilling. Perhaps the best example of the level of need is the proposals which are submitted to National Marine Fisheries Service in response to the S-K solicitation. In 1988 the U.S. seafood industry submitted 209 proposals totalling $22 million. Of these only 91 proposals totalling $7.5 million were selected.

We are at a critical point both in the need for industry-directed research and development projects, and in the commitment to make funds available for their realization.

The Alaska Fisheries Development Foundation stands as an example of what industry can do.

## Where would you like to see AFDF go in the next ten years?

**Rae McFarland:**

In the next ten years, we need to see a two-fold development: First, replace dropping consumption of ground beef with minced re-processed fish that will give higher nutritional value and lower fat; and second, learn how to use by-products for higher-quality animal feeds, to bring more agricultural activity to Alaska. For this, we will need a $25 million budget for AFDF in the next ten years.

I think we're going to replace 10% of the ground beef now being produced in the U.S. with ground fish. There are 125 million head of cattle in the U.S. They average about 250 lbs. each of dressed, boneless meat; 100 lbs. goes into hamburger. I think minced fish and surimi can capture 10% of that market. That would mean 500 million lbs. of minced fish. That's what I see for the future.

**Al Burch:**

In our first ten years, we've done a credible job in picking projects—most of them, anyway—that have been significant to development of the fisheries in Alaska. I hope we can continue to get the same participation that will allow us to make good decisions for the next ten years.

Our primary goal right now is flatfish. We have seen a tremendous increase in flatfish out here, and a decrease in pollock. I hope the Foundation can find some way to develop the flatfish species out here.

It's becoming increasingly important to develop more coordination and cooperation between the Foundation and the state of Alaska. By developing more industry participation and coordination with the state, the Foundation will continue to make a significant impact on Alaska's seafood industry.

**Oral Burch:**

The Foundation is 100% necessary. It provides to the industry a forum for cooperation within the industry, and the exchange of information that otherwise would not be possible. And neither aspect would be worthwhile without the other.

**Chris Riley:**

The major contribution of the Foundation is exploring ways to process groundfish out of the FCZ. In the next 10 years, the full OY of traditional groundfish species in the Bering Sea and Gulf will be harvested and processed domestically. Then there are two directions to go: one is to look at other species that have value but haven't been exploited. The other direction is to increase the value that can be exploited from every ton of fish. The Foundation has already begun this.

Part of increasing value of the fish is increasing efficiency, and reducing the cost of producing groundfish products. So we have many alternatives, and I think the decision of a focus should be made on an opportunistic basis—where there seems to be opportunity, go after it.

Just because actually managing to kill & process fish doesn't mean you're at the end of the learning process. It just means you've started.

**Chris Mitchell:**

The whole philosophy behind the science of development is that if you are successful, you quickly find yourself out of a job. Knowing when to move on is the key. It's not easy to walk away from "Da Glory Road," but AFDF has made the successful transition.

As individuals and companies, we all need to leave the comfort zone and move into the unknown from time to time. AFDF has been able to do this in the past; I hope it will continue to do so.

# Off the Cuff

**By Krys Holmes**

*"Tomorrow hangs on the knife edge of today, needing but the barest breath of free will or circumstance to direct it one way or another."*
*— Robert Kanigel*

Compiling this special 10th Anniversary Issue of The Lodestar was a lesson in perspective. AFDF has seen some hopes dashed, some projects skunked, and some good efforts go to waste. The Foundation has also created some powerful momentum for many companies to use to their own benefit. And it has successfully tamed some dragons so private companies wouldn't have to.

You can't achieve the second without enduring the first, and it's to the credit of the staff and board of directors that through this first decade AFDF has taken on the troubles and tried to steer the successes toward the private companies involved in its projects. I continue to be active and renew my membership yearly because I respect its courage, its audacity, and in some cases, its recklessness. AFDF is a peculiar creature, step-child of a rocky marriage between industry and the feds. It has grown up with ambiguities; it thrives on risk. For that reason alone it has my respect.

It is inevitable that in ten years an organization that was created to further the interests of such a broad constituency will fail someone at some time. AFDF has collected its share of disappointed critics; of fishermen who say they've seen no benefit from AFDF; of processors who say they could just as well have run the race alone; of companies who feel they didn't get enough publicity from their work with AFDF.

These are only some of the risks AFDF faces in its annual direction-finding quest. How to perform the tasks that will be most meaningful to private industry? How to prioritize overlapping goals? How to pursue the broader, more wide-reaching objective without disenfranchising the small-time operator? As the impact of AFDF's work is more widely felt throughout the U.S. food and protein industries, this last question is particularly pertinent.

These questions—some of them are AFDF's biggest problems—come as a direct result of its biggest successes. As the Foundation's effectiveness increased, demands on its energies increased. As more people heard about AFDF, more people had contributed opinions on where they wanted the Foundation to spend its resources next. Which is exactly what AFDF is about.

In the next ten years, I hope to see more participation in the Foundation's program development process, in its membership rosters, in its communications efforts, and in its search for alternative funding sources, from among the Alaskan fishermen and processors who have let their membership lapse, or who have never joined. More active members, and more activity from among members, will be the most important resource for AFDF in the future.

# INDUSTRY News

## On the trail of those high-seas salmon poachers

The U.S. State Department, the Governor of Alaska, industry groups and private companies are making some progress in the fight against illegal harvests of U.S. salmon on the high seas.

Pacific Seafood Processors Association (PSPA), a group of U.S. seafood processors, has led the fight to identify companies peddling illegal salmon at prices that undercut legitimate suppliers. PSPA estimates that at least 10,000 metric tons of salmon worth $15 million have been pirated from U.S. migrating stocks by the Taiwanese squid fleet. New evidence suggests that Japanese and Korean companies are also involved.

The illegal harvest concerns U.S. processors for two reasons: first, the product is being sold at prices far below U.S. product, and therefore is closing out markets for legally-caught salmon. Second, the fish appearing on the market are small, indicating they're immature, and that these harvests will have a long-term detrimental affect on the resource. Decreased run sizes of pinks and cohos in Southeast Alaska in 1988, and a substantial number of salmon marked with gillnet marks, add to these fears.

Frozen coho, sockeye and chum salmon is sent to Singapore and Japan for sale, PSPA charges. Often the product is unloaded under cover of darkness, its paperwork altered. PSPA has documented that between 4,000 and 8,000 metric tons of pink salmon have been shipped to Thailand for canning and re-export.

An October 31 story in the *Bangkok Post* reported that the Thai government has been asked by the U.S. State Department to help investigate the source of salmon shipped to Thai canneries. Thailand is a re-processing center for many fisheries companies worldwide, including U.S. tuna companies. Some Thai canneries are seeking supplies salmon from U.S. producers for canning and re-export.

Information about the activities of individual processors is hard to come by. Salmon canning statistics—including production levels and source of raw material—are held secret by the canning companies. However, one source in Thailand confirmed that at least some of the salmon canned there this year came from Taiwanese fishing boats operating in the North Pacific.

The governments of Thailand, Japan, Singapore and Taiwan have pledged to aid the U.S. effort to stop illegal salmon harvests in the Pacific. At the 1987 meeting of the International North Pacific Fisheries Commission, Japan called for cooperation among the traditional salmon fishing nations to "make every possible effort to prevent such activity."

Efforts are thwarted, however, by the fact that those countries whose help is most needed in the investigation are the countries whose people profit most from the activity.

In the meantime, Gov. Steve Cowper and a contingent from the Alaskan seafood industry have begun drafting a cooperative agreement with the Soviet Union for monitoring high seas activity. In a landmark meeting in October, U.S. and Soviet representatives agreed to work together to put a stop to high seas salmon interception, and to join forces to study unregulated groundfish harvests in the international waters of the Bering Sea.

For more information about the high seas salmon interception issue, call Barry Collier at PSPA, (206) 281-1667. For more information about the joint U.S.-Soviet agreements, call Henry Mitchell at Bering Sea Fishermen's Association, (907) 279-6519.

## *RALSTON PURINA SELLS VAN CAMP*

ST. LOUIS, MO - Ralston Purina Company on November 15 completed the sale of its Van Camp Seafood division to a group of investors led by PT Mantrust. The sale price was approximately $260 million. PT Mantrust is a privately-held company in Indonesia. Van Camp is expected to continue marketing its "Chicken of the Sea" canned tuna and salmon products.

Van Camp Seafood has been a member of AFDF for several years, and R&D Director Bill Reinke is a member of the AFDF Board of Directors.

the LODESTAR
Alaska Fisheries Development Foundation, Inc.
Charting the course of fisheries development today
Volume VI Number 4, Autumn 1988

*"Let us run with perseverance the race that is set before us."*
*— Hebrews 12:1*

## Be a part of the future of AFDF

Alaska Fisheries Development Foundation has come a long way in the past 10 years, and by all counts it has a long way to go in the next ten. You can participate—and benefit—in several ways.

**Become a Foundation member**

Design future projects;
Help set priorities;
Get priority access to information;
Include your products and services in projects

Your company can join for $100 (associate membership), $300 (voting membership) or $500 (supporting membership). Call or write to any staff member, or any of the board of directors listed in this issue.

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# HJR 27

DATE: 3/23/90 FURTHER:

DATE TURNED INTO OFFICE: 4-10-90

Resources Committee considered CSHJR 27 (Resources)

Relating to compensation for lost revenue and income caused by high seas interceptions of Alaskan salmon.

and recommended:

[✓] replace with SCS CSHJR 27 (Res) [✓] same title
[ ] or adopt CS [ ] new title
[ ] technical title change (HB only)

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

[✓] do pass

[ ] do not pass

[ ] no recommendation

[ ] individual recommendations

[ ] further referral to

| ATTACHES NEW FISCAL NOTE(S): | Dept/Date: | APPROVES PREVIOUS: | Dept/Date: |
|---|---|---|---|
| [ ] fiscal note(s) | | [ ] fiscal note(s) | |
| [✓] zero fiscal note(s) | Rev | [ ] zero fiscal note(s) | |
| [ ] appropriation-no fiscal note | | [ ] Governor's bill w/fiscal note | |

SIGNING DO PASS:

OTHER RECOMMENDATIONS:

"good luck"

Chair: Signature and Recommendation

# Representative Jim Zawacki
## Alaska State Legislature

3111 C STREET SUITE 415
ANCHORAGE ALASKA 99503
(907) 561-2037

WHILE IN JUNEAU
POUCH V
JUNEAU ALASKA 99811
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MEMBER
STATE AFFAIRS COMMITTEE
LEGISLATIVE COUNCIL
FINANCE SUBCOMMITTEE
PUBLIC SAFETY
ANCHORAGE CAUCUS
CO-CHAIRMAN


M E M O R A N D U M

TO: SENATOR BETTYE FAHRENKAMP, CHAIR
SENATE RESOURCES COMMITTEE

FROM: Jim Zawacki
Representative

DATE: March 26, 1990

RE: HJR 27

---

I would like to respectfully request that HJR 27, Relating to Compensation for Lost Revenue and Income Caused by High Seas Interceptions of Alaska Salmon, be scheduled for a hearing at the earliest convenience of the Chair.

Thank you for your time and consideration.

# Representative Jim Zawacki
## Alaska State Legislature

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CO-CHAIRMAN


M E M O R A N D U M

TO: ALL REPRESENTATIVES
ALASKA STATE LEGISLATURE

FROM: Representative Jim Zawacki

DATE: March 22, 1990

SUBJ: HJR 27

---

OBJECTIVE: To assist and protect Alaska's fisherman and to assure that the anadromous fish of Alaska origin are protected on the high seas.

SUMMARY: HJR27, requests the President of the United States to bring action before the appropriate international tribunal for recovery of damages on behalf of the State of Alaska and the fisherman of Alaska for revenue and income lost as a consequence of the illegal high seas interception of Alaska salmon.

It also requests the President of the United States to renegotiate existing fisheries treaties and agreements with Japan, South Korea, and Taiwan to provide procedures whereby individual fisherman, fisherman's associations and the states may recover damages from foreign fishing companies for income and revenue lost due to high seas interceptions in violation of the treaty or agreements.

HRJ27 further requests the Congress of the United States to establish a fund to reimburse Alaska fisherman and the State of Alaska for the income and revenue lost by the high seas interception of Alaska salmon and that this fund be financed by a tariff on the fishery products originating in those nations whose fisherman are intercepting Alaska salmon on the high seas.

CONCERNS: Throughout the committee process questions were raised regarding "Federal constitutional concerns with the language or the intent of HJR27." Alaska's delegation to to the United States Congress could find no such constitutional problems.

The constitution of the United States specifically allows citizens to petition the Congress; presumably, any citizen also has the right to contact the President, who is elected by the citizenry. Thus the resolution itself seems to pose no problems.

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Your support of Alaska's fisherman, the protection of Alaska's fishing industry and Alaska's future would be greatly appreciated.

I encourage a YES vote on HJR27. Thank you.

ENDORSEMENTS OF HJR27

March 22, 1990

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1. SEACOPS
2. Bristol Bay Native Corporation
3. Alaska Independent Fishermans' Marketing Association
4. Western Alaska Cooperative Marketing Association
5. Bristol Bay Herring Marketing Co-op
6. Kotzebue Fishermans' Association
7. Bristol Bay Driftnetters' Association
8. City of Manokotak
9. Bristol Bay Borough
10. City Council of Mountain Village
11. North Slope Borough
12. City and Borough of Sitka
13. Ketchikan Gateway Borough
14. United Fisherman of Alaska

# UNITED FISHERMEN OF ALASKA

211 4th Street, Suite 106
Juneau, AK 99801
907-586-2820

**MEMBER ASSOCIATIONS**

Alaska Crab Coalition
Alaska Independent Fishermen's Marketing Association
Alaska Longline Fisherman's Association
Alaska Trollers Association
Bering Sea Fishermen's Association
Bristol Bay Driftnetters Association
Concerned Area 'M' Fishermen
Cook Inlet Aquaculture Association
Copper River Fishermen's Cooperative
Cordova District Fishermen United
Kenai Peninsula Fishermen's Association
North Pacific Fisheries Association
Northern Southeast Regional Aquaculture Association
Peninsula Marketing Association
Petersburg Vessel Owners Association
Prince William Sound Aquaculture Association
Prince William Sound Seiners Association
Seafood Producers Cooperative
Southeast Alaska Seiners
Southern Southeast Regional Aquaculture Association
United Cook Inlet Drift Association
United Southeast Alaska Gillnetters
Western Alaska Cooperative Marketing Association

March 21, 1990

Representative Jim Zawacki
Room 609 Court Building
PO Box V
Juneau, AK 99811

Dear Representative Zawacki:

At the annual board of directors meeting, of the United Fishermen of Alaska, HJR27 was reviewed.

The board unanimously endorsed the concept set forth in the resolution.

If you have any questions concerning this matter, please feel free to contact our office.

Sincerely,

Ken Castner
Executive Director

FILE COPY

# An Estimate of Lost Revenue to Fishermen, Processor Employees and Processors Due to the High Seas Interception of Southeast Alaska's Pink Salmon

Economic Development Center

UAS - Ketchikan

January 5, 1989

S.E.A.C.O.P.S.
700 WATER STREET-UPPER
KETCHIKAN, ALASKA 99901
(907) 225-8004

## Summary

At the request of SEACOPS the following estimates of lost revenue due to high seas salmon interception were developed at the Economic Development Center, UAS-Ketchikan.

It is difficult to find a single measure of income from the Southeast Alaska salmon fishery (ex-vessel price for fish, wages to fishermen and processor employees, wholesale price for the processed fish, the processor's net income after production costs) with which to estimate the losses due to high seas salmon interception. Each one only tells part of the story and to add them together results in either mixing apples and oranges or counting the same dollar twice. For this report I have tried to estimate only two kinds of lost income: 1. The personal income to fishermen (crew shares) and to processor employees (wages) and 2. The net operating income (income after production costs have been subtracted) to boat owner/operators and processors.

To estimate the lost revenue, a hypothetical 1988 salmon season was constructed based on the salmon returns that had been predicted for Southeast Alaska by the Alaska Department of Fish & Game. This hypothetical season was then compared to the actual 1988 salmon season in Southeast Alaska. Estimates for the number and weight of salmon caught in Southeast Alaska in 1988 are from Alaska Department of Fish & Game (ADF&G) harvest estimates (as of 9/30/88). Ex-vessel

and wholesale prices for Southeast Alaska salmon are from the National Marine Fisheries Service's "Fishery Market News" with some adjustments based on interviews with Southeast Alaska fishermen and processors. Estimates of production and labor costs are from Southeast Alaska cannery and cold storage operators.

Apart from the difference between the number of salmon that actually returned and the number that were predicted there are three other variables that have been factored into the hypothetical season:

1. An increase in the amount of fishing time for seiners, drift gillnetters and trollers as a result of there being more pinks and cohos

2. An adjustment in the ex-vessel price (the price of the fish paid by the processor to the fisherman) of almost all salmon species due to the greater volume of fish harvested

3. An adjustment in the per unit wholesale value of the catch due to a greater volume of fish on the market.

With all of the above taken into account the revenue lost in the Southeast Alaska salmon fishery due to high seas salmon interception is estimated to be:

$ 25.8 million to fishermen

$ 7.7 million to processor employees

$ 54.7 million to processors

In the process of preparing this report two significant future losses due to high seas interception surfaced: 1. Diminished future runs of chum and coho due to over fishing on the high seas and 2. Lost customers for canned and fresh salmon due to increases in price and a scarcity of product. Estimating these losses was beyond the scope of this report even though in time they will probably dwarf the losses that are estimated here.

THE SENATE
FIFTEENTH LEGISLATURE, 1990
STATE OF HAWAII

S.C.R. NO. 46
S.D. 1

# SENATE CONCURRENT RESOLUTION

URGING THE PRESIDENT OF THE UNITED STATES AND THE UNITED STATES CONGRESS TO SUSPEND TRADE RELATIONS WITH ANY NATION SUPPORTING OR SANCTIONING THE PRACTICE OF DRIFTNET FISHING.

WHEREAS, driftnet fishing fleets, which are capable of spinning out approximately 30,000 miles of net every day, are decimating the Pacific fisheries resource and illegally trapping and killing endangered or threatened marine life and seabirds having little or no commercial value; and

WHEREAS, these fine, monofilament nets stretch as much as thirty miles in length and forty feet down, indiscriminately trapping whales, dolphins, sharks, fur seals, billfish, salmon, tuna, and albatross, brutalizing and killing them; and

WHEREAS, these dead or dying creatures are then discarded, left to rot or die slow, agonizing deaths; and

WHEREAS, the devastation caused by lost or abandoned driftnets is perhaps worse, as these highly durable nets continue to "ghost fish" indefinitely, continuing to trap and ensnare fish and other marine life for no beneficial purpose whatsoever; and

WHEREAS, these nets sink with the weight of their helpless victims, only to rise up again as the corpses rot and decompose to renew the devastating cycle; and

WHEREAS, at the South Pacific Fisheries Forum held in June 1989, twenty nations called for the Asian driftnet fishing fleets to end their plunder of the Pacific; and

WHEREAS, a "Proclamation on High Seas Driftnet Fisheries in the North Pacific Ocean," dated October 1989, was signed by the Premier of British Columbia and the Governors of Alaska, Washington, Oregon, Idaho, California, and Hawaii to urge Canada and the United States to initiate diplomatic efforts through the United Nations and other appropriate forums to secure an international ban on driftnet fishing on the high seas; and

WHEREAS, only Japan and Taiwan, which maintain large driftnet fleets, refused to join in this effort, and South Korea, although it pulled its driftnet fishing vessels out of the south

Pacific, continues to maintain driftnet fishing operations in the north Pacific; and

WHEREAS, despite Japan's contention that there is insufficient scientific data to prove driftnet fishing is harmful to the environment, Japan has banned driftnets closer than 700 miles to its shores for the last ten years to protect its own fisheries; and

WHEREAS, existing evidence tends to refute Japan's position, for example:

(1) In 1988-1989, driftnetters caught between 40,000 and 50,000 tons of albacore tuna, which is four to five times greater than the sustainable yield of the Pacific, and such exploitation could cause a collapse of the fishery within two years;

(2) Research by Canadian fisheries biologists has revealed unacceptable numbers of mortalities for various species of whales, dolphins, porpoise, seals, seabirds, and other marine life as a result of driftnet fishing;

(3) Biologists believe that hundreds of thousands, perhaps millions, of seabirds perish each year in driftnets of the more than 1,000 fishing vessels in the Pacific ocean; and

(4) Scientists studying whale populations fear that driftnetting may pose an even greater threat to the existence of whales than commercial whaling;

and

WHEREAS, newly outfitted fishing vessels can carry twice the amount of driftnet as older vessels; and

WHEREAS, the Hawaii State Legislature has previously acted to prohibit the deplorable practice of driftnet fishing in Hawaiian waters by enacting Act 345 during the Regular Session of 1989; and

WHEREAS, stronger measures must be taken to send a message to driftnet fishing nations that the brutal and indiscriminate killing of marine life through the use of driftnets will no longer be tolerated; now, therefore,

BE IT RESOLVED by the Senate of the Fifteenth Legislature of the State of Hawaii, Regular Session of 1990, the House of Representatives concurring, that the Legislature hereby publicly condemns the practice of driftnet fishing and expresses its deep concern over the continuation of the practice; and

BE IT FURTHER RESOLVED that the President of the United States and the United States Congress are urged to suspend trade relations with any nation supporting or sanctioning the practice of driftnet fishing; and

BE IT FURTHER RESOLVED that certified copies of this Concurrent Resolution be transmitted to the President of the United States, the President of the United States Senate, the Speaker of the United States House of Representatives, and Hawaii's congressional delegation.

# Salmon smuggler enters guilty plea

The Associated Press

SEATTLE — A Taiwanese fish broker arrested in an undercover sting operation last summer has pleaded guilty to conspiracy, smuggling and money-laundering charges related to pirated salmon. He faces up to 30 years in prison and $1 million in fines, officials said.

Patrick Lee, 41, entered the plea Monday and will be sentenced March 23.

Assistant U.S. Attorney Robert Chadwell said charges involving trade in smaller amounts of salmon were dropped as part of a plea agreement.

Lee was arrested last summer with five others following a six-month sting operation in which federal agents agreed to pay $1.3 million for salmon caught illegally by two Taiwanese fishing boats.

Such harvests have outraged Alaska fishermen, who charge the Taiwanese and other high-seas fishermen are taking salmon that otherwise would return to state waters to spawn. Scientist sampling of the high-seas salmon have found that some return to Asian spawning grounds, and some to North America.

The six men caught in the Seattle sting were charged with violating the Lacey Act, which prohibits commerce in illegally caught fish or wildlife. Taiwan has a law expressly forbidding its fishing boats from catching salmon since no salmon breed in its rivers.

Lee's name was noticed last spring when he placed ads in an international seafood journal for headed and gutted salmon.

Undercover investigators arranged to buy 500 tons of salmon for $1.3 million.

Lee and John Chin-Hong Wang, a naturalized American citizen who had just graduated from the Massachusetts Institute of Technology and whose father was a vessel owner, flew together from Taiwan to Seattle, investigators said.

According to a court filing, an undercover agent, code-named "Frambes," showed Lee $1.5 million in cash in a safe deposit box at Seafirst Bank, supposedly to cover the purchase.

Please see Page D-3, FISH

# FISH: Taiwanese broker pleads guilty to salmon scam

Continued from Page D-1

Frambes contacted undercover agents on Redfin, a leased freighter, and confirmed they had rendezvoused with two Taiwanese squid boats on the high seas and had seen the salmon in their holds.

Lee and Wesley Meng Hsu, identified as Lee's Los Angeles agent, then went into a private room at Seafirst Bank where Frambes handed over an initial payment of $330,000.

Hsu and Lee were arrested outside the bank with the money in Hsu's briefcase.

Meanwhile, at sea, the captains of the two squid boats, Meng Gin Hsu and Chan Lon Lin, were invited on board the Redfin. Once aboard the U.S.-flagged vessel, they were arrested, with interpreter Jen Chu.

As a Coast Guard cutter arrived on the scene, the two Taiwanese vessels fled. In an ensuing chase, one boat escaped while the other was boarded by the Coast Guard and Taiwanese authorities.

The arrests, combined with the conviction of two major fish brokers earlier this year, has dried up the sale of pirated salmon in the United States, said Wayne Lewis, the special agent in charge of law enforcement at the National Marine Fisheries Service.

But he said Taiwanese driftnet boats continue to pirate U.S. salmon.

Anchorage Times
Nov. 3, 1989

Sen. Ted Stevens
... initiated idea

# U.S. seeks ban on drift netting

By DANIEL R. SADDLER
Times Writer

The United States has introduced a resolution in the United Nations General Assembly seeking a global moratorium on the use of drift nets to harvest fish on the high seas.

The resolution asks all nations to voluntarily end use of the nets by June 30, 1992, and to cooperate in collection of scientific data on the impact of the fishing practice on marine life.

It also seeks an immediate ban on high-seas drift netting in the South Pacific to prevent irreversable damage to fish resources and to give time for development of fish management plans.

In recent years, fishing vessels from Japan, Tai-

See Ban, page A-6

# Ban: High-seas drift netting

Continued from page A-1

wan, South Korea and China have increased their use of the nets. Stretched up to 40 miles through the international waters, the monofilament nets efficiently harvest many species of fish and squid, but also indiscriminately snare marine mammals, seabirds and other species.

The resolution echoes the concerns of fishermen and environmentalists in Alaska and elsewhere that improper use of driftnets represents a "strip mining" of the oceans.

"Large-scale pelagic drift-net fishing is an indis- c nate fishing method which threatens the ef- ve conservation of living marine resources h as highly migratory and anadromous species ish, birds and marine mammals," the resolution said.

In recent months the United States signed driftnet treaties with Japan, Taiwan and South Korea, requiring observers to gather data on catches and watch for fishing abuses, and in some cases, granting enforcement powers to the U.S. Coast Guard.

Alaska Sen. Ted Stevens proposed the idea for a U.N. resolution to Secretary of State James Baker several months ago, Jane Robbins, a Stevens aide, said Thursday.

"United Nations approval of this resolution would place tremendous worldwide pressure on the governments of Japan, Taiwan and South Korea to put an end to their high seas drift-net fleets," Stevens said in announcing the resolution.

Stevens hopes to build global pressure to bear against those Asian nations to end the practice and to make sure that any driftnets banned in one ocean don't end up in the North Pacific to compete with Alaska fishermen.

"There's been a move in the South Pacific to start a moratorium on drift nets down there, and Sen. Stevens is worried that the fleets that operate in the South Pacific were kicked out they might move to the North Pacific," said Robbins.

U.N. delegations from New Zealand and Australia co-sponsored the resolution, introduced in the General Assembly Thursday afternoon by Thomas Pickering, the U.S. ambassador to the United Nations.

The non-binding resolution will be referred to the U.N. Committee on Environment for consideration, and a vote could come by early December, Robbins said.

DON YOUNG
CONGRESSMAN FOR ALL ALASKA

WASHINGTON OFFICE
2331 RAYBURN BUILDING
TELEPHONE 202/225-5765

COMMITTEES:
INTERIOR AND INSULAR AFFAIRS
MERCHANT MARINE AND FISHERIES
POST OFFICE AND CIVIL SERVICE

# Congress of the United States

## House of Representatives

Washington, D.C. 20515

January 10, 1990

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P.O. BOX 1860
NOME, ALASKA 99762

Honorable Jim Zawacki
Alaska House of Representatives
Pouch V
Juneau, AK 99811

Dear Jim:

Thank you for your letter regarding House Joint Resolution #27. I appreciated hearing from you.

I have asked my staff on the Subcommittee on Fisheries and Wildlife Conservation and the Environment to review the resolution as you requested. A copy of the memo that was prepared is enclosed. I hope that this will be of help in deciding whether to move forward with your resolution.

If I can provide any additional information or assistance, please let me know.

Sincerely,

DON YOUNG
Congressman for All Alaska

Enclosure

DY:rhm

U.S. House of Representatives
Committee on
Merchant Marine and Fisheries
Room 1334, Longworth House Office Building
Washington, DC 20515-6230



January 9, 1990

MEMORANDUM

TO: Congressman Don Young

FROM: Minority Staff

RE: Alaska House Joint Resolution No. 27

The following analysis was prepared in response to the request received from Representative Zawacki of the Alaska State Legislature.

Representative Zawacki indicates that there may be "Federal constitutional concerns with the language or the intent of the resolution." Staff can find no such Constitutional problems. A resolution of this nature is simply a request by the Legislature for the Federal government to take some action. The Constitution of the United States specifically allows citizens to petition the Congress; presumably, any citizen also has the right to contact the President, who is elected by the citizenry. Thus, the resolution itself seems to pose no problems.

There are, however, potential policy and legal difficulties with certain sections of the resolution. These will be addressed in the order in which they appear.

First, while the government of the United States can request other nations to submit to binding arbitration in order to recover damages from lost fish, those nations can refuse to do so and there is no legal means to compel them to do so. The United States no longer accepts the compulsory jurisdiction of the International Court of Justice (ICJ); therefore, any decision to take a case to the ICJ must be agreed to by both parties. Further, neither Korea nor Taiwan are recognized as nations by the ICJ and we could not bring any case involving these countries. While we have an arbitration agreement with Taiwan, it is not compulsory. An initial review by the Department of State indicates that there is not even a voluntary arbitration procedure available to the U.S. and Korea. Thus, there is no way for the Federal government to comply with the request of the Alaska Legislature, even if it chose to do so.

Second, the U.S. government can obviously seek to renegotiate treaties at any time. However, there is no requirement that the other treaty parties agree to new treaty terms. If these terms included a right of suit by private individuals beyond what is currently allowed under law, it is doubtful that the foreign government would participate in the treaty.

Third, there is a problem proving loss to Alaskan fishermen. As you are aware, the salmon enforcement cases currently being prosecuted by the U.S. government involve violations of the Lacey Act, not the Magnuson Fishery Conservation and Management Act (MFCMA). This is primarily due to the fact that it is nearly impossible to prove the continent of origin of a salmon found on the high seas. This was the rationale behind your amendment to the MFCMA establishing a rebuttable presumption regarding continent of origin of salmon. However, in order to collect damages from a foreign company, there is probably a need for a plaintiff to demonstrate a higher standard of proof.

Finally, the resolution requests the Congress to enact legislation to reimburse Alaskans for lost revenue. Congress has the power to do this if it chooses, although the lack of success in reimbursing those who arguably have suffered a greater loss calls into question the desire of Congress to consider such legislation. Further the proposed funding mechanism - a tariff on imported fish products - would most likely violate the General Agreement on Tariffs and Trade.

In sum, the resolution does not violate the Constitution of the United States but does pose problems in regard to federal and international law and policy.

FRANK H. MURKOWSKI
ALASKA

COMMITTEES:

VETERANS' AFFAIRS (RANKING MEMBER)
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January 12, 1990

The Honorable Jim Zawacki
Alaska House of Representatives
Pouch V
Juneau , Alaska 99811

Dear Representative Zawacki:

Thank you for asking me to comment on HJR 27, relating to compensation for lost revenue and income caused by high seas interceptions of Alaskan salmon.

As was explained in telephone conversations between our staffs, I took the step of referring your questions on the constitutionality of the resolution to the specialists in international and domestic law at the Congressional Research Service of the Library of Congress.

I'm pleased to report that they find no specific constitutional problems with any of the three "resolve" clauses in the bill. There may, however, be other legal and practical difficulties.

The first clause asks the President of the United States to "bring an action before the appropriate international tribunal for recovery of damages on behalf of the State of Alaska and the fishermen of Alaska for revenue and income lost..." This poses a problem in that there appears to be no international standing tribunal that operates as a court in economic disputes of this nature. International claims tribunals can be established by agreement between two or more nations to address specific issues, but would of course require the consent and participation of the offending nation. In addition, such tribunals are rarely, if ever, established in such a way as to make their recommendations binding.

Another option might be the World Court, but its decisions are also non-binding. Further, the World Court is primarily involved in political, rather than economic disputes. Finally, approaching it with a case where few violators can positively be identified could leave the U.S. in a position of seeking damages from the foreign governments, and that would probably run counter to the generally recognized principles of sovereign immunity.

The second of the clauses asks that existing agreements with Japan, South Korea and Taiwan be renegotiated to provide procedures for the recovery of damages from foreign fishing companies. Although as a practical matter this might be somewhat difficult to accomplish, it presents no legal difficulty. However, it could be difficult to resolve technical questions such as quantifying losses from the activities of aspecific foreign company.

The final clause calls upon Congress to establish a fund to reimburse fishermen and the State for losses, and specifies that the fund should be financed by a tariff on fishery imports from nations whose fishermen intercept Alaska salmon. The establishment of a fund presents no legal problem. However, the imposition of a tariff might do so. Such a tariff would probably be considered a violation of the General Agreement on Trade and Tariffs. One could argue that the situation fits a GATT-provided exception for cases in which the preservation of a species is at risk, butwhether or not the Office of the U.S. Trade Representative would fell such an argument could prevail is open to question.

I hope this is helpful. Please let me know if I can be of any further assistance.

Sincerely,

Frank H. Murkowski
United States Senate

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
*National Marine Fisheries Service*
*P.O. Box 21668*
*Juneau, Alaska 99802-1668*
7 February 1989

Dr. David Harrison
Representative Jim Zawacki's Office
House of Representatives
P.O. Box V
Juneau, Alaska 99811

Dear Dr. Harrison:

As we discussed on the telephone on 3 February 1989, I am providing you with some information on the high-seas gillnet fisheries of the North Pacific Ocean and their interceptions of salmon originating in North America. No document contains all the information you wanted, and some of the information you want simply doesn't exist.

At the present time, three foreign fisheries are likely to intercept salmon of North American origin: (1) the Japanese high-seas mothership salmon fishery, (2) the Japanese land-based salmon fishery, and (3) the Japanese, Republic of Korea, and Taiwanese high-seas squid fisheries. The enclosed documents discuss how each of these fisheries operate and contain some information on their interceptions of North American salmon. The information is most complete for the Japanese mothership fishery. The next best information is for the Japanese land-based salmon fishery. Of the three, we know the least about the foreign high-seas squid fishery.

In the past, the foreign trawl fisheries in the U.S. Exclusive Economic Zone (EEZ) off the coast of Alaska for walleye pollock and bottomfish also intercepted some salmon of North American origin, but the directed foreign trawl fisheries have been excluded from the U.S. EEZ in the Gulf of Alaska since 1 January 1987 and in the Bering Sea and Aleutian Islands areas since 1 January 1988.

A directed foreign trawl fishery for Pacific whiting (hake) in the U.S. EEZ off the coasts of Washington, Oregon, and California still intercepts some salmon of North American origin, but it is unlikely that any are of Alaskan origin.

For specific details on the Japanese mothership or land-based salmon fisheries, I suggest you contact Dr. Michael D. Dahlberg, Auke Bay Laboratory, National Marine Fisheries Service (789-6002). He directs the NMFS program for monitoring and analyzing those fisheries.

For specific details on the foreign high-seas squid fisheries, I suggest you contact Mr. Steven E. Ignell, Auke Bay Laboratory, NMFS (789-6029). He directs the NMFS program for monitoring and analyzing the high-seas squid fisheries.

The Federal Government is working towards eliminating the high-seas interceptions of North American salmon. Since the early 1950's, the National Marine Fisheries Service (and its predecessor agency, the Bureau of Commercial Fisheries) has worked with Congress, the U.S. Department of State, the U.S. Coast Guard, and Alaska and the other Pacific Coast states to reduce the incidental harvest of North American salmon by the Japanese mothership and landbased high-seas salmon gillnet fisheries, particularly through our participation in the International North Pacific Fisheries Commission.

Since 1985, NMFS has been monitoring the foreign high-seas squid fisheries with particular interest in the incidental catch of salmon, steelhead, marine mammals, and sea birds. We have placed U.S. scientific observers aboard Japanese and Republic of Korea commercial squid fishing vessels as well as on Japanese, Taiwanese, Republic of Korea, and Canadian squid research vessels.

Also, since 1986, NMFS has been involved in domestic and international investigations involving high seas harvesting, transportation, and sale of salmon by vessels from Taiwan. As a result of our efforts, it appears that the flow of these fish into the United States has stopped. However, we have received reports indicating that salmon harvested illegally by Taiwanese vessels have been shipped elsewhere, notably to Singapore and Thailand, where they are canned and then shipped to Europe. In addition, Japanese enforcement officials recently uncovered an illegal salmon harvesting and shipping scheme involving Taiwanese vessels.

NMFS recently undertook several initiatives to improve the monitoring of illegal salmon harvesting and shipping activities. We launched a cooperative enforcement program with Japan by placing a NMFS Special Agent on board a Japanese enforcement vessel assigned to the North Pacific squid driftnet fishing area. We also were able to exchange information with Japanese and Soviet enforcement officials regarding the high seas fishing activities of Taiwanese driftnet vessels. We intend to expand these information exchanges in the future.

In the meantime, NMFS has worked with the Department of State to initiate talks with Japan and Korea and to request talks

with Taiwan concerning the monitoring and enforcement agreements called for by the Driftnet Impact Monitoring, Assessment, and Control Act of 1987. Also, NMFS has contacted officials in Hong Kong, Singapore, Thailand, Japan, Korea, and Taiwan to request their assistance in providing information on possible illegal salmon shipping schemes. We hope that these initiatives will enhance our monitoring and enforcement capabilities.

Sincerely,

Aven M. Andersen

Aven M. Andersen, Ph.D.
Fisheries Management Biologist

Enclosures:

cc: Brad Pierce, House Research Agency

North American Journal of Fisheries Management 4:414–430, 1984


# Yield Loss of Western Alaska Chinook Salmon Resulting from the Large Catch by the Japanese Salmon Mothership Fleet in the North Pacific Ocean and Bering Sea in 1980

RICHARD L. MAJOR

*Resource Ecology and Fisheries Management Division*
*Northwest and Alaska Fisheries Center*
*National Marine Fisheries Service*
*National Oceanic and Atmospheric Administration*
*2725 Montlake Boulevard East*
*Seattle, Washington 98112*

## ABSTRACT

**The Japanese salmon mothership fleet, fishing with gill nets in the North Pacific Ocean and Bering Sea in 1980, took a record 704,000 chinook salmon (*Oncorhynchus tshawytscha*), an estimated 380,000 of which originated in western Alaska. On the basis of information coalesced from earlier studies, non-catch mortality of western Alaska chinook salmon (referring to fish that die at sea because of their encounter with the gill nets but are not taken aboard ship as part of the catch) also was set at 380,000 fish. Nearly all were 1, 2, or 3 years from maturity. By balancing growth against mortality over time to maturity, it was estimated that the survivors of western Alaska chinook salmon caught or killed at sea as a result of the gill-net fishery would have weighed 6.52 times (range 3.53–11.58) the original high-seas catch had they been allowed to mature and enter the coastal fisheries of western Alaska. This ratio is, by far, the highest yet reported for Pacific salmon. The aggregate 1980–1983 chinook salmon runs to western Alaska (catch plus escapement) were reduced by 5,712 t (range 1,986–13,288) because of the 1980 mothership fishery.**

The record high catch of 703,798 chinook salmon (*Oncorhynchus tshawytscha*) by the Japanese salmon mothership fleet, fishing with gill nets in the North Pacific Ocean and Bering Sea in 1980, generated new interest in the possible effects of the high-seas fishery on the inshore runs of chinook salmon, particularly those originating in rivers that enter the Bering Sea through western Alaska (Fig. 1). This interest is based on findings summarized in the International North Pacific Fisheries Commission (INPFC) joint comprehensive report on chinook salmon (Major et al. 1978). The report showed that western Alaska chinook salmon predominate in the central Bering Sea, where large numbers are often taken by the mothership fishery, and occur elsewhere throughout the mothership fishing area. Asian chinook salmon, on the other hand (mostly from the USSR), predominate in the southern and western reaches of the mothership fishing area and occur less frequently in the central Bering Sea.[1] The report (Major et al. 1978) further showed that 80% or more of the mothership catch typically is made up of immature individuals 1–3 years from maturity. This, coupled with the knowledge that chinook salmon, the largest of all species of Pacific salmon, would grow from roughly 2.5 kg on the high seas to 9.5 kg inshore at time of maturity in western Alaska, suggests that the differential yield effect associated with high-seas harvesting of chinook salmon could be prodigious.

Assessing the effects of offshore fishing on the yield of Pacific salmon was originally a subject of wide interest in the 1960's and early 1970's. There emerged an impressive body of papers prepared by scientists of four nations (Canada, Japan, USA, and USSR) dealing with the five major species of salmon. Sockeye salmon (*Oncorhynchus nerka*), chum salmon (*Oncorhynchus keta*), and pink salmon (*Oncorhynchus gorbuscha*) were studied in terms of distant high-seas fisheries, while coho salmon (*Oncorhynchus kisutch*) and chinook salmon were examined in the somewhat different context of coastal troll fisheries.

Ricker (1976) reviewed, condensed, and in some cases extended the pertinent earlier works

[1] Fredin et al. (1977) provided comprehensive background information on Pacific salmon and the high-seas fisheries of Japan.




Figure 1
to 197
1977
and 9.
right-
Yukon

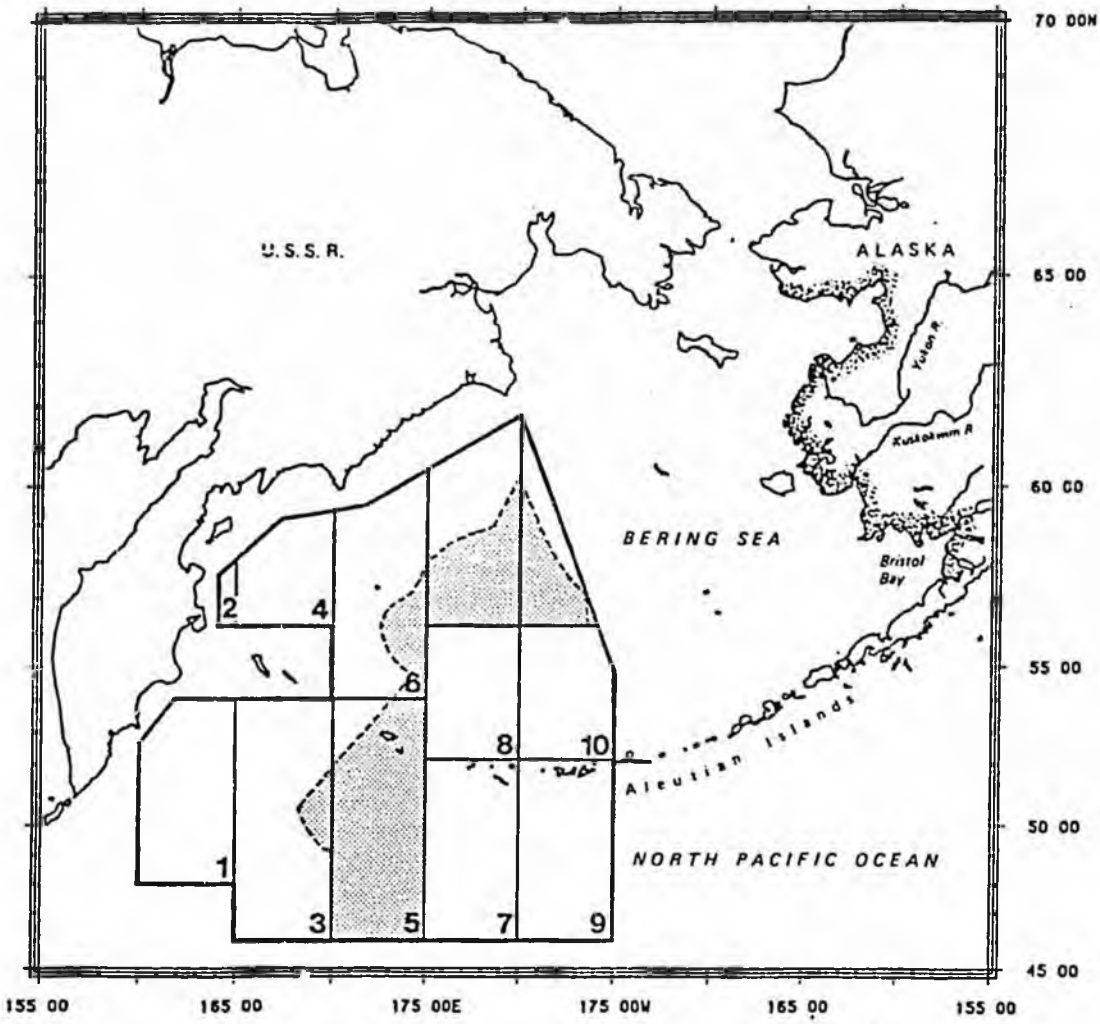


**Figure 1.** Geographic areas important to the study. The Japanese salmon mothership fishery prior to 1977 is identified by the bold outer margin; in 1978 and later years by the stippled inner area. 1977 was a transition year in which fishing was allowed in the stippled inner area, in subareas 7 and 9, and in the southern portions of subareas 8 and 10. Subareas are numbered in the lower right-hand corner of each block. Western Alaska, including the Bristol Bay, Kuskokwim and Yukon fishing regions, also is shown.

on growth, natural mortality, non-catch mortality, and yield of Pacific salmon. Of particular value were Ricker's conclusions on non-catch mortality (referring to fish that die at sea because of their encounter with fishing gear but are not taken aboard ship as part of the catch). For immature fish taken in a gill-net fishery on the high seas, he estimated that one is killed for every one landed; for mature fish in their final year, one fish dies for every three landed.

In this paper, I describe a process for estimating the potential yield loss of western Alaska chinook salmon resulting from the large Japanese mothership catch in 1980 and compare the results to estimates of yield loss reported earlier in studies of other species of Pacific salmon. The potential sources of error also are discussed, and the sensitivity of the yield loss estimate to changes in the various input parameters is examined.

## Calculation of Yield Loss

The effect of high-seas fishing on yield is measured as the potential change in mass between

fish caught or otherwise dying at sea because of the fishing activity and survivors of the same fish if they had been allowed to move inshore to the coastal fishery. Because the weight of the survivors reaching the coast always exceeds the weight of the catch taken at sea, studies of yield effect are, in fact, studies of yield loss (Ricker 1976).

Yield loss can be expressed either in terms of total catch (the observed coastal catch (C) plus the added potential catch inshore of fish caught or otherwise dying at sea because of high-seas fishing activity (P) divided by the sum of the observed coastal catch (C) and the observed high-seas catch (H)), or in terms of the high-seas catch alone—(P) divided by (H), without consideration of the coastal catch. Because the inshore catch of chinook salmon involved in the 1980 high-seas fishing season was not complete until 1983 (after the present study was initiated), this analysis is in terms of the 1980 high-seas catch alone, hence (P/H). For example, a ratio of 1.14 would mean that the potential inshore catch is 1.14 times the high-seas catch (14% higher).

The format for computing the potential change in mass (Parker 1963) is essentially that in which growth and natural mortality are balanced over time:

$$m = e^{(g-q)t}$$

where

m = change in mass,
g = monthly instantaneous growth rate,
q = monthly instantaneous natural mortality rate,
t = time, in months, between the high-seas and coastal fisheries.

Change in mass in this study is calculated separately for 119 cells, each consisting of a unique combination of the following categories:

(1) month
(2) subarea
(3) maturity stage
(4) ocean age
(5) sex

} at time of capture in the high-seas fishery

(6) projected ocean age at time of return to coastal waters

This was done because the percentage of western Alaska chinook salmon in the Japanese salmon mothership fishery varies greatly by month and subarea and also because the biological data from the fishery are grouped by month and subarea. Each cell is weighted according to its representation in the total catch of western Alaska fish in the 1980 Japanese mothership fishery. Finally, potential change in mass is adjusted by the non-catch mortality factor. Hence, the equation becomes:

$$m = \sum_{c=1}^{119} f_c w_c e^{(g_c - q_c)t_c}$$

where the added considerations are: cell (c), weighting factor (w), and non-catch mortality (f).

Given the non-catch mortality factors provided by Ricker (1976), four additional bits of information are required:

(1) maturity, ocean-age, and sex composition of western Alaska chinook salmon in the 1980 Japanese mothership fishery by month and subarea,
(2) growth,
(3) natural mortality,
(4) maturity schedule.

The derivation of this information is presented in the following subsections. For each of the key variables involved (proportion of western Alaska fish in the high-seas catch, growth, natural mortality, maturity schedule, and non-catch mortality), the text discussion is developed in terms of average values or best estimates thereof. The sensitivity of the yield-loss estimate to changes in the five variables is discussed separately.

### Area of Origin, Maturity, Ocean-Age and Sex Composition

The maturity, ocean-age, and sex composition of (1) the 1980 Japanese mothership catch of chinook salmon as a whole (without reference to area of origin), and (2) the western Alaska portion of the catch are presented in Table 1 by month and subarea. The subarea system was devised by Fredin and Worlund (1974) and also was used later in my own studies to determine the origin of chinook salmon taken on the high seas (Major et al. 1975, 1977a, 1977b). The subareas are shown in Fig. 1 as they pertain to the earlier studies and to the present study. The system of age designation, first appearing in Table 1 and then used throughout the rest of the paper, shows the number of annuli in fresh water by a figure preceding the dot and the number of annuli in the ocean by a figure following the dot. Thus, a

**Table 1. Catch of chinook salmon in the Japanese mothership fishery in 1980 by month, subarea, maturity, ocean age, and sex.**

| Month and subarea | Total catch[a] | | | | | | | | Proportion western Alaska[c] | Western Alaska catch | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mature, .2[b] | | Immature .1 | | Immature .2 | | Immature .3 | | | Mature, .2 | | Immature .1 | | Immature .2 | | Immature .3 | |
| | Male | Female | Male | Female | Male | Female | Male | Female | | Male | Female | Male | Female | Male | Female | Male | Female |
| June | | | | | | | | | | | | | | | | | |
| 3 | 29 | 0 | 0 | 0 | 307 | 315 | 40 | 79 | 0.320 | 0[d] | 0[d] | 0 | 0 | 98 | 101 | 13 | 25 |
| 5 | 1,058 | 11 | 0 | 0 | 11,195 | 11,514 | 1,446 | 2,882 | 0.345 | 0[d] | 0[d] | 0 | 0 | 3,863 | 3,972 | 499 | 994 |
| 6 | 58 | 1 | 0 | 0 | 617 | 634 | 80 | 159 | 0.250 | 15 | 0 | 0 | 0 | 154 | 159 | 20 | 40 |
| 8 | 450 | 5 | 0 | 0 | 4,773 | 4,908 | 616 | 1,229 | 0.655 | 295 | 3 | 0 | 0 | 3,126 | 3,215 | 403 | 805 |
| 10 | 124 | 1 | 0 | 0 | 1,315 | 1,352 | 170 | 338 | 0.945 | 117 | 1 | 0 | 0 | 1,243 | 1,278 | 161 | 319 |
| July | | | | | | | | | | | | | | | | | |
| 3 | 30 | 1 | 24 | 13 | 3,362 | 3,499 | 175 | 348 | 0.183 | 0[d] | 0[d] | 4 | 2 | 615 | 640 | 32 | 64 |
| 5 | 954 | 29 | 756 | 424 | 106,116 | 110,448 | 5,519 | 11,004 | 0.103 | 0[d] | 0[d] | 78 | 44 | 10,930 | 11,376 | 568 | 1,133 |
| 6 | 195 | 6 | 46 | 26 | 6,206 | 6,460 | 464 | 926 | 0.665 | 130 | 4 | 31 | 17 | 4,127 | 4,296 | 309 | 616 |
| 8 | 543 | 16 | 358 | 201 | 83,582 | 86,993 | 4,851 | 9,674 | 0.690 | 375 | 11 | 247 | 139 | 57,672 | 60,025 | 3,347 | 6,675 |
| 10 | 0 | 0 | 1,102 | 617 | 99,798 | 103,872 | 3,157 | 6,296 | 0.910 | 0 | 0 | 1,003 | 561 | 90,816 | 94,524 | 2,873 | 5,729 |
| | | | | | Total 703,798 | | | | | | | | | Total 379,932 | | | |

[a] Total catch (number of fish) is allocated by maturity and ocean age on the basis of data reported by the Fishery Agency of Japan (1981a, 1981b). The numbers of males and females were determined from historical averages reported by Major et al. (1978).

[b] See text for explanation of term.

[c] Adapted from Major et al. 1977b (Fig. 1a and 1b).

[d] In accordance with the rationale of the earlier studies to determine continent of origin of chinook salmon taken in the Japanese mothership fishery (Major et al. 1975, 1977a, 1977b), all maturing fish taken in subareas 3 and 5 were assumed to be of Asian origin.

.3 fish is one whose scale reflects three annuli at sea (freshwater age unspecified), a 2. fish is one whose scale shows two annuli in fresh water (ocean age unspecified), and an age 2.3 fish is one with two annuli in fresh water and three at sea. Total age (year of life) is obtained by adding one to the sum of the freshwater and ocean ages. This system of age designation follows the recommendations of Koo (1962).

Estimates of the area of origin of chinook salmon in the mothership area are based on a combination of direct and indirect evidence. Tagging studies (Aro et al. 1971; Aro 1974, 1980; Fishery Agency of Japan 1981c) show conclusively that western Alaska chinook salmon range as far west as 172°E and Asian chinook as far east as 172°W in the North Pacific Ocean and Bering Sea north of 46°N. The mothership fishing area, which lies almost entirely within these two longitudinal boundaries, is the primary intermixing zone for chinook salmon from Asia and western Alaska. There is no evidence from tagging that chinook salmon from North American areas other than western Alaska occur in the present mothership fishing area.

Indirect estimates of the proportion of western Alaska chinook salmon present in the various sectors of the mothership fishing area are from studies with scales collected in 1966–1972 (adapted from Major et al. 1977b), the only such information available. In Table 1, these estimates are applied to the total catch to determine the catch of western Alaska chinook salmon taken by the mothership fishery in 1980. The proportions used in Table 1 are averages for 1966–1972. To allow for between-year variability, the maximum and minimum values observed in each month/subarea cell are used later in the sensitivity analysis section of this paper.

Most of the estimated 379,932 western Alaska fish were immature (99.8%) and in the .2 ocean-age group (92.7%). Sex ratios varied with ocean age, females being relatively scarce among the mature fish (all .2's) but increasingly abundant among the immature fish as ocean age increased.

## Growth and Natural Mortality

There have been no definitive studies on the growth of chinook salmon in the ocean, particularly in terms of weight. Consequently growth, as estimated here, is the difference between the mean weight of a particular ocean-age and sex component of the high-seas catch and the mean weight of the surviving members of that same component as they appear in the inshore catch 1–3 years later. Instantaneous growth rates (g) required for yield-loss computations are estimated from the relationship:

$$g = (\text{Ln } W_t - \text{Ln } W_o)/t$$

where Ln $W_t$ is the natural logarithm of the mean weight in kilograms of a particular ocean-age and sex group as they occur in the inshore fishery in mid-June, (t) months after their counterparts have been taken in the high-seas fishery. Ln $W_o$ is the same statistic for the comparable group taken earlier in the high-seas fishery. The (g) values and the data from which they were computed are listed in Table 2. Growth (g) is on a per-month basis and (t) is the time elapsed from 15 June or 15 July (the midpoints of the two months comprising the high-seas fishing season) to 15 June (the peak of the inshore season) in ensuing years. The few mature fish taken on the high seas (0.2% of the total) were arbitrarily assigned $t = 0$, meaning that the survivors would move inshore directly after the high-seas fishery.

Similarly, as with growth, there is little information on the natural mortality of western Alaska chinook salmon in the ocean. Researchers working with stocks of chinook salmon from other spawning areas, however, have used annual instantaneous rates of from 0.1 to 0.69 (0.008–0.058 monthly) over varying periods of the oceanic life. Ricker (1980) used an annual rate 0.1 for fish age .2 and older, and asserts elsewhere (Ricker 1976) that 0.24 is probably somewhat too large. The value 0.2 (0.017 monthly) was used here.

## Maturity Schedule

Thus far I have estimated the number of western Alaska chinook salmon taken by the Japanese mothership fishery in 1980 by month, subarea, maturity stage, ocean age, sex, and assigned growth and natural mortality rates to each category. However, because all fish in a particular category are not destined to mature at the same time, it was necessary also to approximate the schedule according to which immature fish at sea would have matured had they not been caught. This permits growth and mortality to be balanced, one against the other, over the appropriate span of months and for the appropriate number of fish.

The maturity schedule of immature age .1 chi-

**Table 2. Statistics for computing growth rate of chinook salmon during the period between the Japanese mothership and western Alaska fisheries.**

| Japanese mothership fishery | | | | | Western Alaska fishery | | | |
|---|---|---|---|---|---|---|---|---|
| Ocean age | Month | Subarea | Sex | Mean weight (kg) | Ocean age | Mean weight (kg) | Elapsed time (months) | Growth rate |
| Mature | | | | | All mature | | | |
| .2 | June | 6 | M | 2.97 | .2 | 3.25 | 0 | 0 |
| | | 8 | M | 2.92 | .2 | 3.25 | 0 | 0 |
| | | | F | 3.36[a] | .2 | 3.29 | 0 | 0 |
| | | 10 | M | 2.36 | .2 | 3.25 | 0 | 0 |
| | | | F | 2.71[a] | .2 | 3.29 | 0 | 0 |
| | July | 6 | M | 2.83 | .2 | 3.25 | 0 | 0 |
| | | | F | 3.25[a] | .2 | 3.29 | 0 | 0 |
| | | 8 | M | 2.53 | .2 | 3.25 | 0 | 0 |
| | | | F | 2.91[a] | .2 | 3.29 | 0 | 0 |
| Immature | | | | | | | | |
| .1 | July | 3 | M | 1.75 | .2 | 3.25 | 11 | 0.056 |
| | | | F | 1.43 | .2 | 3.29 | 11 | 0.076 |
| | | 5 | M | 1.75[f] | .2 | 3.25 | 11 | 0.056 |
| | | | F | 1.43[f] | .2 | 3.29 | 11 | 0.076 |
| | | 6 | M | 1.28 | .2 | 3.25 | 11 | 0.085 |
| | | | F | 1.28 | .2 | 3.29 | 11 | 0.085 |
| | | 8 | M | 1.28[a] | .2 | 3.25 | 11 | 0.085 |
| | | | F | 1.28[a] | .2 | 3.29 | 11 | 0.085 |
| | | 10 | M | 1.28[a] | .2 | 3.25 | 11 | 0.085 |
| | | | F | 1.28[a] | .2 | 3.29 | 11 | 0.085 |
| .2 | June | 3 | M | 2.60 | .3 | 7.36 | 12 | 0.087 |
| | | | | 2.60 | .4 | 11.48 | 24 | 0.062 |
| | | | | 2.60 | .5 | 15.16 | 36 | 0.049 |
| | | | F | 2.61 | .3 | 8.54 | 12 | 0.099 |
| | | | | 2.61 | .4 | 11.37 | 24 | 0.061 |
| | | | | 2.61 | .5 | 13.39 | 36 | 0.045 |
| | | 5 | M | 2.55 | .3 | 7.36 | 12 | 0.088 |
| | | | | 2.55 | .4 | 11.48 | 24 | 0.063 |
| | | | | 2.55 | .5 | 15.16 | 36 | 0.050 |
| | | | F | 2.47 | .3 | 8.54 | 12 | 0.103 |
| | | | | 2.47 | .4 | 11.37 | 24 | 0.064 |
| | | | | 2.47 | .5 | 13.39 | 36 | 0.047 |
| | | 6 | M | 2.00 | .3 | 7.36 | 12 | 0.109 |
| | | | | 2.00 | .4 | 11.48 | 24 | 0.073 |
| | | | | 2.00 | .5 | 15.16 | 36 | 0.056 |
| | | | F | 1.81 | .3 | 8.54 | 12 | 0.129 |
| | | | | 1.81 | .4 | 11.37 | 24 | 0.077 |
| | | | | 1.81 | .5 | 13.39 | 36 | 0.056 |
| | | 8 | M | 2.01 | .3 | 7.36 | 12 | 0.108 |
| | | | | 2.01 | .4 | 11.48 | 24 | 0.073 |
| | | | | 2.01 | .5 | 15.16 | 36 | 0.056 |
| | | | F | 2.04 | .3 | 8.54 | 12 | 0.119 |
| | | | | 2.04 | .4 | 11.37 | 24 | 0.072 |
| | | | | 2.04 | .5 | 13.39 | 36 | 0.052 |
| | | 10 | M | 1.99 | .3 | 7.36 | 12 | 0.109 |
| | | | | 1.99 | .4 | 11.48 | 24 | 0.073 |
| | | | | 1.99 | .5 | 15.16 | 36 | 0.056 |
| | | | F | 2.04 | .3 | 8.54 | 12 | 0.119 |
| | | | | 2.04 | .4 | 11.37 | 24 | 0.072 |
| | | | | 2.04 | .5 | 13.39 | 36 | 0.052 |
| | July | 3 | M | 2.74 | .3 | 7.36 | 11 | 0.090 |
| | | | | 2.74 | .4 | 11.48 | 23 | 0.062 |
| | | | | 2.74 | .5 | 15.16 | 35 | 0.049 |
| | | | F | 2.76 | .3 | 8.54 | 11 | 0.103 |
| | | | | 2.76 | .4 | 11.37 | 23 | 0.062 |
| | | | | 2.76 | .5 | 13.39 | 35 | 0.045 |

Table 2. Continued.

| Japanese mothership fishery | | | | | Western Alaska fishery | | | |
|---|---|---|---|---|---|---|---|---|
| Ocean age | Month | Subarea | Sex | Mean[a] weight (kg) | Ocean age | Mean[a] weight (kg) | Elapsed time (months) | Growth rate |
| | | 5 | M | 2.97 | .3 | 7.36 | 11 | 0.082 |
| | | | | 2.97 | .4 | 11.48 | 23 | 0.059 |
| | | | | 2.97 | .5 | 15.16 | 35 | 0.047 |
| | | | F | 2.85 | .3 | 8.54 | 11 | 0.100 |
| | | | | 2.85 | .4 | 11.37 | 23 | 0.060 |
| | | | | 2.85 | .5 | 13.39 | 35 | 0.044 |
| | | 6 | M | 2.09 | .3 | 7.36 | 11 | 0.114 |
| | | | | 2.09 | .4 | 11.48 | 23 | 0.074 |
| | | | | 2.09 | .5 | 15.16 | 35 | 0.057 |
| | | | F | 2.00 | .3 | 8.54 | 11 | 0.132 |
| | | | | 2.00 | .4 | 11.37 | 23 | 0.076 |
| | | | | 2.00 | .5 | 13.39 | 35 | 0.054 |
| | | 8 | M | 2.12 | .3 | 7.36 | 11 | 0.113 |
| | | | | 2.12 | .4 | 11.48 | 23 | 0.073 |
| | | | | 2.12 | .5 | 15.16 | 35 | 0.056 |
| | | | F | 2.08 | .3 | 8.54 | 11 | 0.128 |
| | | | | 2.08 | .4 | 11.37 | 23 | 0.074 |
| | | | | 2.08 | .5 | 13.39 | 35 | 0.053 |
| | | 10 | M | 2.23 | .3 | 7.36 | 11 | 0.109 |
| | | | | 2.23 | .4 | 11.48 | 23 | 0.071 |
| | | | | 2.23 | .5 | 15.16 | 35 | 0.055 |
| | | | F | 2.20 | .3 | 8.54 | 11 | 0.123 |
| | | | | 2.20 | .4 | 11.37 | 23 | 0.071 |
| | | | | 2.20 | .5 | 13.39 | 35 | 0.052 |
| .3 | June | 3 | M | 4.29 | .4 | 11.48 | 12 | 0.082 |
| | | | | 4.29 | .5 | 15.16 | 24 | 0.053 |
| | | | F | 4.17 | .4 | 11.37 | 12 | 0.084 |
| | | | | 4.17 | .5 | 13.39 | 24 | 0.049 |
| | | 5 | M | 4.08 | .4 | 11.48 | 12 | 0.086 |
| | | | | 4.08 | .5 | 15.16 | 24 | 0.055 |
| | | | F | 3.97 | .4 | 11.37 | 12 | 0.088 |
| | | | | 3.97 | .5 | 13.39 | 24 | 0.051 |
| | | 6 | M | 3.76 | .4 | 11.48 | 12 | 0.093 |
| | | | | 3.76 | .5 | 15.16 | 24 | 0.058 |
| | | | F | 3.70 | .4 | 11.37 | 12 | 0.094 |
| | | | | 3.70 | .5 | 13.39 | 24 | 0.054 |
| | | 8 | M | 3.55 | .4 | 11.48 | 12 | 0.098 |
| | | | | 3.55 | .5 | 15.16 | 24 | 0.060 |
| | | | F | 3.66 | .4 | 11.37 | 12 | 0.094 |
| | | | | 3.66 | .5 | 13.39 | 24 | 0.054 |
| | | 10 | M | 3.67 | .4 | 11.48 | 12 | 0.095 |
| | | | | 3.67 | .5 | 15.16 | 24 | 0.059 |
| | | | F | 3.62 | .4 | 11.37 | 12 | 0.095 |
| | | | | 3.62 | .5 | 13.39 | 24 | 0.055 |
| | July | 3 | M | 4.35 | .4 | 11.48 | 11 | 0.088 |
| | | | | 4.35 | .5 | 15.16 | 23 | 0.054 |
| | | | F | 4.18 | .4 | 11.37 | 11 | 0.091 |
| | | | | 4.18 | .5 | 13.39 | 23 | 0.051 |
| | | 5 | M | 3.98 | .4 | 11.48 | 11 | 0.096 |
| | | | | 3.98 | .5 | 15.16 | 23 | 0.058 |
| | | | F | 4.11 | .4 | 11.37 | 11 | 0.093 |
| | | | | 4.11 | .5 | 13.39 | 23 | 0.051 |
| | | 6 | M | 3.51 | .4 | 11.48 | 11 | 0.108 |
| | | | | 3.51 | .5 | 15.16 | 23 | 0.064 |
| | | | F | 3.79 | .4 | 11.37 | 11 | 0.100 |
| | | | | 3.79 | .5 | 13.39 | 23 | 0.055 |
| | | 8 | M | 3.58 | .4 | 11.48 | 11 | 0.106 |

Table 2. Continued.

| Japanese mothership fishery | | | | | Western Alaska fishery | | | |
|---|---|---|---|---|---|---|---|---|
| Ocean age | Month | Subarea | Sex | Mean[a] weight (kg) | Ocean age | Mean[b] weight (kg) | Elapsed time (months) | Growth rate |
| | | | | 3.58 | .5 | 15.16 | 23 | 0.063 |
| | | | F | 3.68 | .4 | 11.37 | 11 | 0.103 |
| | | | | 3.68 | .5 | 13.39 | 23 | 0.056 |
| | | 10 | M | 3.37 | .4 | 11.48 | 11 | 0.111 |
| | | | | 3.37 | .5 | 15.16 | 23 | 0.065 |
| | | | F | 3.39 | .4 | 11.37 | 11 | 0.110 |
| | | | | 3.39 | .5 | 13.39 | 23 | 0.060 |

[a] Fishery Agency of Japan. Data for 1966–1972 now on file at the Northwest and Alaska Fisheries Center, NOAA, Seattle, Washington.

[b] All data originally collected by Alaska Department of Fish and Game. Data summaries for the Yukon River 1964–1968 and 1981 and for the Kuskokwim River 1964–1968 are now on file at the Northwest and Alaska Fisheries Center. Bristol Bay data (1964–1978) are from Meacham (1980). Data were weighted according to the following average run strengths compiled from Meacham and Arvey (1981): Yukon River 0.386, Kuskokwim River 0.263, and Bristol Bay 0.351. Lesser streams were ignored.

[c] Mature fish are assumed to move directly inshore.

[d] Among the data (footnote a above), there is little information on maturing .2 females in subareas 6, 8, and 10. When data from adjacent cells are pooled, the mean weight of the females is computed to be 1.15 that of the males. This ratio is used to estimate the mean weights of females in subareas 6, 8, and 10.

[e] Only the largest .1 immatures are taken in the mothership gill nets (Major et al. 1978). All are assumed to mature as .2's.

[f] Data from Subarea 3.

[g] Data from Subarea 6.

nook salmon can be surmised directly. Major et al. (1978) noted that only the very largest .1's are taken in the gill nets of the size fished by the Japanese fleet. Because the largest individuals of a particular ocean-age and sex group mature earliest (Parker and Larkin 1959; Grachev 1967), it can be reasonably assumed that all of the relatively few .1 chinook taken in the mothership fishery would have matured the following year at age .2.

The maturity schedule of .2 and .3 fish taken at sea is derived from the ocean-age composition of the coastal catches of western Alaska chinook salmon. This was achieved by adjusting the observed inshore data backward in time to account for the mortalities that have occurred between the oceanic and coastal fisheries. Ideally, both natural mortality and fishing mortality should be taken into account in making such an adjustment (there being fishing mortalities associated with the mothership fishery itself and with the groundfish fisheries). Because information on fishing mortality is lacking, however, adjustment here is for natural mortality only. The inability to correct for fishing mortality leads to overestimating the proportions of ocean-caught fish that are destined to mature at young ages and, conversely, to underestimating proportions of fish that will mature at older ages. At least partially offsetting this bias is the effect of gill-net selectivity on the ocean-age composition of the inshore catch, which is the original basis for estimating the maturity schedule of fish taken at sea. Inshore gill nets tend to capture fewer younger-maturing fish and more older-maturing fish.

The initial ingredient in the computation of the maturity schedule (the observed ocean-age composition of the mature catch) is from data collected in the major fishing regions of western Alaska (the Yukon, Kuskokwim, and Bristol Bay areas). Using catch data from the individual regions, as reported by Meacham and Arvey (1981) in conjunction with corresponding information on ocean-age composition (Meacham 1980) and sex ratio (unpublished data collected by Alaska Department of Fish and Game and now on file at the Northwest and Alaska Fisheries Center, NOAA, Seattle, Washington), the average ocean-age composition of chinook salmon caught in the commercial fisheries of western Alaska 1964–1978 is estimated as follows:

| | Ocean age | | | |
|---|---|---|---|---|
| | .2 | .3 | .4 | .5 |
| Males | 0.115 | 0.397 | 0.425 | 0.063 |
| Females | 0.002 | 0.165 | 0.718 | 0.115 |

From the inshore data, a maturity schedule was developed using the following expressions:

(1) Maturity schedule of .2's at sea

$$= \frac{PP_i}{\sum_{i=3,4,\text{or }5} PP_i}$$

(2) Maturity schedule of .3's at sea

$$= \frac{PP_i}{\sum_{i=4\text{ or }5} PP_i}$$

where

$PP_i = \frac{OP_i}{e^{-qt}}$ = proportion predicted to mature at ocean age (i),

$OP_i$ = observed (inshore) proportion of ocean age (i),

$q$ = monthly instantaneous natural mortality rate,

$t$ = time, in months, between the high-seas and coastal fisheries.

The maturity schedule is presented in Table 3 and the ultimate composition (number and weight) of the 1980 Japanese mothership catch of western Alaska salmon by maturity, ocean-age, month, subarea, sex, and the projected ocean age at return is shown in Table 4.

Table 3. Maturity schedule for various ocean-age groups of immature western Alaska chinook salmon taken in the Japanese mothership fishery.

| Months to maturity | Ocean age at capture | | | | | |
|---|---|---|---|---|---|---|
| | Males | | | Females | | |
| | .1 | .2 | .3 | .1 | .2 | .3 |
| 11 or 12* | 1.000 | 0.392 | 0.846 | 1.000 | 0.135 | 0.836 |
| 23 or 24* | | 0.515 | 0.154 | | 0.77[illegible] | 0.164 |
| 35 or 36* | | 0.093 | | | 0.1[illegible] | |

* Depending on whether the fish were captured at sea in June or July.

## Yield Loss

Following the approach of Parker (1963), the elements required for the calculation of yield loss are arranged in Table 5. Yield loss (using immature fish as an example) was calculated as follows:

$$\text{Yield loss} = 2(0.00001e^{0.429} + 0.00016e^{0.429} + 0.00007e^{0.649} \text{ etc., for all of the remaining cells})$$
$$= 6.52$$

Hence, the potential inshore catch is 6.52 times the high-seas catch or, stated another way, the increase in yield would be 552%, assuming discontinuation of high-seas fishing and the existence of an inshore fishery capable of catching all fish available to it.

It is further instructive to describe yield loss in terms of total weight. Considering that the estimated weight of the western Alaska component of the 1980 Japanese mothership catch was 876 t (Table 4), the potential yield loss to western Alaska fishermen would be 5,712 t (6.52 × 876 t). More likely, yield loss would be some fraction of this potential, depending on the fraction of the total run harvested.

The yield-loss ratio of 6.52 reported above is for all western Alaska chinook salmon taken in the 1980 Japanese mothership fishery or otherwise dying at sea because of encounters with gill nets employed by the fishery. A few were mature but most were 1, 2, or 3 years from maturity. To facilitate comparison of these results to those obtained earlier for other species of salmon, it is necessary to express the yield-loss ratios of the three groups of immature western Alaska chinook salmon separately: 5.60, 6.92, and 7.04 for fish 1, 2, and 3 years from maturity, respectively.

In comparing the yield-loss ratios of salmon taken on the high seas one year from maturity, note that the value 5.60 for western Alaska chinook salmon greatly exceeds the closest values obtained for other species of salmon: 3.78 for chum salmon (Ricker 1964) and 3.36 for sockeye salmon (Parker 1963), after the latter values have been adjusted to reflect the non-catch mortality factor of 2.0 and the July 1 seasonal midpoint of the mothership fishery. Similarly, for salmon taken at sea 2 years prior to maturity, the yield-loss ratio 6.92 for western Alaska chinook salmon is much greater than the 3.96 reported for sockeye salmon (Fredin 1964). There are no examples to which the yield-loss ratio 7.04 for western Alaska chinook salmon taken at sea 3 years prior to maturity can be compared.

That yield losses stemming from high-seas fishing are much greater for western Alaska chi-

Table 4. The number, mean weight, and total weight of western Alaska chinook salmon taken in the Japanese mothership fishery in 1980 by maturity, ocean age at capture, month, subarea, sex, ocean age at maturity, and the proportion of the total weight taken in each cell.

| Ocean age (Japanese mothership fishery) | Month | Subarea | Sex | Ocean age at maturity | Number of fish | Mean weight (kg) | Total weight[a] | Proportion of high-seas catch in weight |
|---|---|---|---|---|---|---|---|---|
| | | | | Mature | | | | |
| .2 | June | 6 | M | .2 | 15 | 2.97 | 43 | 0.00005 |
| | | 8 | M | .2 | 295 | 2.92 | 861 | 0.00098 |
| | | | F | .2 | 3 | 3.36 | 11 | 0.00001 |
| | | 10 | M | .2 | 117 | 2.36 | 277 | 0.00032 |
| | | | F | .2 | 1 | 2.71 | 3 | 0.00000 |
| | July | 6 | M | .2 | 130 | 2.83 | 367 | 0.00042 |
| | | | F | .2 | 4 | 3.25 | 13 | 0.00001 |
| | | 8 | M | .2 | 375 | 2.53 | 948 | 0.00108 |
| | | | F | .2 | 11 | 2.91 | 32 | 0.00004 |
| | | | | Immature | | | | |
| .1 | July | 3 | M | .2 | 4 | 1.75 | 8 | 0.00001 |
| | | | F | .2 | 2 | 1.43 | 3 | 0.00000 |
| | | 5 | M | .2 | 78 | 1.75 | 136 | 0.00016 |
| | | | F | .2 | 44 | 1.43 | 62 | 0.00007 |
| | | 6 | M | .2 | 31 | 1.28 | 39 | 0.00004 |
| | | | F | .2 | 17 | 1.28 | 22 | 0.00003 |
| | | 8 | M | .2 | 247 | 1.28 | 316 | 0.00036 |
| | | | F | .2 | 139 | 1.28 | 178 | 0.00020 |
| | | 10 | M | .2 | 1,003 | 1.28 | 1,284 | 0.00147 |
| | | | F | .2 | 561 | 1.28 | 719 | 0.00082 |
| .2 | June | 3 | M | .3 | 39 | 2.60 | 100 | 0.00011 |
| | | | | .4 | 51 | 2.60 | 133 | 0.00015 |
| | | | | .5 | 9 | 2.60 | 24 | 0.00003 |
| | | | F | .3 | 14 | 2.61 | 36 | 0.00004 |
| | | | | .4 | 73 | 2.61 | 190 | 0.00022 |
| | | | | .5 | 14 | 2.61 | 37 | 0.00004 |
| | | 5 | M | .3 | 1,514 | 2.55 | 3,861 | 0.00441 |
| | | | | .4 | 1,989 | 2.55 | 5,072 | 0.00579 |
| | | | | .5 | 359 | 2.55 | 916 | 0.00105 |
| | | | F | .3 | 536 | 2.47 | 1,325 | 0.00151 |
| | | | | .4 | 2,872 | 2.47 | 7,094 | 0.00810 |
| | | | | .5 | 564 | 2.47 | 1,393 | 0.00159 |
| | | 6 | M | .3 | 60 | 2.00 | 121 | 0.00014 |
| | | | | .4 | 79 | 2.00 | 159 | 0.00018 |
| | | | | .5 | 14 | 2.00 | 29 | 0.00003 |
| | | | F | .3 | 21 | 1.81 | 39 | 0.00004 |
| | | | | .4 | 115 | 1.81 | 207 | 0.00024 |
| | | | | .5 | 23 | 1.81 | 41 | 0.00005 |
| | | 8 | M | .3 | 1,226 | 2.01 | 2,463 | 0.00281 |
| | | | | .4 | 1,610 | 2.01 | 3,236 | 0.00369 |
| | | | | .5 | 291 | 2.01 | 584 | 0.00067 |
| | | | F | .3 | 434 | 2.04 | 885 | 0.00101 |
| | | | | .4 | 2,324 | 2.04 | 4,741 | 0.00541 |
| | | | | .5 | 456 | 2.04 | 931 | 0.00106 |
| | | 10 | M | .3 | 487 | 1.99 | 969 | 0.00111 |
| | | | | .4 | 640 | 1.99 | 1,274 | 0.00145 |
| | | | | .5 | 116 | 1.99 | 230 | 0.00026 |
| | | | F | .3 | 172 | 2.04 | 352 | 0.00040 |
| | | | | .4 | 924 | 2.04 | 1,884 | 0.00215 |
| | | | | .5 | 181 | 2.04 | 370 | 0.00042 |
| | July | 3 | M | .3 | 241 | 2.74 | 661 | 0.00075 |
| | | | | .4 | 317 | 2.74 | 869 | 0.00099 |
| | | | | .5 | 57 | 2.74 | 157 | 0.00018 |
| | | | F | .3 | 86 | 2.76 | 239 | 0.00027 |
| | | | | .4 | 463 | 2.76 | 1,278 | 0.00146 |
| | | | | .5 | 91 | 2.76 | 251 | 0.00029 |

Table 4. Continued.

| Ocean age (Japanese mothership fishery) | Month | Subarea | Sex | Ocean age at maturity | Number of fish | Mean weight (kg) | Total weight[a] | Proportion of high-seas catch in weight |
|---|---|---|---|---|---|---|---|---|
| | | 5 | M | .3 | 4,285 | 2.97 | 12,725 | 0.01453 |
| | | | | .4 | 5,629 | 2.97 | 16,718 | 0.01908 |
| | | | | .5 | 1,016 | 2.97 | 3,019 | 0.00345 |
| | | | F | .3 | 1,536 | 2.85 | 4,377 | 0.00500 |
| | | | | .4 | 8,225 | 2.85 | 23,441 | 0.02676 |
| | | | | .5 | 1,615 | 2.85 | 4,604 | 0.00526 |
| | | 6 | M | .3 | 1,618 | 2.09 | 3,381 | 0.00386 |
| | | | | .4 | 2,125 | 2.09 | 4,441 | 0.00507 |
| | | | | .5 | 384 | 2.09 | 802 | 0.00092 |
| | | | F | .3 | 580 | 2.00 | 1,160 | 0.00132 |
| | | | | .4 | 3,106 | 2.00 | 6,212 | 0.00709 |
| | | | | .5 | 610 | 2.00 | 1,220 | 0.00139 |
| | | 8 | M | .3 | 22,607 | 2.12 | 47,927 | 0.05471 |
| | | | | .4 | 29,701 | 2.12 | 62,966 | 0.07188 |
| | | | | .5 | 5,363 | 2.12 | 11,371 | 0.01298 |
| | | | F | .3 | 8,103 | 2.08 | 16,855 | 0.01924 |
| | | | | .4 | 43,398 | 2.08 | 90,268 | 0.10304 |
| | | | | .5 | 8,524 | 2.08 | 17,729 | 0.02024 |
| | | 10 | M | .3 | 35,600 | 2.23 | 79,388 | 0.09062 |
| | | | | .4 | 46,770 | 2.23 | 104,297 | 0.11905 |
| | | | | .5 | 8,446 | 2.23 | 18,834 | 0.02150 |
| | | | F | .3 | 12,761 | 2.20 | 28,073 | 0.03205 |
| | | | | .4 | 68,341 | 2.20 | 150,349 | 0.17162 |
| | | | | .5 | 13,422 | 2.20 | 29,529 | 0.03371 |
| .3 | June | 3 | M | .4 | 11 | 4.29 | 46 | 0.00005 |
| | | | | .5 | 2 | 4.29 | 8 | 0.00001 |
| | | | F | .4 | 21 | 4.17 | 88 | 0.00010 |
| | | | | .5 | 4 | 4.17 | 17 | 0.00002 |
| | | 5 | M | .4 | 422 | 4.08 | 1,722 | 0.00197 |
| | | | | .5 | 77 | 4.08 | 313 | 0.00036 |
| | | | F | .4 | 831 | 3.97 | 3,299 | 0.00377 |
| | | | | .5 | 163 | 3.97 | 647 | 0.00074 |
| | | 6 | M | .4 | 17 | 3.76 | 64 | 0.00007 |
| | | | | .5 | 3 | 3.76 | 12 | 0.00001 |
| | | | F | .4 | 33 | 3.70 | 123 | 0.00014 |
| | | | | .5 | 7 | 3.70 | 24 | 0.00003 |
| | | 8 | M | .4 | 341 | 3.55 | 1,212 | 0.00138 |
| | | | | .5 | 62 | 3.55 | 221 | 0.00025 |
| | | | F | .4 | 673 | 3.66 | 2,463 | 0.00281 |
| | | | | .5 | 132 | 3.66 | 483 | 0.00055 |
| | | 10 | M | .4 | 136 | 3.67 | 499 | 0.00057 |
| | | | | .5 | 25 | 3.67 | 91 | 0.00010 |
| | | | F | .4 | 267 | 3.62 | 965 | 0.00110 |
| | | | | .5 | 52 | 3.62 | 190 | 0.00022 |
| | July | 3 | M | .4 | 27 | 4.35 | 118 | 0.00013 |
| | | | | .5 | 5 | 4.35 | 21 | 0.00002 |
| | | | F | .4 | 53 | 4.18 | 222 | 0.00025 |
| | | | | .5 | 10 | 4.18 | 44 | 0.00005 |
| | | 5 | M | .4 | 481 | 3.98 | 1,914 | 0.00218 |
| | | | | .5 | 88 | 3.98 | 348 | 0.00040 |
| | | | F | .4 | 948 | 4.11 | 3,896 | 0.00445 |
| | | | | .5 | 186 | 4.11 | 764 | 0.00087 |
| | | 6 | M | .4 | 261 | 3.51 | 916 | 0.00105 |
| | | | | .5 | 48 | 3.51 | 167 | 0.00019 |
| | | | F | .4 | 515 | 3.79 | 1,952 | 0.00223 |
| | | | | .5 | 101 | 3.79 | 387 | 0.00044 |
| | | 8 | M | .4 | 2,832 | 3.58 | 10,136 | 0.01157 |
| | | | | .5 | 515 | 3.58 | 1,845 | 0.00211 |

Table 4. Continued.

| Ocean age (Japanese mothership fishery) | Month | Subarea | Sex | Ocean age at maturity | Number of fish | Mean weight (kg) | Total weight* | Proportion of high-seas catch in weight |
|---|---|---|---|---|---|---|---|---|
| | | | F | .4 | 5,580 | 3.68 | 20,534 | 0.02344 |
| | | | | .5 | 1,095 | 3.68 | 4,029 | 0.00460 |
| | | 10 | M | .4 | 2,430 | 3.37 | 8,191 | 0.00935 |
| | | | | .5 | 442 | 3.37 | 1,491 | 0.00170 |
| | | | F | .4 | 4,790 | 3.39 | 16,238 | 0.01854 |
| | | | | .5 | 940 | 3.39 | 3,185 | 0.00364 |
| Totals | | | | | 379,930 | | 876,042 | |

* Rounded to the nearest whole number for presentation here; carried to 5 decimal places in the calculation of the proportion of each category in the total high-seas catch.

nook salmon than for the the other species of salmon, even when time to maturity is constant, can be attributed to the large size ultimately attainable by chinook salmon at maturity (9.5 kg vs. 7.5 kg or less for the other species of salmon).

## Sensitivity Analysis

Studies such as this, dependent as they are on data collected for other purposes by other agencies, are susceptible to more than ordinary error. The growth rates calculated here are, for example, little more than first-order approximations. This assessment stems from the use of a common weight for all immature fish of a particular ocean-age and sex group taken at sea, regardless of their eventual ocean age at maturity. Parker and Larkin (1959) and Grachev (1967) have shown, on the contrary, that chinook salmon destined to mature at a young age are larger at a common earlier age than their counterparts who are destined to mature later. Thus, the growth of early-maturing fish, as calculated here, tends to be overestimated and that of the late-maturing fish to be underestimated. The extent to which one offsets the other in the final computation of yield loss is unmeasured.

Similarly, the natural mortality rate of chinook salmon at sea has received little study. The annual rate (0.2) used in the base run of the model may be too high or too low and is most likely not constant within or between seasons or for all ocean-age groups as assumed here.

The estimated maturity schedule, which affects the weighting of the various cells in the model, is also imperfect. Not only is the maturity schedule affected by the rate of natural mortality used to transform observed inshore ocean-age composition backward in time to the high-seas fishery, but also there is no basis for making a comparable adjustment for fishing mortality. The inability to adjust for fishing mortality leads to overestimation of the proportion of fish scheduled to mature at a young age and underestimation of those scheduled to mature later. The extent to which this is compensated for by the inshore fishery, which inadequately samples the younger fish in favor of the older, is unknown.

Finally, estimates of non-catch mortality are not well documented. Moreover, the estimates were developed for species of salmon other than chinook so the propriety of direct extrapolation between species is open to question.

Although the aforementioned errors surrounding growth, natural mortality, maturity schedule, and non-catch mortality are unmeasured, it is possible to estimate the relative impact of each variable on the model output. This is achieved by a sensitivity analysis wherein the variables are perturbed one at a time and the adjusted output is then measured in terms of the output obtained in the base run of the model. Results are expressed as:

$$\text{Relative sensitivity} = -\frac{\text{Percent change in output}}{\text{Percent change in the variable}}$$

The advantage of the relative sensitivity measurement is that it minimizes the effect of different orders of magnitude which may exist among the tested variables and the outputs.

For the sensitivity analysis, growth is allowed to vary by ±10% and natural mortality by ±50%

(Kings)

**Table 5. Information for calculating yield loss of western Alaska chinook salmon taken in the 1980 Japanese mothership fishery.**

| A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ocean age (Japanese mother-ship fishery) | Month | Sub-area | Sex | Ocean age at maturity | Time (months) | Monthly instantaneous rate of change: Growth | Mor-tality | Mass (G–H) | Total change in mass (F × I) | Weight-ing factor | Non-catch mortality |
| | | | | | | Mature | | | | | |
| .2 | June | 6 | M | .2 | 0 | | | | 0.000 | 0.00005 | 1.333 |
| | | 8 | M | .2 | 0 | | | | 0.000 | 0.00098 | 1.333 |
| | | | F | .2 | 0 | | | | 0.000 | 0.00001 | 1.333 |
| | | 10 | M | .2 | 0 | | | | 0.000 | 0.00032 | 1.333 |
| | | | F | .2 | 0 | | | | 0.000 | 0.00000 | 1.333 |
| | July | 6 | M | .2 | 0 | | | | 0.000 | 0.00042 | 1.333 |
| | | | F | .2 | 0 | | | | 0.000 | 0.00001 | 1.333 |
| | | 8 | M | .2 | 0 | | | | 0.000 | 0.00108 | 1.333 |
| | | | F | .2 | 0 | | | | 0.000 | 0.00004 | 1.333 |
| | | | | | | Immature | | | | | |
| .1 | July | 3 | M | .2 | 11 | 0.056 | 0.017 | 0.039 | 0.429 | 0.00001 | 2.000 |
| | | | F | .2 | 11 | 0.076 | 0.017 | 0.059 | 0.649 | 0.00000 | 2.000 |
| | | 5 | M | .2 | 11 | 0.056 | 0.017 | 0.039 | 0.429 | 0.00016 | 2.000 |
| | | | F | .2 | 11 | 0.076 | 0.017 | 0.059 | 0.649 | 0.00007 | 2.000 |
| | | 6 | M | .2 | 11 | 0.085 | 0.017 | 0.068 | 0.748 | 0.00004 | 2.000 |
| | | | F | .2 | 11 | 0.085 | 0.017 | 0.068 | 0.748 | 0.00003 | 2.000 |
| | | 8 | M | .2 | 11 | 0.085 | 0.017 | 0.068 | 0.748 | 0.00036 | 2.000 |
| | | | F | .2 | 11 | 0.085 | 0.017 | 0.068 | 0.748 | 0.00020 | 2.000 |
| | | 10 | M | .2 | 11 | 0.085 | 0.017 | 0.068 | 0.748 | 0.00147 | 2.000 |
| | | | F | .2 | 11 | 0.085 | 0.017 | 0.068 | 0.748 | 0.00082 | 2.000 |
| .2 | June | 3 | M | .3 | 12 | 0.087 | 0.017 | 0.070 | 0.840 | 0.00011 | 2.000 |
| | | | | .4 | 24 | 0.062 | 0.017 | 0.045 | 1.080 | 0.00015 | 2.000 |
| | | | | .5 | 36 | 0.049 | 0.017 | 0.032 | 1.152 | 0.00003 | 2.000 |
| | | | F | .3 | 12 | 0.099 | 0.017 | 0.082 | 0.984 | 0.00004 | 2.000 |
| | | | | .4 | 24 | 0.061 | 0.017 | 0.044 | 1.056 | 0.00022 | 2.000 |
| | | | | .5 | 36 | 0.045 | 0.017 | 0.028 | 1.008 | 0.00004 | 2.000 |
| | | 5 | M | .3 | 12 | 0.088 | 0.017 | 0.071 | 0.852 | 0.00441 | 2.000 |
| | | | | .4 | 24 | 0.063 | 0.017 | 0.046 | 1.104 | 0.00579 | 2.000 |
| | | | | .5 | 36 | 0.050 | 0.017 | 0.033 | 1.188 | 0.00105 | 2.000 |
| | | | F | .3 | 12 | 0.103 | 0.017 | 0.086 | 1.032 | 0.00151 | 2.000 |
| | | | | .4 | 24 | 0.064 | 0.017 | 0.047 | 1.128 | 0.00810 | 2.000 |
| | | | | .5 | 36 | 0.047 | 0.017 | 0.030 | 1.080 | 0.00159 | 2.000 |
| | | 6 | M | .3 | 12 | 0.109 | 0.017 | 0.092 | 1.104 | 0.00014 | 2.000 |
| | | | | .4 | 24 | 0.073 | 0.017 | 0.056 | 1.344 | 0.00018 | 2.000 |
| | | | | .5 | 36 | 0.056 | 0.017 | 0.039 | 1.404 | 0.00003 | 2.000 |
| | | | F | .3 | 12 | 0.129 | 0.017 | 0.112 | 1.344 | 0.00004 | 2.000 |
| | | | | .4 | 24 | 0.077 | 0.017 | 0.060 | 1.440 | 0.00024 | 2.000 |
| | | | | .5 | 36 | 0.056 | 0.017 | 0.039 | 1.404 | 0.00005 | 2.000 |
| | | 8 | M | .3 | 12 | 0.108 | 0.017 | 0.091 | 1.092 | 0.00281 | 2.000 |
| | | | | .4 | 24 | 0.073 | 0.017 | 0.056 | 1.344 | 0.00369 | 2.000 |
| | | | | .5 | 36 | 0.056 | 0.017 | 0.039 | 1.404 | 0.00067 | 2.000 |
| | | | F | .3 | 12 | 0.119 | 0.017 | 0.102 | 1.224 | 0.00101 | 2.000 |
| | | | | .4 | 24 | 0.072 | 0.017 | 0.055 | 1.320 | 0.00541 | 2.000 |
| | | | | .5 | 36 | 0.052 | 0.017 | 0.035 | 1.260 | 0.00106 | 2.000 |
| | | 10 | M | .3 | 12 | 0.109 | 0.017 | 0.092 | 1.104 | 0.00111 | 2.000 |
| | | | | .4 | 24 | 0.073 | 0.017 | 0.056 | 1.344 | 0.00145 | 2.000 |
| | | | | .5 | 36 | 0.056 | 0.017 | 0.039 | 1.404 | 0.00026 | 2.000 |
| | | | F | .3 | 12 | 0.119 | 0.017 | 0.102 | 1.224 | 0.00040 | 2.000 |
| | | | | .4 | 24 | 0.072 | 0.017 | 0.055 | 1.320 | 0.00215 | 2.000 |
| | | | | .5 | 36 | 0.052 | 0.017 | 0.035 | 1.260 | 0.00042 | 2.000 |
| | July | 3 | M | .3 | 11 | 0.090 | 0.017 | 0.073 | 0.803 | 0.00075 | 2.000 |
| | | | | .4 | 23 | 0.062 | 0.017 | 0.045 | 1.035 | 0.00099 | 2.000 |
| | | | | .5 | 35 | 0.049 | 0.017 | 0.032 | 1.120 | 0.00018 | 2.000 |

Table 5. Continued.

| A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ocean age (Japanese mother-ship fishery) | Month | Sub-area | Sex | Ocean age at maturity | Time (months) | Monthly instantaneous rate of change: Growth | Mortality | Mass (G–H) | Total change in mass (F × I) | Weighting factor | Non-catch mortality |
| | | | F | .3 | 11 | 0.103 | 0.017 | 0.086 | 0.946 | 0.00027 | 2.000 |
| | | | | .4 | 23 | 0.062 | 0.017 | 0.045 | 1.035 | 0.00146 | 2.000 |
| | | | | .5 | 35 | 0.045 | 0.017 | 0.028 | 0.980 | 0.00029 | 2.000 |
| | | 5 | M | .3 | 11 | 0.082 | 0.017 | 0.065 | 0.715 | 0.01453 | 2.000 |
| | | | | .4 | 23 | 0.059 | 0.017 | 0.042 | 0.966 | 0.01908 | 2.000 |
| | | | | .5 | 35 | 0.047 | 0.017 | 0.030 | 1.050 | 0.00345 | 2.000 |
| | | | F | .3 | 11 | 0.100 | 0.017 | 0.083 | 0.913 | 0.00500 | 2.000 |
| | | | | .4 | 23 | 0.060 | 0.017 | 0.043 | 0.989 | 0.02676 | 2.000 |
| | | | | .5 | 35 | 0.044 | 0.017 | 0.027 | 0.945 | 0.00526 | 2.000 |
| | | 6 | M | .3 | 11 | 0.114 | 0.017 | 0.097 | 1.067 | 0.00386 | 2.000 |
| | | | | .4 | 23 | 0.074 | 0.017 | 0.057 | 1.311 | 0.00507 | 2.000 |
| | | | | .5 | 35 | 0.057 | 0.017 | 0.040 | 1.400 | 0.00092 | 2.000 |
| | | | F | .3 | 11 | 0.132 | 0.017 | 0.115 | 1.265 | 0.00132 | 2.000 |
| | | | | .4 | 23 | 0.076 | 0.017 | 0.059 | 1.357 | 0.00709 | 2.000 |
| | | | | .5 | 35 | 0.054 | 0.017 | 0.037 | 1.295 | 0.00139 | 2.000 |
| | | 8 | M | .3 | 11 | 0.113 | 0.017 | 0.096 | 1.056 | 0.05471 | 2.000 |
| | | | | .4 | 23 | 0.073 | 0.017 | 0.056 | 1.288 | 0.07188 | 2.000 |
| | | | | .5 | 35 | 0.056 | 0.017 | 0.039 | 1.365 | 0.01298 | 2.000 |
| | | | F | .3 | 11 | 0.128 | 0.017 | 0.111 | 1.221 | 0.01924 | 2.000 |
| | | | | .4 | 23 | 0.074 | 0.017 | 0.057 | 1.311 | 0.10304 | 2.000 |
| | | | | .5 | 35 | 0.053 | 0.017 | 0.036 | 1.260 | 0.02024 | 2.000 |
| | | 10 | M | .3 | 11 | 0.109 | 0.017 | 0.092 | 1.012 | 0.09062 | 2.000 |
| | | | | .4 | 23 | 0.071 | 0.017 | 0.054 | 1.242 | 0.11905 | 2.000 |
| | | | | .5 | 35 | 0.055 | 0.017 | 0.038 | 1.330 | 0.02150 | 2.000 |
| | | | F | .3 | 11 | 0.123 | 0.017 | 0.106 | 1.166 | 0.03205 | 2.000 |
| | | | | .4 | 23 | 0.071 | 0.017 | 0.054 | 1.242 | 0.17162 | 2.000 |
| | | | | .5 | 35 | 0.052 | 0.017 | 0.035 | 1.225 | 0.03371 | 2.000 |
| .3 | June | 3 | | .4 | 12 | 0.082 | 0.017 | 0.065 | 0.780 | 0.00005 | 2.000 |
| | | | | .5 | 24 | 0.053 | 0.017 | 0.036 | 0.864 | 0.00001 | 2.000 |
| | | | M | .4 | 12 | 0.084 | 0.017 | 0.067 | 0.804 | 0.00010 | 2.000 |
| | | | | .5 | 24 | 0.049 | 0.017 | 0.032 | 0.768 | 0.00002 | 2.000 |
| | | 5 | | .4 | 12 | 0.086 | 0.017 | 0.069 | 0.828 | 0.00197 | 2.000 |
| | | | F | .5 | 24 | 0.055 | 0.017 | 0.038 | 0.912 | 0.00036 | 2.000 |
| | | | | .4 | 12 | 0.088 | 0.017 | 0.071 | 0.852 | 0.00377 | 2.000 |
| | | | | .5 | 24 | 0.051 | 0.017 | 0.034 | 0.816 | 0.00074 | 2.000 |
| | | 6 | M | .4 | 12 | 0.093 | 0.017 | 0.076 | 0.912 | 0.00007 | 2.000 |
| | | | | .5 | 24 | 0.058 | 0.017 | 0.041 | 0.984 | 0.00001 | 2.000 |
| | | | | .4 | 12 | 0.094 | 0.017 | 0.077 | 0.924 | 0.00014 | 2.000 |
| | | | F | .5 | 24 | 0.054 | 0.017 | 0.037 | 0.888 | 0.00003 | 2.000 |
| | | 8 | | .4 | 12 | 0.098 | 0.017 | 0.081 | 0.972 | 0.00138 | 2.000 |
| | | | | .5 | 24 | 0.060 | 0.017 | 0.043 | 1.032 | 0.00025 | 2.000 |
| | | | M | .4 | 12 | 0.094 | 0.017 | 0.077 | 0.924 | 0.00281 | 2.000 |
| | | | | .5 | 24 | 0.054 | 0.017 | 0.037 | 0.888 | 0.00055 | 2.000 |
| | | 10 | | .4 | 12 | 0.095 | 0.017 | 0.078 | 0.936 | 0.00057 | 2.000 |
| | | | F | .5 | 24 | 0.059 | 0.017 | 0.042 | 1.008 | 0.00010 | 2.000 |
| | | | | .4 | 12 | 0.095 | 0.017 | 0.078 | 0.936 | 0.00110 | 2.000 |
| | | | | .5 | 24 | 0.055 | 0.017 | 0.038 | 0.912 | 0.00022 | 2.000 |
| | July | 3 | M | .4 | 11 | 0.088 | 0.017 | 0.071 | 0.781 | 0.00013 | 2.000 |
| | | | | .5 | 23 | 0.054 | 0.017 | 0.037 | 0.851 | 0.00002 | 2.000 |
| | | | F | .4 | 11 | 0.091 | 0.017 | 0.074 | 0.814 | 0.00025 | 2.000 |
| | | | | .5 | 23 | 0.051 | 0.017 | 0.034 | 0.782 | 0.00005 | 2.000 |
| | | 5 | M | .4 | 11 | 0.096 | 0.017 | 0.079 | 0.869 | 0.00218 | 2.000 |
| | | | | .5 | 23 | 0.056 | 0.017 | 0.041 | 0.943 | 0.00040 | 2.000 |
| | | | F | .4 | 11 | 0.093 | 0.017 | 0.076 | 0.836 | 0.00445 | 2.000 |
| | | | | .5 | 23 | 0.051 | 0.017 | 0.034 | 0.782 | 0.00082 | 2.000 |

Table 5. Continued.

| A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ocean age (Japanese mother-ship fishery) | Month | Sub-area | Sex | Ocean age at maturity | Time (months) | Monthly instantaneous rate of change: Growth | Mortality | Mass (G–H) | Total change in mass (F × I) | Weighting factor | Non-catch mortality |
| | | 6 | M | .4 | 11 | 0.108 | 0.017 | 0.091 | 1.001 | 0.00105 | 2.000 |
| | | | | .5 | 23 | 0.064 | 0.017 | 0.047 | 1.081 | 0.00019 | 2.000 |
| | | | F | .4 | 11 | 0.100 | 0.017 | 0.083 | 0.913 | 0.00223 | 2.000 |
| | | | | .5 | 23 | 0.055 | 0.017 | 0.038 | 0.874 | 0.00044 | 2.000 |
| | | 8 | M | .4 | 11 | 0.106 | 0.017 | 0.089 | 0.979 | 0.01157 | 2.000 |
| | | | | .5 | 23 | 0.063 | 0.017 | 0.046 | 1.058 | 0.00211 | 2.000 |
| | | | F | .4 | 11 | 0.103 | 0.017 | 0.086 | 0.946 | 0.02344 | 2.000 |
| | | | | .5 | 23 | 0.056 | 0.017 | 0.039 | 0.897 | 0.00460 | 2.000 |
| | | 10 | M | .4 | 11 | 0.111 | 0.017 | 0.094 | 1.034 | 0.00935 | 2.000 |
| | | | | .5 | 23 | 0.065 | 0.017 | 0.048 | 1.104 | 0.00170 | 2.000 |
| | | | F | .4 | 11 | 0.110 | 0.017 | 0.093 | 1.023 | 0.01854 | 2.000 |
| | | | | .5 | 23 | 0.060 | 0.017 | 0.043 | 0.989 | 0.00364 | 2.000 |

(there being even less certainty about the natural mortality rate than the growth rate). Maturity schedule is examined in terms of the average ocean age at return projected for immature .2 and .3 fish in the high-seas catch. Maturity schedules are, in turn, based on the ocean-age composition of .3, .4, and .5 fish in the historical inshore catch, 1964–1978. Three such ocean-age compositions were used in the sensitivity analysis. The first (the 1964–1978 average) has al-

Table 6. Sensitivity analysis of growth, natural mortality, maturity schedule and non-catch mortality key variables are used in the model to compute yield loss of western Alaska chinook salmon resulting from the 1980 Japanese mothership fishery.

| Variable | Base value | Test value | Output (yield loss) | Percent change: Variable | Percent change: Output | Relative sensitivity |
|---|---|---|---|---|---|---|
| Growth (annual instantaneous rate) | 1.00[a] | | 6.52 | | | |
| | | 0.90[a] | 5.58 | −10.00 | −14.42 | 1.44 |
| | | 1.10[a] | 7.61 | 10.00 | 16.72 | 1.67 |
| Natural mortality (annual instantaneous rate) | 0.20 | | 6.52 | | | |
| | | 0.10 | 7.73 | −50.00 | 18.56 | −0.37 |
| | | 0.30 | 5.48 | 50.00 | −15.95 | −0.32 |
| Maturity schedule | 3.88[b] | | 6.52 | | | |
| | | 3.57[b] | 6.24 | −8.00 | −4.29 | 0.54 |
| | | 4.05[b] | 6.62 | 4.38 | 1.53 | 0.35 |
| Non-catch mortality | | | | | | |
| Immatures | 2.00 | | | | | |
| Matures | 1.33 | | 6.52 | | | |
| Immatures | | 1.50 | | | | |
| Matures | | 1.00 | 4.89 | −25.00 | −25.00 | 1.00 |
| Immatures | | 2.50 | | | | |
| Matures | | 1.67 | 8.14 | 25.00 | 25.00 | 1.00 |

[a] Fish in each of the 119 cells have their own unique rate of growth. For the sensitivity analysis, the rate of growth for each cell used in the standard model run was assigned a value of 1.00 and allowed to vary by 10% in either direction; hence, the values of 0.90 and 1.10.

[b] Average ocean age at return projected for immature .2 and .3 fish in the high-seas catch.

ready been described and employed in the test run of the model. Average ocean age at return under this condition was 3.88 years. Ocean-age compositions also were selected that would minimize and maximize the average ocean-age at return. The resultant values, 3.57 and 4.05 years, respectively, are compared to the average age of 3.88 years in the tests. Finally, to demonstrate its direct impact on the yield-loss ratio, non-catch mortality is allowed to vary by ±25%.

The results of the sensitivity analysis are summarized in Table 6. Of the four variables examined, growth is clearly the most powerful element in the model. A decrease in growth rate causes an even larger decrease in output, and an increase in growth rate brings about an even larger increase in output.

Non-catch mortality is second in order of importance, exerting a direct 1:1 influence on the model output. For example, if the non-catch mortality factor doubles, the estimated yield-loss ratio will double; if the factor is halved, the yield-loss ratio is halved.

The maturity schedule exerts moderate influence on estimates of yield loss. When the immature .2 and .3 fish taken on the high seas are scheduled to return at younger ocean ages, yield loss decreases and when they are scheduled to return at older ocean ages, yield loss increases.

Natural mortality rate is the least important of the four variables tested to measure their effect on yield-loss ratio. The relationship is negative; as natural mortality increases, model output decreases and when natural mortality decreases, model output increases. A change in natural mortality rate exerts offsetting influences within the model. An increase in natural mortality would, for example, result in fewer fish reaching maturity (tending to reduce yield loss) but, by using the same increased mortality rate in the calculation of maturity schedule, the maturing fish (although fewer in number) would be older (tending to increase yield loss). As a result of these offsetting influences, a change in natural mortality rate does not bring about as large a change in output as a comparable change in growth rate, even though both variables are exponential. A 50% change in the natural mortality rate (Table 6) would bring about a smaller (15–20%) change in output, depending on the direction of the change.

If all four variables are taken to their extreme simultaneously, potential yield loss expressed as a ratio would vary from 3.53 to 11.58, with all but the very lowest values exceeding those computed earlier for other species of Pacific salmon.

Unexamined to this point is the proportion of the Japanese mothership catch that is initially identified as "western Alaskan." This variable does not affect yield loss expressed as a ratio, but it has a direct 1:1 effect when yield loss is expressed in terms of weight. When the proportion of western Alaska chinook salmon is set at the minimum and maximum values reported by Major et al. (1977b) and used in conjunction with the minimum and maximum ratios used above (3.53 and 11.58, respectively), the potential yield loss in terms of weight ranges from 1,986 to 13,288 t, thus providing some bounds to the estimate of 5,712 t obtained in the base run of the model.

Growth rate, the non-catch mortality factor, identification of western Alaska fish, maturity schedule, and natural mortality rate all emerge from the foregoing analysis as variables that exert substantial influence on estimates of yield loss of western Alaska chinook salmon resulting from high-seas fishing. Only the identification of western Alaska chinook stocks is presently being studied, with the Fisheries Research Institute, University of Washington, endeavoring to bring the earlier estimates up to date. The other elements in the r
catch mortali
high seas—ar

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# Japan's Pacific Salmon Fisheries and Trade, 1974-84

A. George Herrfurth

## Introduction

Japan obtains Pacific salmon, *Oncorhynchus* spp. (Table 1), from four sources: 1) A coastal trap-net fishery (based on returns of salmon released from hatcheries), 2) a high-seas catch, 3) imports, and 4) cage culture. This salmon supply more than doubled between 1974 and 1984 (Table 2).

An increased salmon demand, a decreased high-seas catch, and the deisre to reduce dependence on salmon imports and help domestic fishermen, prompted the Japanese Government to expand the salmon hatchery program in 1979. Hatchery returns have grown steadily since, and accounted for 45 percent of Japan's salmon supply in 1983, according to the Japan Fisheries Agency (JFA).

Japan's annual salmon imports averaged 10,000 metric tons (t) in the middle 1970's, owing to lower demand and no 200-mile fishing zone restrictions. Since then, however, the United States has become Japan's leading salmon supplier and exports to Japan increased markedly during the past decade because of Japan's growing salmon demand and decreasing high-seas catches. Japanese imports of U.S. salmon were over 96,000 t in 1983, but were expected to be lower in 1984 because of an over-supply of salmon in Japan.

Japan's hatchery programs, however, cannot completely replace imports. Chum salmon, *Oncorhynchus keta*, is the primary species in the Japanese hatchery program, while most imported salmon is sockeye, *O. nerka*. The coho salmon, *O. kisutch*, is the primary cage-cultured species.

Table 1.—Names of the Pacific salmon.

| English name | Japanese name | Scientific name |
|---|---|---|
| Cherry salmon | masu | *Oncorhynchus masou* |
| Chinook salmon[1] | masunosuke | *O. tshawytscha* |
| Chum salmon | sake | *O. keta* |
| Coho salmon[2] | gin-zake | *O. kisutch* |
| Pink salmon | karafuto-masu | *O. gorbuscha* |
| Redspot salmon | amenouo | *O. rhoduru* |
| Sockeye salmon[3] | beni-zake | *O. nerka* |

[1]Also called king salmon.
[2]Also called silver salmon
[3]Also called red salmon; the land-locked form is called kokanee salmon.

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Table 2.—Japan's salmon supply, 1974-84[1].

| Year | Catch (1,000 t) Coastal[2] | High-seas[3] | Culture | Total | Trade (1,000 t) Imports | Exports | Balance | Total supply (1,000 t) |
|---|---|---|---|---|---|---|---|---|
| 1974 | 39.2 | 86.9 | | 126.1 | 8.3 | 13.1 | + 4.8 | 121.3 |
| 1975 | 64.2 | 91.0 | | 155.2 | 10.7 | 19.9 | + 9.2 | 146.0 |
| 1976 | 38.1 | 82.2 | | 120.3 | 9.5 | 20.8 | + 11.3 | 109.0 |
| 1977 | 45.5 | 62.6 | | 108.1 | 26.4 | 4.7 | - 21.7 | 129.8 |
| 1978 | 59.1 | 41.5 | 0.1 | 100.7 | 57.9 | 4.2 | - 53.7 | 154.4 |
| 1979 | 87.3 | 42.4 | 0.4 | 130.1 | 64.7 | 1.7 | - 63.0 | 193.1 |
| 1980 | 79.9 | 42.5 | 1.9 | 124.3 | 48.7 | 1.3 | - 47.4 | 171.7 |
| 1981 | 107.9 | 42.5 | 1.2 | 151.7 | 83.1 | 1.7 | - 81.4 | 233.1 |
| 1982 | 101.5 | 42.4 | 2.1 | 146.0 | 117.7 | 0.5 | -117.2 | 263.2 |
| 1983 | 120.6 | 42.5 | 2.9 | 166.0 | 108.5 | 0.9 | -107.6 | 273.6 |
| 1984 | N/A[4] | 40.0 | 4.5E[5] | N/A | N/A | N/A | N/A | N/A |

[1]Catch is given in live weight and trade statistics are in product weight. Since over 90 percent of all salmon imported in recent years was whole fresh or frozen, the total supply weight has only a small margin of error.
[2]The Japanese refer to this catch as the "hatchery returns" catch. In addition to the inshore coastal catch, the figures also include the inland salmon catch, but exclude a small cherry salmon and landlocked salmon catch.
[3]The Soviet-granted catch quota was 42,500 t from 1978 to 1983; in 1984, it was reduced to 40,000 t.
[4]N/A = Not available.
[5]E = Estimate.

Table 3.—Japan's salmon catch, by species, 1974-83.

| Species | Catch (t) 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983[1] |
|---|---|---|---|---|---|---|---|---|---|---|
| Chum | 80,148 | 99,485 | 78,417 | 71,931 | 74,089 | 101,468 | 96,920 | 120,801 | 111,760 | |
| Pink | 32,537 | 45,936 | 29,629 | 35,264 | 17,178 | 24,060 | 20,101 | 25,509 | 20,797 | |
| Coho | 9,713 | 8,181 | 7,697 | 3,757 | 5,755 | 2,708 | 3,634 | 3,285 | 5,022 | |
| Sockeye | 8,155 | 7,733 | 8,844 | 4,601 | 5,261 | 5,510 | 6,070 | 5,227 | 4,269 | |
| Cherry | 3,101 | 3,871 | 3,814 | 3,822 | 3,600 | 2,669 | 2,777 | 3,298 | 3,661 | |
| Chinook | 1,867 | 1,115 | 1,604 | 908 | 1,075 | 1,227 | 2,484 | 1,381 | 1,018 | |
| Total[2] | 135,519 | 166,301 | 130,005 | 120,283 | 108,958 | 137,640 | 131,986 | 159,499 | 146,527 | 166,000 |

[1]Preliminary estimate.
[2]FAO and Japanese catch statistics do not always agree (see "Total catch" in Table 2).

## The Fisheries

Japan catches salmon in both coastal and high-seas fisheries and farms them in coastal cages. Until the middle 1970's, most of Japan's catch was taken by the high-seas fleet. However, the Soviet declaration of a 200-mile fishing zone in 1976, and subsequent insistence that the Japanese reduce their high-seas catch of Soviet-origin salmon, sent Japan's high-seas catch to a low of 107,000 t in 1978.

The Government enlarged its hatchery program in 1979 to improve coastal harvests, and the program has been remarkably successful. Thus, the increasing coastal catch helped Japanese fishermen land a record 166,000 t of salmon in 1983. Several species of Pacific salmon are caught by Japanese fishermen, but most (>75 percent in 1983) are chum salmon (Table 3).

### Coastal

Japan's coastal salmon fishery is conducted almost entirely with fixed gear. Trap nets are set in shallow coastal waters near the natal rivers where the hatchery-produced salmon return to

Table 4.—Salmon hatchery programs in Hokkaido and Honshu, 1974-87.

| Year | Fry released (in millions) | | | Salmon returns[1] (1,000 t) | | |
|---|---|---|---|---|---|---|
| | Hokkaido | Honshu | Total[2] | Hokkaido | Honshu | Total[2] |
| 1974 | 485 | 272 | 757 | 35.1 (2.2) | 4.0 (0.8) | 39.2 (1.8) |
| 1975 | 802 | 344 | 1,146 | 57.6 (2.7) | 6.7 (0.9) | 64.2 (2.2) |
| 1976 | 523 | 287 | 810 | 32.1 (1.9) | 6.0 (0.7) | 38.1 (1.5) |
| 1977 | 693 | 413 | 1,106 | 37.3 (2.3) | 8.2 (0.8) | 45.5 (1.7) |
| 1978 | 779 | 433 | 1,212 | 48.0 (2.7) | 11.2 (1.1) | 59.2 (2.1) |
| 1979 | 873 | 590 | 1,463 | 69.0 (2.9) | 18.7 (1.5) | 87.7 (2.1) |
| 1980 | 1,146 | 750 | 1,896 | 56.4 (3.0) | 25.4 (2.4) | 81.8 (2.8) |
| 1981 | 1,060 | 738 | 1,818 | 80.0 (3.2) | 29.1 (1.9) | 109.1 (2.7) |
| 1982 | 1,108 | 864 | 1,972 | 73.1 (2.6) | 30.4 (1.9) | 103.6 (2.3) |
| 1983 | 1,147 | 829 | 1,976 | 84.0 (2.6) | 39.5 (1.8) | 123.5 (2.3) |
| 1984 | 1,179[3] | 846[3] | 2,025[3] | N/A[4] | N/A | N/A |
| 1985 | N/A | N/A | N/A | N/A | N/A | N/A |
| 1986 | N/A | N/A | N/A | N/A | N/A | N/A |
| 1987 | N/A | N/A | N/A | 100.7 (2.5)E[5] | 40.2 (1.9)E | 140.9 (2.3)E |

[1]Includes cage-culture production. Data in parentheses indicate percentage rates of return of salmon fry released 4 years earlier.
[2]Totals may not agree because of rounding.
[3]Releases planned for 1984.
[4]N/A = Not available.
[5]E = Estimated from salmon fry released in 1984.

Table 5.—JFA budget for the Salmon Culture Program, 1979-84.

| Item | Budget (millions of yen) | | | | | |
|---|---|---|---|---|---|---|
| | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 |
| Cost of governmental hatcheries | ¥2,005 | ¥2,200 | ¥2,264 | ¥2,186 | ¥2,218 | ¥2,070 |
| Subsidies to private hatcheries[1] | 1,241 | 1,386 | 1,409 | 1,289 | 1,241 | 1,172 |
| Total (millions of yen) | ¥3,246 | ¥3,586 | ¥3,673 | ¥3,475 | ¥3,459 | ¥3,242 |
| Total (millions of U.S. dollars) | $14.7 | $15.9 | $18.6 | $13.9 | $14.5 | $14.1 |

[1]The 1951 "Aquatic Resources Conservation Law," obligates the Japanese Government to subsidize the expenses of privately managed salmon hatcheries, provided that coastal fishermen also bear part of the expenses.

spawn after being at sea 3-7 years.

The coastal fishery is also entirely dependent on the returns of hatchery-raised chum salmon. Those which escape this commercial fishery, and continue their migration upriver, are collected in weirs for delivery to hatcheries where they are spawned to complete the life cycle.

Japan's salmon hatchery programs have been exceptionally successful, and returns have increased steadily. The coastal catch of hatchery-produced salmon increased from 39,200 t in 1974 to 120,600 t in 1983, or by 200 percent (Table 2). The increased returns were especially pronounced during the early 1980's and were the result of the 5-year (1979-83) salmon culture program sponsored by the Japanese Government.

This program was carried out by 44 governmental and about 220 private hatcheries in Hokkaido and Honshu, and increased releases and new release methods reportedly insured the program's success. Although the salmon return 3-5 years after release, the JFA calculates the returns for an average 4-year period (Table 4).

Japan released nearly 2 billion salmon fry in 1983 (1.2 billion from government hatcheries and 0.8 billion from private hatcheries). Most (1.8 billion—94 percent) were chum fry. The Japanese also released small amounts of sockeye; pink, *O. gorbuscha*; cherry, *O. masou*; and kokanee, *O. nerka*, salmon fry in 1983. Japanese coastal fishermen expect to harvest 140,900 t, or about 38.6 million mature salmon in 1987.

The JFA has expressed concern about a new 5-year salmon hatchery program (1984-88) because of the long-term effect it might have on prices and the costs involved. If the 1987 projected hatchery returns are accurate and if salmon imports continue to increase, JFA officials believe that salmon supplies might exceed the demand, resulting in lower prices. The JFA is therefore considering a hatchery enhancement program for fry of such high-valued species as cherry and sockeye salmon (i.e., qualitative rather than quantitative hatchery enhancement). The JFA is also considering sponsoring new efforts to advance the return season of chum salmon to increase its oil content and value since the Japanese prefer a "fatty" salmon.

Financial problems are also affecting plans for a new 5-year salmon hatchery program. The Japanese Finance Ministry does not wish the JFA to continue assuming the large burden of financing the hatchery program and believes that coastal trap-net fishermen should contribute more to the hatchery program since they benefit most from the salmon returns. In 1983, Japanese fishermen paid only $5.5 million of the $20.0 million spent on the hatchery enhancement program, while the JFA salmon culture budget supplied the remaining $14.5 million (Table 5).

## High-Seas

Japan's high-seas salmon fishery consists of mothership, drift-net, and longlining operations in the North Pacific. Japan also depends on annual catch quotas granted by the U.S.S.R. for its high-seas salmon catch, about 90 percent of which was spawned in Soviet rivers[1].

Until 1977, Japan obtained most of its salmon from the high-seas (65 percent in 1974). By 1983, however, only 16 percent came from this fishery (Fig. 1), as the Soviet quotas were reduced more than 52 percent (from 83,000 t in 1974 to 40,000 t in 1984).

The most significant quota reduction occurred in 1978 when the U.S.S.R. proposed a total ban on the Japanese high-seas salmon fishing and, as a compromise, reduced Japan's salmon quota from 62,000 t to 42,500 t, where it remained through 1983. During the 1984 negotiations, the Japanese high-seas salmon quota was further reduced to 40,000 t.

The bilateral salmon agreement also requires Japan to pay fishery fees. These are paid in goods related to the enhancement of the Soviet Pacific salmon industry. Although Japan's annual high-seas salmon quota was constant between 1978 and 1983, Soviet fishing fee demands increased. In 1978 Japan paid Russia $8.5 million ($200/t), and in 1983 the fees had more than doubled to $17.9 million

[1]In addition to the U.S.S.R. salmon quota, established by a bilateral agreement, Japanese fishermen also operate under the terms of the International North Pacific Fisheries Convention (INPFC).

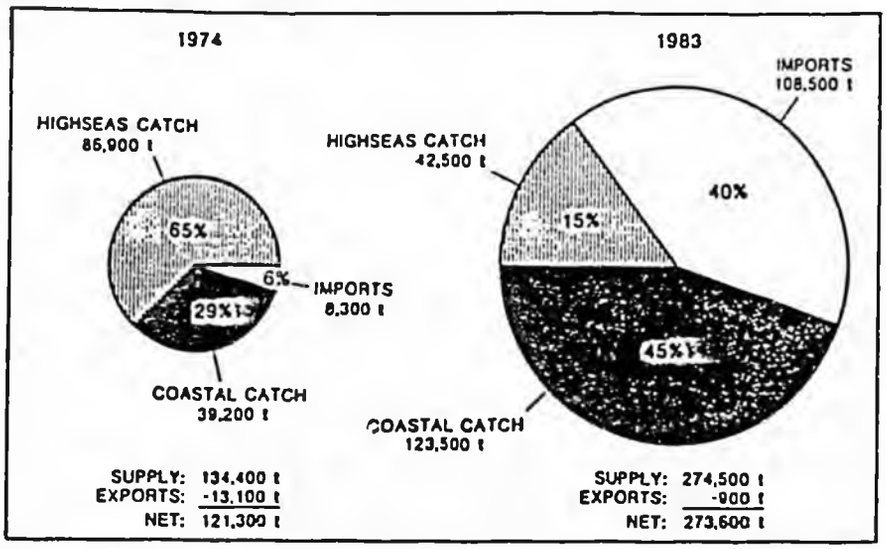


Figure 1.—Japan's salmon supply, excluding exports, 1974 and 1983.

Table 6.—The seven Japanese chum salmon gradings, after W. C. Atkinson (1984), "The Japan Salmon Market with Emphasis on the Market for Kotzebue Chum Salmon".

| Grading | Description |
|---|---|
| Meyka | "Ocean bright" salmon taken in the high-seas catch; meat is firm, skin color is healthy. |
| Ginka | "Silver bright" salmon taken in the coastal catch; meat is firm, skin color is healthy. |
| Buna "A" | "Dark salmon" taken in the coastal catch; color of skin and flesh is slightly changed. |
| Buna "B" | "Dark salmon" taken in the coastal catch; skin and flesh colors have darkened. |
| Buna "C" | "Dark salmon" taken in the coastal catch. This is the darkest colored chum in the coastal catch. |
| River Buna | "River dark" salmon taken in rivers (inland catch); these are salmon taken just prior to spawning. |
| Marked | Damaged or wounded chum salmon. |

($42l/t). The Japanese Finance Ministry has criticized this fee because the Japanese fishing industry pays only 55 percent of it, while the remaining 45 percent is subsidized through the JFA budget.

## Cage Culture

Japanese fish farmers raise only the coho or silver salmon in ocean cages. Salmon farming began in 1973 when 1 million coho eggs were imported from the United States for experimental freshwater culture. Japanese pen-farming operations switched to ocean-cage farming in 1975 because the salmon had a slow growth rate in fresh water.

Japan's coho production increased from 72 t in 1978 to 2,900 t in 1983 (Table 2) and all was consumed domestically. Japanese companies expected to harvest 4,500 t of farmed salmon in 1984 and as much as 8,000 t by 1990. More than half of the 1984 harvest will be produced by the Nichiro company (2,500 t), followed by Taiyo (1,000 t), Nichimo (500 t), and various smaller companies (500 t). The Japanese Government does not offer financial incentives to salmon farmers as they do to private salmon hatchery operations, and apparently prefers to "let the market decide."

## Domestic Markets

Salmon is popular in the Japanese diet, especially as a holiday gift item. Consumption was minimal before 1960, however, and limited mainly to northern Japan where the fish were caught. Since then, salmon consumption has increased throughout Japan owing to population growth, extensive advertising, fluctuating supplies of other fishery products, and an increase in per capita income. Observers forecast that the Japanese salmon consumption will expand if prices do not increase significantly.

Japan's salmon market was over-supplied in 1983 by record coastal catches and large imports. This depressed salmon prices and, in some instances, resulted in their dumping. Although the JFA projected that the fall 1984 coastal catch would be lower than in 1983, observers believed that 1984 salmon imports would also decline.

## Commodities

Most salmon in Japan is salted, smoked, or canned; the rest is consumed fresh. Although per capita consumption of salted and smoked salmon has increased greatly in recent years, fresh salmon consumption has increased only marginally, perhaps because the Japanese traditionally favor salted and smoked salmon over fresh salmon.

Salmon roe, a favored delicacy in Japan, is mostly cured, either as "sujiko" (in the membranous skein) or "ikura" (eggs separated from the skein). It is especially consumed during the New Year holidays (Oshogatsu).

## Species

Chum salmon is the cheapest and most abundant salmon in Japan, and more of it is consumed there than any other salmon. Mostly salted or smoked, it is obtained from the coastal catch; only small quantities are processed from imports or the high-seas catch.

When landed, chums are systematically graded by age and condition. Those with bright skin, firm and "good color" flesh, and high fat content are rated highest, while old and spent or damaged salmon are rated among the lowest of the seven gradings (Table 6).

Chum salmon have long been popular gifts in Japan. However, Japanese wholesalers see a need to reassess the so-called "gift salmon" market since the 1983 record-high chum landings depressed market prices. Lower prices resulted in decreased demand as many Japanese consumers saw the low-priced and abundant product as an undesirable gift item. One Japanese wholesaler believes that Japanese consumers may switch from chum to sockeye as a gift item if there is an over-supply of chum in the future, since sockeye is not only more expensive, but is also thought to be a better tasting, fattier salmon with redder flesh.

Sockeye and pink salmon are also popular in Japan. Sockeye is the species

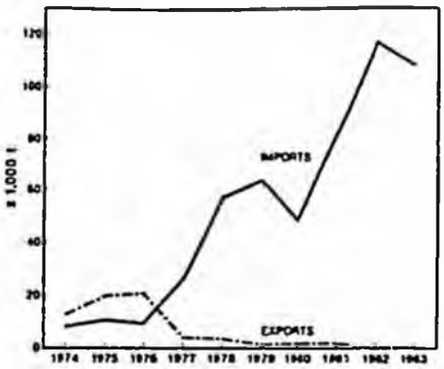


Figure 2.—Japan's salmon imports and exports (product weight), 1974-83.

most imported, while the pink accounts for Japan's second-largest salmon catch. Both species are favored by Japanese buyers who prefer that fish be landed or imported in the "princess cut" style (head-on) so quality-conscious consumers can better evaluate it for eye clarity and proper handling.

## Trade

Before 1977, Japan exported more salmon than it imported. Since then, however, increasing demand (especially for species less harvested by Japanese fishermen), combined with declining high-seas catches, have greatly increased salmon imports (Fig. 2, Table 2), i.e. 108,500 t were imported vs. 900 t exported in 1983.

### Imports

Japan's salmon imports (primarily frozen) increased from 8,300 t in 1974 to 108,500 t in 1983, largely owing to the high-seas catch decline, growth in salmon demand by increasingly affluent consumers, and fluctuating exchange rates. For example, 1978 salmon imports more than doubled from 1977 because a strong yen made U.S. salmon purchases less expensive. Also, Japanese importers were concerned about future salmon supplies which seemed uncertain after the Soviet Union reduced Japan's salmon catch quota 32 percent (20,100 t).

As a result of the increased imports, Japan accumulated large inventories of frozen salmon in 1979, which overlapped into 1980, causing a 30 percent decrease in salmon imports. Then, during 1981 and 1982, salmon imports increased nearly 130 percent (from 48,700 t to 117,700 t) as domestic demand increased.

In 1983, Japan's salmon imports again decreased (to 108,500 t) as a result of the record domestic catch. This 1983 "glut" also depressed Japan's salmon prices 30-40 percent in the wholesale market, and by 20 percent in the retail market. Preliminary FAO estimates[2] forecast that Japan's 1984 imports of frozen salmon would be 70,000-75,000 t, a 30 percent drop from 1983 imports, which would adversely impact many U.S. salmon exporters.

Japan imports more salmon from the United States than from any other country (Table 7). Their 1983 imports totaled over 96,000 t, and accounted for 90 percent of Japan's total salmon imports by quantity. Frozen salmon was the largest commodity imported (86,700 t), followed by salmon roe (8,175 t), fresh salmon (1,272 t), and canned salmon (93 t).

The United States was the largest sup-

Table 7.—Japan's salmon imports by commodity and country, 1977-84.

| Commodity and country | Imports (t) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 |
| Fresh | | | | | | | | |
| United States | 50 | 27 | 74 | 8 | 38 | 206 | 1,272 | 5 |
| Norway | | | | 2 | 29 | 33 | 78 | 179 |
| Other countries | 5 | 15 | 6 | 6 | 428 | 6 | 7 | 69 |
| Subtotal | 55 | 42 | 80 | 14 | 495 | 245 | 1,357 | 253 |
| Frozen | | | | | | | | |
| United States | 14,834 | 40,833 | 48,030 | 33,019 | 60,212 | 93,063 | 86,669 | 80,271 |
| Canada | 3,706 | 7,053 | 4,720 | 2,641 | 5,157 | 10,834 | 3,837 | 5,178 |
| Taiwan | 31 | 5 | | | | | 3,687 | 2,413 |
| North Korea | 662 | 1,808 | 1,382 | 1,674 | 3,002 | 1,501 | 1,188 | 1,681 |
| South Korea | 12 | 7 | 25 | 6 | 359 | 1,362 | 1,928 | 1,982 |
| U.S.S.R. | | | 439 | 1,991 | 2,546 | 645 | 254 | 1,363 |
| Other countries | 34 | 32 | 15 | 1 | 65 | 73 | 283 | 110 |
| Subtotal | 19,279 | 49,738 | 54,610 | 39,331 | 71,341 | 107,478 | 97,848 | 92,978 |
| Cured | | | | | | | | |
| United States | | | | | | | 7 | 695 |
| Canada | | | | | | | 121 | 563 |
| North Korea | | | | | | | 17 | 10 |
| Subtotal | | | | | | | 145 | 1,268 |
| Roe | | | | | | | | |
| Cured[1] (sujiko) | | | | | | | | |
| United States | 5,554 | 6,319 | 6,799 | 7,403 | 9,509 | 8,596 | 8,098 | 8,544 |
| Canada | 1,110 | 1,474 | 983 | 1,154 | 1,190 | 982 | 648 | 629 |
| Other countries | 18 | 10 | 9 | 43 | 33 | 59 | 36 | 33 |
| Subtotal | 6,682 | 7,803 | 7,791 | 8,600 | 10,732 | 9,637 | 8,782 | 9,206 |
| Cured[1] (ikura) | | | | | | | | |
| United States | 80 | 35 | 50 | 50 | 10 | 2 | 77 | 19 |
| Canada | 4 | 2 | 9 | negl. | 2 | negl. | 4 | 2 |
| China | 32 | 17 | 8 | 3 | | | | |
| Other countries | 5 | 7 | 9 | 1 | 1 | negl. | 1 | 5 |
| Subtotal | 121 | 61 | 76 | 54 | 13 | 2 | 82 | 26 |
| Canned | | | | | | | | |
| United States | 214 | 213 | 1,547 | 345 | 294 | 121 | 93 | 20 |
| U.S.S.R. | 60 | 1 | 390 | 415 | 203 | 112 | 117 | 137 |
| Canada | 1 | 60 | 232 | 29 | 61 | 87 | 65 | 41 |
| Other countries | negl. | negl. | 1 | 1 | 3 | 1 | 2 | 4 |
| Subtotal | 275 | 274 | 2,170 | 790 | 561 | 321 | 277 | [2]202 |
| Grand total[3] | 26,412 | 57,918 | 64,735 | 48,789 | 83,142 | 117,685 | 108,491 | 103,933 |

[1]"Sujiko" is cured roe in the skein. "Ikura" is cured roe separated from the skein.
[2]Japan's canned salmon imports were only available from January through November 1984.
[3]Totals may not agree because of rounding.

[2]FAO. "Infofish Trade News" (84/11), 16 June 1984.

Table 8.—Japanese imports of salmon products from the United States, by species, 1977-84.

| Species | Imports (t) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 |
| Sockeye | N/A[1] | N/A | N/A | N/A | 42,387 | 55,226 | 71,664 | 56,468 |
| Chum | N/A | N/A | N/A | N/A | 6,564 | 8,251 | 6,069 | 6,261 |
| Chinook | N/A | N/A | N/A | N/A | 2,548 | 1,432 | 2,465 | 1,172 |
| Pink | IA | N/A | N/A | N/A | 1,061 | 12,876 | 1,556 | 10,167 |
| Other[2] | IA | N/A | N/A | N/A | 16,303 | 22,503 | 12,729 | 11,920 |
| Total[3] | 15,594 | 41,418 | 44,596 | 30,914 | 68,863 | 100,288 | 94,483 | 85,988 |

[1]N/A = Not available.
[2]Unidentified salmon species; includes canned and filleted products and salmon roe.
[3]U.S. and Japanese trade statistics do not agree (i.e., 1983 U.S. Department of Commerce trade statistics indicate that the U.S. exported 94,483 t of salmon to Japan; Japanese trade statistics, however, showed U.S. exports of 96,217 t).

however, upon Japan's domestic demand for salmon. Some observers believe that Japanese consumers are developing a greater affinity for U.S. sockeye over the traditionally favored chum. Salmon prices will also influence U.S. exports, since the typical Japanese consumer is price-conscious about seafood.

Japan's salmon catches (both coastal and high-seas) will also influence U.S. exports. Furthermore, if Japan's high-seas salmon quota is reduced in the future, U.S. salmon exports would probably increase. (Source: IFR-84/79D.)

plier of fresh salmon to Japan in 1983, accounting for 1,272 t, or 93.8 percent of the total (Table 7). Norway was the second largest supplier (but of Atlantic salmon, *Salmo salar*), providing 77.5 t, or 5.7 percent of the total. Preliminary Japanese trade statistics through May 1984 indicated that Norway had already exported almost 94 t of fresh Atlantic salmon to Japan, 20 percent more than in 1983. Observers believe that Norway's farmed Atlantic salmon exports to Japan will continue to compete with U.S. fresh Pacific salmon exports.

Sockeye or red salmon has been the leading U.S. species imported by Japan in recent years (Table 8). In 1983, the sockeye accounted for over 75 percent by quantity and 70 percent by value of U.S. salmon shipments to Japan.

U.S. salmon exporters were not greatly affected by Japan's record salmon hatchery returns in 1983. U.S. shipments totaled over 96,000 t in 1983, a decline of only 5 percent from the nearly 102,000 t exported in 1982 (Table 7). This is because Japan released and harvested mostly chum salmon and not sockeye salmon—the primary U.S. export species.

Concern among U.S. salmon exporters may develop, however, if Japan expands hatchery efforts on sockeye salmon. In 1983, the JFA released 61,000 sockeye fry, and observers reported that the JFA planned to hatch and release 100,000 sockeye fry by 1985. If the sockeye returns are successful, the JFA may increase such releases in the future.

### Exports

Japan enjoyed a favorable balance of trade in salmon products until 1976 (Table 2). However, salmon product exports have since declined (Fig. 2), especially in 1977 after the Soviets decreased Japan's high-seas catch quota. Expanded domestic salmon demand in recent years also contributed to the export reduction.

Both in 1982 and 1983, Japan exported less than 1,000 t of salmon products. However, Japanese trade statistics through May 1984 indicated that Japan's early 1984 salmon exports (1,000 t) had already exceeded 1983 exports, which observers indicate was due to the 1983 over-supply of salmon on the Japanese market.

### Conclusions

The factors which continue to influence Japan's salmon supply include: 1) Coastal (hatchery-produced) chum catches, 2) salmon imports, and 3) high-seas catches. Japan must carefully balance these factors to meet the domestic demand while not over-supplying the market (as in 1983).

The high-seas catch represents an especially difficult problem since it depends on annual bilateral quota agreements with the Soviet Union. Japan has tried to convince Soviets to agree to a long-term salmon agreement that would assure economic stability for Japanese high-seas salmon fishermen and also assure domestic markets a specified portion of the total salmon supply for several years. So far the Soviets have been unwilling to agree to this proposal.

Japan will remain the largest foreign market for U.S. salmon exports. The amount of U.S. exports will depend,

## *Status of Mexico's Fisheries, 1983-84*

Mexico's Fisheries Secretary Pedro Ojeda Paullada has announced that the Mexican Government's goal is to more than double the 1983-84 fisheries catch of 1.1 million metric tons (t) (data adjusted for the period 1 Sept.-31 Aug.) to 2.5 million t by 1988. While the 1983-84 harvest was less than in previous years (Table 1), the apparent decline probably reflects more accurate statistical reporting and the lingering results of the of the 1982-83 El Niño on the important Pacific Coast small pelagic fisheries. Secretary Ojeda's remarks came in a late 1984 briefing of the Mexican Congress on the status of the fisheries.

Mexico has a mixed economy and the three major economic sectors (private, cooperative, and public) each play an important role in the fishing industry. The private sector takes the largest quantity of fish, about 66 percent during 1983-84. Most of the private catch

Table 1.—Mexico's fish catch, recent and projected (1988).

| Year[1] | Catch (1,000 t) |
|---|---|
| 1975 | 487.5 |
| 1976 | 526.3 |
| 1977 | 610.8 |
| 1978 | 702.6 |
| 1979 | 877.0 |
| 1980 | 1,243.8 |
| 1981 | 1,564.8 |
| 1982 | 1,506.0 |
| 1983-84[2] | 1,100.0 |
| 1988 | 2,500.0 |

[1]Calendar year.
[2]Sept.-31 Aug.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Auke Bay Laboratory
P. O. Box 210155, Auke Bay, Alaska 99821
907 789 6000
Western Union Telex II (TWX) 5101000492

February 14, 1989

Dr. Dave Harrison
c/o Rep. Jim Zawacki
Pouch V
Juneau, Ak 99811

Dear Dr. Harrison:

I am including estimates of salmon interceptions by the high seas salmon fisheries of Japan per your telephone request of this date. I estimated interceptions by the Japanese mothership fishery as follows:

Table 1.--Estimates of interceptions of North American salmon by the Japanese mothership salmon fishery in thousands of fish, 1980-1987.[1]

| Year | Sockeye | Chum | Pink | Coho | Chinook | Total |
|---|---|---|---|---|---|---|
| 1980 | 885 | 39 | 8 | 164 | 582 | 1,678 |
| 1981 | 668 | 28 | 2 | 154 | 69 | 921 |
| 1982 | 523 | 38 | 8 | 288 | 85 | 942 |
| 1983 | 513 | 44 | 2 | 74 | 68 | 701 |
| 1984 | 632 | 40 | 15 | 196 | 68 | 951 |
| 1985 | 410 | 15 | <1 | 32 | 52 | 510 |
| 1986 | 142 | 29 | <1 | 16 | 47 | 235 |
| 1987[2] | 134 | 26 | <1 | 9 | 32 | 211 |

[1]Source: Michael Dahlberg, NMFS, Auke Bay. April 27, 1988, Fredin, R.A., et al. 1977. Pacific Salmon and the high seas salmon fisheries of Japan. Proc. Rept. U.S. Dept. Comm. NOAA. Northwest and Alaska Fisheries Center. 324 pp. INPFC Documents 2489, 2607, 2739, 2866, 2988, 3132 and 3269. C. Harris, 1987, FRI,pers. comm.

[2]Preliminary

Estimates of interceptions by the Japanese landbased driftnet fishery were published in a paper by C. Harris; I include a copy of pertinent tables.

Sincerely,

Michael L. Dahlberg, Ph.D.
Mathematical Statistician

Table 14. Total catch and estimated catch of Western Alaska (including Canadian Yukon) chinook salmon (in thousands of fish) in Japanese high seas salmon gillnet fisheries, 1964-1988[a,b]

| | Mothership | | Landbased | | Combined | |
|---|---|---|---|---|---|---|
| Year | Total Catch | W.AK Catch | Total Catch | W.AK Catch | Total Catch | W.AK Catch |
| 1964 | 410 | 179 | 208 | 40 | 618 | 219 |
| 1965 | 185 | 106 | 102 | 20 | 287 | 126 |
| 1966 | 208 | 108 | 118 | 22 | 326 | 130 |
| 1967 | 128 | 71 | 115 | 22 | 243 | 93 |
| 1968 | 362 | 244 | 97 | 18 | 459 | 262 |
| 1969 | 554 | 367 | 88 | 17 | 642 | 384 |
| 1970 | 437 | 312 | 148 | 28 | 585 | 340 |
| 1971 | 206 | 132 | 139 | 27 | 345 | 159 |
| 1972 | 261 | 189 | 107 | 20 | 368 | 209 |
| 1973 | 119 | 56 | 165 | 31 | 284 | 87 |
| 1974 | 361 | 208 | 188 | 36 | 549 | 244 |
| 1975 | 162 | 108 | 137 | 20 | 299 | 407 |
| 1976 | 285 | 117 | 201 | 42 | 486 | 159 |
| 1977 | 93 | 55 | 146 | 31 | 239 | 86 |
| 1978 | 105 | 36 | 210 | 63 | 315 | 99 |
| 1979 | 126 | 69 | 160 | 45 | 286 | 114 |
| 1980 | 704 | 416 | 160 | 22 | 864 | 438 |
| 1981 | 88 | 30 | 190 | 55 | 278 | 85 |
| 1982 | 107 | 45 | 165 | 41 | 272 | 86 |
| 1983 | 87 | 31 | 178 | 44 | 265 | 75 |
| 1984 | 82 | 36 | 92 | 21 | 174 | 57 |
| 1985 | 66 | 25 | 101 | 22 | 167 | 47 |
| 1986 | 60 | 24 | 77 | 20[c] | 137 | 44[c] |
| 1987[d] | 39 | 20 | 77 | NA[e] | 116 | NA[e] |
| 1988 | NA[e] | NA[e] | NA[e] | NA[e] | NA[e] | NA[e] |

[a] Sources: 1964-83: Rogers, Donald et al., 1984. Origins of chinook salmon in the area of Japanese Mothership Fisheries. Fisheries Research Institute, University of Washington. 215 pgs. 1984-1987 WA catch estimate for mothership fishery: Mike Dahlburg, National Marine Fisheries Service, Juneau, AK.

[b] Western Alaska catches represent fish from Bristol Bay, Kuskokwim, Yukon River and Norton Sound areas.

[c] From Rogers, Donald. April 1987. Interceptions of Yukon Salmon by High Seas Fisheries, Fishery Research Institute, University of Washington, 34 pp. Dahlburg, Michael T. (NMFS) reported 9/27/86 an estimate of 24,000 west AK chinook salmon intercepted by mothership fleet. The difference between these two estimates results in the estimate of 20,000 western AK chinooks intercepted in the landbased fishery for 1986.

[d] Preliminary information.

[e] Data not available.

STATE OF ALASKA
1990 LEGISLATIVE SESSION

BILL VERSION: SCS CSHJR 27(Res)
PUBLISH DATE: 4/10/90

# FISCAL NOTE

REQUEST:

Revision Date:
Title: Compensation for Salmon Interceptions
Sponsor: Zawacki and Hanley
Requestor: House Rules

Agency Affected: Revenue
BRU: Income & Excise Audit
Component: Operating

EXPENDITURES/REVENUES: (Thousands of Dollars)

| OPERATING | FY 90 | FY 91 | FY 92 | FY 93 | FY 94 | FY 95 |
|---|---|---|---|---|---|---|
| PERSONAL SERVICES | | | | | | |
| TRAVEL | | | | | | |
| CONTRACTUAL | | | | | | |
| SUPPLIES | | | | | | |
| EQUIPMENT | | | | | | |
| LAND & STRUCTURES | | | | | | |
| GRANTS, CLAIMS | | | | | | |
| MISCELLANEOUS | | | | | | |
| TOTAL OPERATING | -0- | -0- | -0- | -0- | -0- | -0- |
| CAPITAL | -0- | -0- | -0- | -0- | -0- | -0- |
| REVENUE | -0- | -0- | -0- | -0- | -0- | -0- |

FUNDING: (Thousands of Dollars)

| | | | | | | |
|---|---|---|---|---|---|---|
| GENERAL FUND | | | | | | |
| FEDERAL FUNDS | | | | | | |
| OTHER | | | | | | |
| TOTAL | -0- | -0- | -0- | -0- | -0- | -0- |

POSITIONS: N/A

| | | | | | | |
|---|---|---|---|---|---|---|
| FULL-TIME | | | | | | |
| PART-TIME | | | | | | |
| TEMPORARY | | | | | | |

ANALYSIS: (Attach a separate page if necessary)

Updated fiscal note - attachment

Prepared by: Rep. Ben Grussendorf, Chairman
Phone: 465-3764
Division: House Rules Committee
Date:

Approved by Commissioner:
Date:
Agency:

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

Changes in SCS CSHJR (Res) have no fiscal impact. This fiscal note is appropriate. Projections of no fiscal impact would continue through 1996.

Anchorage Times
Nov. 3, 1989

Sen. Ted Stevens
. . . initiated idea

# U.S. seeks ban on drift netting

By DANIEL R. SADDLER
Times Writer

The United States has introduced a resolution in the United Nations General Assembly seeking a global moratorium on the use of drift nets to harvest fish on the high seas.

The resolution asks all nations to voluntarily end use of the nets by June 30, 1992, and to cooperate in collection of scientific data on the impact of the fishing practice on marine life.

It also seeks an immediate ban on high-seas drift netting in the South Pacific to prevent irreversable damage to fish resources and to give time for development of fish management plans.

In recent years, fishing vessels from Japan, Tai-

See Ban, page A-6

# Ban: High-seas drift netting

Continued from page A-1

wan, South Korea and China have increased their use of the nets. Stretched up to 40 miles through the international waters, the monofilament nets efficiently harvest many species of fish and squid, but also indiscriminately snare marine mammals, seabirds and other species.

The resolution echoes the concerns of fishermen and environmentalists in Alaska and elsewhere that improper use of driftnets represents a "strip mining" of the oceans.

"Large-scale pelagic drift-net fishing is an indiscriminate fishing method which threatens the effective conservation of living marine resources such as highly migratory and anadromous species of fish, birds and marine mammals," the resolution said.

In recent months the United States signed driftnet treaties with Japan, Taiwan and South Korea, requiring observers to gather data on catches and watch for fishing abuses, and in some cases, granting enforcement powers to the U.S. Coast Guard.

Alaska Sen. Ted Stevens proposed the idea for a U.N. resolution to Secretary of State James Baker several months ago, Jane Robbins, a Stevens aide, said Thursday.

"United Nations approval of this resolution would place tremendous worldwide pressure on the governments of Japan, Taiwan and South Korea to put an end to their high seas drift-net fleets," Stevens said in announcing the resolution.

Stevens hopes to build global pressure to bear against those Asian nations to end the practice and to make sure that any driftnets banned in one ocean don't end up in the North Pacific to compete with Alaska fishermen.

"There's been a move in the South Pacific to start a moratorium on drift nets down there, and Sen. Stevens is worried that the fleets that operate in the South Pacific were kicked out they might move to the North Pacific," said Robbins.

U.N. delegations from New Zealand and Australia co-sponsored the resolution, introduced in the General Assembly Thursday afternoon by Thomas Pickering, the U.S. ambassador to the United Nations.

The non-binding resolution will be referred to the U.N. Committee on Environment for consideration, and a vote could come by early December, Robbins said.

# CORRECTION

THIS DOCUMENT
HAS BEEN REPHOTOGRAPHED
TO ASSURE LEGIBILITY

STATE OF ALASKA
1990 LEGISLATIVE SESSION

BILL VERSION: SCS CSHJR 27(Res)
PUBLISH DATE: 4/10/90

# FISCAL NOTE

REQUEST:

Revision Date: _____
Title: Compensation for Salmon Interceptions
Sponsor: Zawacki and Hanley
Requestor: House Rules

Agency Affected: Revenue
BRU: Income & Excise Audit
Component: Operating

EXPENDITURES/REVENUES: (Thousands of Dollars)

| OPERATING | FY 90 | FY 91 | FY 92 | FY 93 | FY 94 | FY 95 |
|---|---|---|---|---|---|---|
| PERSONAL SERVICES | | | | | | |
| TRAVEL | | | | | | |
| CONTRACTUAL | | | | | | |
| SUPPLIES | | | | | | |
| EQUIPMENT | | | | | | |
| LAND & STRUCTURES | | | | | | |
| GRANTS, CLAIMS | | | | | | |
| MISCELLANEOUS | | | | | | |
| TOTAL OPERATING | -0- | -0- | -0- | -0- | -0- | -0- |
| CAPITAL | -0- | -0- | -0- | -0- | -0- | -0- |
| REVENUE | -0- | -0- | -0- | -0- | -0- | -0- |

FUNDING: (Thousands of Dollars)

| | | | | | | |
|---|---|---|---|---|---|---|
| GENERAL FUND | | | | | | |
| FEDERAL FUNDS | | | | | | |
| OTHER | | | | | | |
| TOTAL | -0- | -0- | -0- | -0- | -0- | -0- |

POSITIONS: N/A

| | | | | | | |
|---|---|---|---|---|---|---|
| FULL-TIME | | | | | | |
| PART-TIME | | | | | | |
| TEMPORARY | | | | | | |

ANALYSIS: (Attach a separate page if necessary)

Updated fiscal note - attachment

Prepared by: Rep. Ben Grussendorf, Chairman
Phone: 465-3764
Division: House Rules Committee
Date: _____

Approved by Commissioner: _____
Date: _____
Agency: _____

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

Changes in SCS CSHJR (Res) have no fiscal impact. This fiscal note is appropriate. Projections of no fiscal impact would continue through 1996.

HJR 27
Prepared by:
Steven E. Kettel
Department of Revenue
March 30, 1989

SJR 27 estimates high seas interception of salmon at 2,000,000 fish. To determine the fish tax lost as a result of interception we have made the following assumptions:

1) 15% of the fish are Western Alaska Chinooks with an ex-vessel value of $19.00 per fish.

2) 44% of the fish are Bristol Bay Sockeye with an ex-vessel value of $4.60 per fish.

3) 3% of the fish are Western Alaska chums with an ex-vessel value of $2.80 per fish.

4) 38% of the fish are Prince William Sound Coho with an ex-vessel value of $8.50 per fish.

5) All fish are processed by floating processors which pay a 5% raw fish tax.

6) No estimate of salmon enhancement tax losses are considered for purposes of this analysis.

| Specie | # of Fish | Value/Fish | Total Value | Tax(5%) |
|---|---|---|---|---|
| Chinook | 300,000 | $19.00 | 5,700,000 | 285,000 |
| Sockeye | 880,000 | 4.60 | 4,048,000 | 202,400 |
| Chums | 60,000 | 2.80 | 168,000 | 8,400 |
| Coho | 760,000 | 8.50 | 6,460,000 | 323,000 |
| | 2,000,000 | | 16,376,000 | 818,800 |

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See Ban, page A-6

# Ban: High-seas drift netting

Continued from page A-1

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Prepared by:
Steven E. Kettel
Department of Revenue
March 30, 1989

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| | 2,000,000 | | 16,376,000 | 818,800 |

STATE OF ALASKA
1990 LEGISLATIVE SESSION

BILL VERSION: SCS CSHJR 27(Res)
PUBLISH DATE: 4/10/90

# FISCAL NOTE

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Revision Date:
Title: Compensation for Salmon Interceptions
Sponsor: Zawacki and Hanley
Requestor: House Rules

Agency Affected: Revenue
BRU: Income & Excise Audit
Components: Operating

**EXPENDITURES/REVENUES:** (Thousands of Dollars)

| OPERATING | FY 90 | FY 91 | FY 92 | FY 93 | FY 94 | FY 95 |
|---|---|---|---|---|---|---|
| PERSONAL SERVICES | | | | | | |
| TRAVEL | | | | | | |
| CONTRACTUAL | | | | | | |
| SUPPLIES | | | | | | |
| EQUIPMENT | | | | | | |
| LAND & STRUCTURES | | | | | | |
| GRANTS, CLAIMS | | | | | | |
| MISCELLANEOUS | | | | | | |
| TOTAL OPERATING | -0- | -0- | -0- | -0- | -0- | -0- |
| CAPITAL | -0- | -0- | -0- | -0- | -0- | -0- |
| REVENUE | -0- | -0- | -0- | -0- | -0- | -0- |

**FUNDING:** (Thousands of Dollars)

| | | | | | | |
|---|---|---|---|---|---|---|
| GENERAL FUND | | | | | | |
| FEDERAL FUNDS | | | | | | |
| OTHER | | | | | | |
| TOTAL | -0- | -0- | -0- | -0- | -0- | -0- |

**POSITIONS:** N/A

| | | | | | | |
|---|---|---|---|---|---|---|
| FULL-TIME | | | | | | |
| PART-TIME | | | | | | |
| TEMPORARY | | | | | | |

**ANALYSIS:** (Attach a separate page if necessary)

Updated fiscal note - attachment

Prepared by: Rep. Ben Grussendorf, Chairman
Phone: 465-3764
Division: House Rules Committee
Date:

Approved by Commissioner:
Date:
Agency:

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

Changes in SCS CSHJR (Res) have no fiscal impact. This fiscal note is appropriate. Projections of no fiscal impact would continue through 1996.

Anchorage Times
Nov. 3, 1989

Sen. Ted Stevens
... initiated idea

# U.S. seeks ban on drift netting

By DANIEL R. SADDLER
Times Writer

The United States has introduced a resolution in the United Nations General Assembly seeking a global moratorium on the use of drift nets to harvest fish on the high seas.

The resolution asks all nations to voluntarily end use of the nets by June 30, 1992, and to cooperate in collection of scientific data on the impact of the fishing practice on marine life.

It also seeks an immediate ban on high-seas drift netting in the South Pacific to prevent irreversable damage to fish resources and to give time for development of fish management plans.

In recent years, fishing vessels from Japan, Tai-

See Ban, page A-6

# Ban: High-seas drift netting

Continued from page A-1

wan, South Korea and China have increased their use of the nets. Stretched up to 40 miles through the international waters, the monofilament nets efficiently harvest many species of fish and squid, but also indiscriminately snare marine mammals, seabirds and other species.

The resolution echoes the concerns of fishermen and environmentalists in Alaska and elsewhere that improper use of driftnets represents a "strip mining" of the oceans.

"Large-scale pelagic drift-net fishing is an indiscriminate fishing method which threatens the effective conservation of living marine resources such as highly migratory and anadromous species of fish, birds and marine mammals," the resolution said.

In recent months the United States signed driftnet treaties with Japan, Taiwan and South Korea, requiring observers to gather data on catches and watch for fishing abuses, and in some cases, granting enforcement powers to the U.S. Coast Guard.

Alaska Sen. Ted Stevens proposed the idea for a U.N. resolution to Secretary of State James Baker several months ago, Jane Robbins, a Stevens aide, said Thursday.

"United Nations approval of this resolution would place tremendous worldwide pressure on the governments of Japan, Taiwan and South Korea to put an end to their high seas drift-net fleets," Stevens said in announcing the resolution.

Stevens hopes to build global pressure to bear against those Asian nations to end the practice and to make sure that any driftnets banned in one ocean don't end up in the North Pacific to compete with Alaska fishermen.

"There's been a move in the South Pacific to start a moratorium on drift nets down there, and Sen. Stevens is worried that the fleets that operate in the South Pacific were kicked out they might move to the North Pacific," said Robbins.

U.N. delegations from New Zealand and Australia co-sponsored the resolution, introduced in the General Assembly Thursday afternoon by Thomas Pickering, the U.S. ambassador to the United Nations.

The non-binding resolution will be referred to the U.N. Committee on Environment for consideration, and a vote could come by early December, Robbins said.

# Salmon smuggler enters guilty plea

The Associated Press

SEATTLE — A Taiwanese fish broker arrested in an undercover sting operation last summer has pleaded guilty to conspiracy, smuggling and money-laundering charges related to pirated salmon. He faces up to 30 years in prison and $1 million in fines, officials said.

Patrick Lee, 41, entered the plea Monday and will be sentenced March 23.

Assistant U.S. Attorney Robert Chadwell said charges involving trade in smaller amounts of salmon were dropped as part of a plea agreement.

Lee was arrested last summer with five others following a six-month sting operation in which federal agents agreed to pay $1.3 million for salmon caught illegally by two Taiwanese fishing boats.

Such harvests have outraged Alaska fishermen, who charge the Taiwanese and other high-seas fishermen are taking salmon that otherwise would return to state waters to spawn. Scientist sampling of the high-seas salmon have found that some return to Asian spawning grounds, and some to North America.

The six men caught in the Seattle sting were charged with violating the Lacey Act, which prohibits commerce in illegally caught fish or wildlife. Taiwan has a law expressly forbidding its fishing boats from catching salmon since no salmon breed in its rivers.

Lee's name was noticed last spring when he placed ads in an international seafood journal for headed and gutted salmon.

Undercover investigators arranged to buy 500 tons of salmon for $1.3 million.

Lee and John Chin-Hong Wang, a naturalized American citizen who had just graduated from the Massachusetts Institute of Technology and whose father was a vessel owner, flew together from Taiwan to Seattle, investigators said.

According to a court filing, an undercover agent, code-named "Frambes," showed Lee $1.5 million in cash in a safe deposit box at Seafirst Bank, supposedly to cover the purchase.

Please see Page D-3, FISH

# FISH: Taiwanese broker pleads guilty to salmon scam

Continued from Page D-1

Frambes contacted undercover agents on Redfin, a leased freighter, and confirmed they had rendezvoused with two Taiwanese squid boats on the high seas and had seen the salmon in their holds.

Lee and Wesley Meng Hsu, identified as Lee's Los Angeles agent, then went into a private room at Seafirst Bank where Frambes handed over an initial payment of $330,000.

Hsu and Lee were arrested outside the bank with the money in Hsu's briefcase.

Meanwhile, at sea, the captains of the two squid boats, Meng Gin Hsu and Chan Lon Lin, were invited on board the Redfin. Once aboard the U.S.-flagged vessel, they were arrested, with interpreter Jen Chu.

As a Coast Guard cutter arrived on the scene, the two Taiwanese vessels fled. In an ensuing chase, one boat es caped while the other wa boarded by the Coast Guar and Taiwanese authorities.

The arrests, combine with the conviction of tw major fish brokers earlie this year, has dried up th sale of pirated salmon in th United States, said Wayn Lewis, the special agent i charge of law enforcement a the National Marine Fishe ies Service.

But he said Taiwanes driftnet boats continue t pirate U.S. salmon.

# HJR

# 28

STATE OF ALASKA
1990 LEGISLATIVE SESSION

BILL VERSION : HJR 28
PUBLISH DATE :

FISCAL NOTE

REQUEST:

Revision Date: 5-Feb-90
Agency Affected: Natural Resources
Title: Relating To the Beringia International Biosphere Reserve
BRU: Management & Administration
Sponsor: M.Davis, Foster Koponen Brown
Components: Commissioner's Office
Requestor: Senate Resources

EXPENDITURES/REVENUES: (Thousands of Dollars)

| OPERATING | FY 91 | FY 92 | FY 93 | FY 94 | FY 95 | FY 96 |
|---|---|---|---|---|---|---|
| PERSONAL SERVICES | | | | | | |
| TRAVEL | | | | | | |
| CONTRACTUAL | | | | | | |
| SUPPLIES | | | | | | |
| EQUIPMENT | | | | | | |
| LAND&STRUCTURES | | | | | | |
| GRANTS,CLAIMS | | | | | | |
| MISCELLANEOUS | | | | | | |
| TOTAL OPERATING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CAPITAL | | | | | | |
| REVENUE | | | | | | |

FUNDING: (Thousands of Dollars)

| | | | | | | |
|---|---|---|---|---|---|---|
| GENERAL FUND | | | | | | |
| FEDERAL FUNDS | | | | | | |
| OTHER | | | | | | |
| TOTAL | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

POSITIONS:

| | | | | | | |
|---|---|---|---|---|---|---|
| FULL-TIME | | | | | | |
| PART-TIME | | | | | | |
| TEMPORARY | | | | | | |

ANALYSIS: (Attach a separate page if necessary)

Prepared by: Larry Ostrovsky
Phone : 465-2400
Division: Commissioner's Office
Date : 5-Feb-90

Approved by Commissioner: Lennie Gorsuch
Date: 5-Feb-90
Agency: Department of Natural Resources

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

# Alaska State Legislature

Representative Mike Davis District 19

P.O. Box V
Juneau, Alaska 99811
(907) 465-4930/4941

Interim Office
P.O. Box 81435
Fairbanks, Alaska 99708
(907) 456-8161

To: Senate Resources Committee

From: Representative Mike Davis

Date: April 25, 1989

Re: CS for HJR 28 (Resources)
Beringia International Biosphere Reserve

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During the Moscow Summit in May of 1972, President Nixon and General Secretary Brezhnev developed the "Basic Principles of Relations Between the U.S. and the U.S.S.R.", in which the improvement of U.S.- Soviet relations was the central issue.

In 1987 at the Washington summit, President Reagan and General Secretary Gorbachev agreed in principle to "encourage expanded contacts and cooperation on issues relating to the Arctic... including cooperation of scientific research...of the region's environment."

HJR 28 would cover all those points, in just that spirit of cooperation. Here is an opportunity for Alaska and the Magadan Territory to work together for common goal.

The Beringian area is the Seward peninsula on the Alaska side and the Chukotsk peninsula on the Soviet side, and the portion of the Bering Sea joining the two. It is an area of outstanding biological and cultural values. A proposed Beringia International Biosphere designation would recognize this rich and unique area, encourage joint scientific research, and provide unprecedented opportunity for promoting mutual understanding between the U.S.S.R and the U.S for wise stewardship of shared resources.

A Biosphere Reserve would not change in any way the current status, such as subsistence use. Such a designation is simply an overlay on other existing land uses. In addition, local people benefit from Reserves in several ways: more influence in land-use decisions, improved land management, and continued opportunities to maintain their existing ways of life.

# Alaska State Legislature

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A biosphere reserve is an international designation made by UNESCO. UNESCO encourages biosphere reserves to establish mechanisms for planning and coordinating reserve activities. They also encourage each b/r administrator to prepare a management plant that specifies steps to be taken to develop and coordinate b/r functions.

We need Biosphere Reserves:

- To conserve biological resources
  * B/R's contain examples of characteristic ecosystems of the world's natural regions.

- To perpetuate and learn from traditional forms of land use
  * people are an integral component
  * some reserves include landscapes resulting from traditional patterns of land use

- To learn how natural systems work

- To monitor natural and human-caused changes
  * such as air pollution
  * results can be compared regionally & worldwide

- To improve management of natural resources
  * "Research to find land-use practices that improve human well-being without degrading the environment is a central purpose of biosphere reserves."

- To share knowledge
  * results of research are transmitted by on-the-spot training and education
  * publications and other media
  * principal recipients are local people and local, national and foreign scientists, resource managers, protected area administrators, govt officials and visitors.

- To cooperate in solving natural resource problems
  * people from many regions can learn from each other in solving shared problems

Other important information

1. Bicsphere reserves are intended to become models of resource use practices.

2. Because they are part of a global network, biosphere reserves encourage international participation.

3. Biosphere reserves help indigenous peoples maintain their traditions and improve their economic well-being through use of culturally and environmentally appropriate technologies.

4. Biosphere reserves encourage research.

5. They are multipurpose protected areas established to conserve species and natural communities.

How Local People benefit from Biosphere Reserves

* protection of basic resources
* improved land management
* more productive and diverse economic base
* additional employment
* more influence in land-use decisions
* increased pride in their traditions
* continued opportunities to maintain existing lifeways

# STATE OF ALASKA
# 1989 LEGISLATIVE SESSION

BILL VERSION: HJR 28
PUBLISH DATE:

## FISCAL NOTE

REQUEST:

Revision Date: 28-Feb-89
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Title: Relating to the Beringia International Biosphere Reserve
BRU: Management & Administration
Sponsor: M.Davis,Foster,Koponen,Brown, and Navarre
Components: Commissioners Office
Requestor: House Special Committee on Foreign Trade and Resources

EXPENDITURES/REVENUES: (Thousands of Dollars)

| OPERATING | FY 89 | FY 90 | FY 91 | FY 92 | FY 93 | FY 94 |
|---|---|---|---|---|---|---|
| PERSONAL SERVICES | | | | | | |
| TRAVEL | | | | | | |
| CONTRACTUAL | | | | | | |
| SUPPLIES | | | | | | |
| EQUIPMENT | | | | | | |
| LAND&STRUCTURES | | | | | | |
| GRANTS,CLAIMS | | | | | | |
| MISCELLANEOUS | | | | | | |
| TOTAL OPERATING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CAPITAL | | | | | | |
| REVENUE | | | | | | |

FUNDING: (Thousands of Dollars)

| | | | | | | |
|---|---|---|---|---|---|---|
| GENERAL FUND | | | | | | |
| FEDERAL FUNDS | | | | | | |
| OTHER | | | | | | |
| TOTAL | 0.0 | | | | | |

POSITIONS:

| | | | | | | |
|---|---|---|---|---|---|---|
| FULL-TIME | | | | | | |
| PART-TIME | | | | | | |
| TEMPORARY | | | | | | |

ANALYSIS: (Attach a separate page if necessary)

Prepared by: Larry Ostrovsky
Phone: 465-2400
Division: Commissioner's Office
Date: 28-Feb-89

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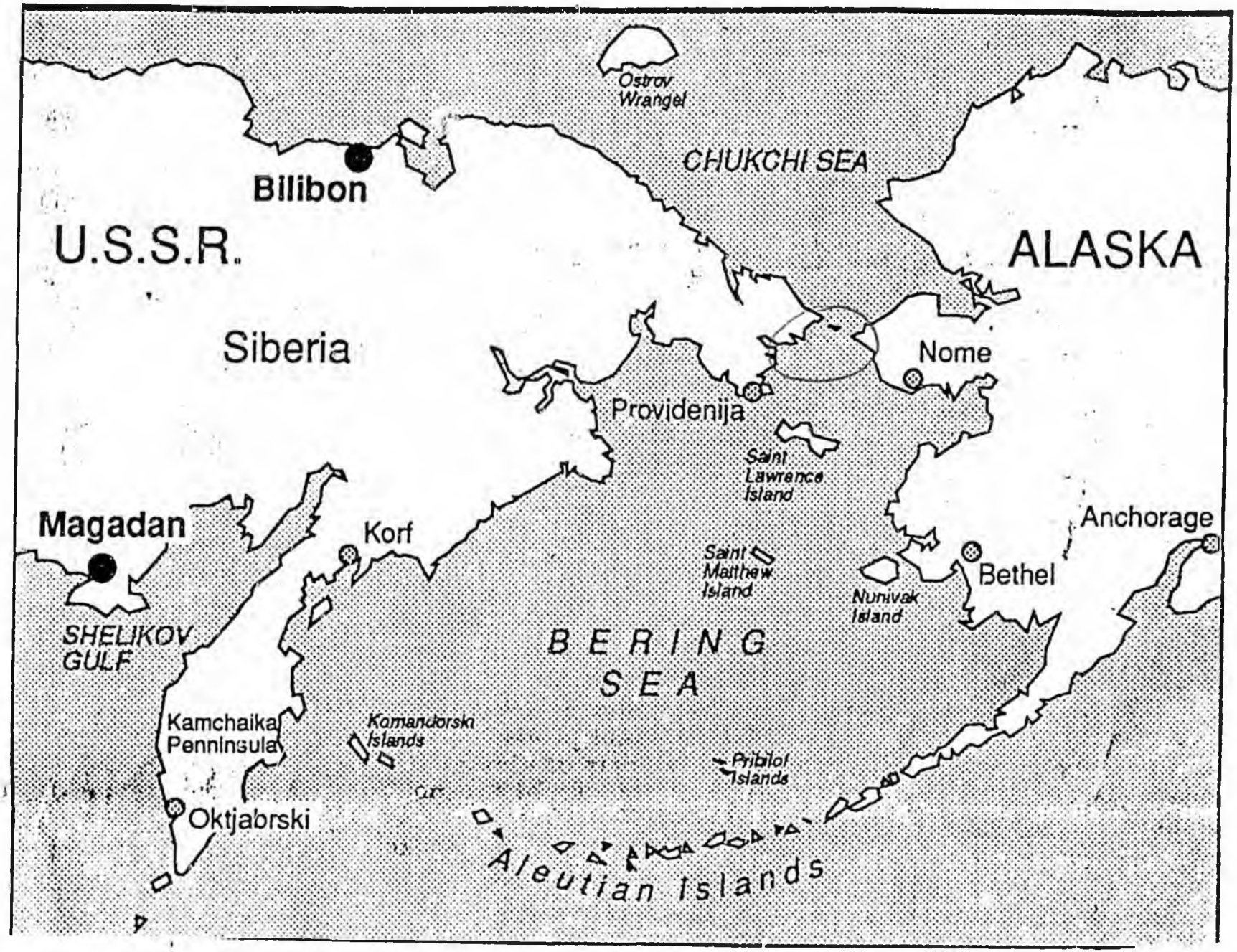
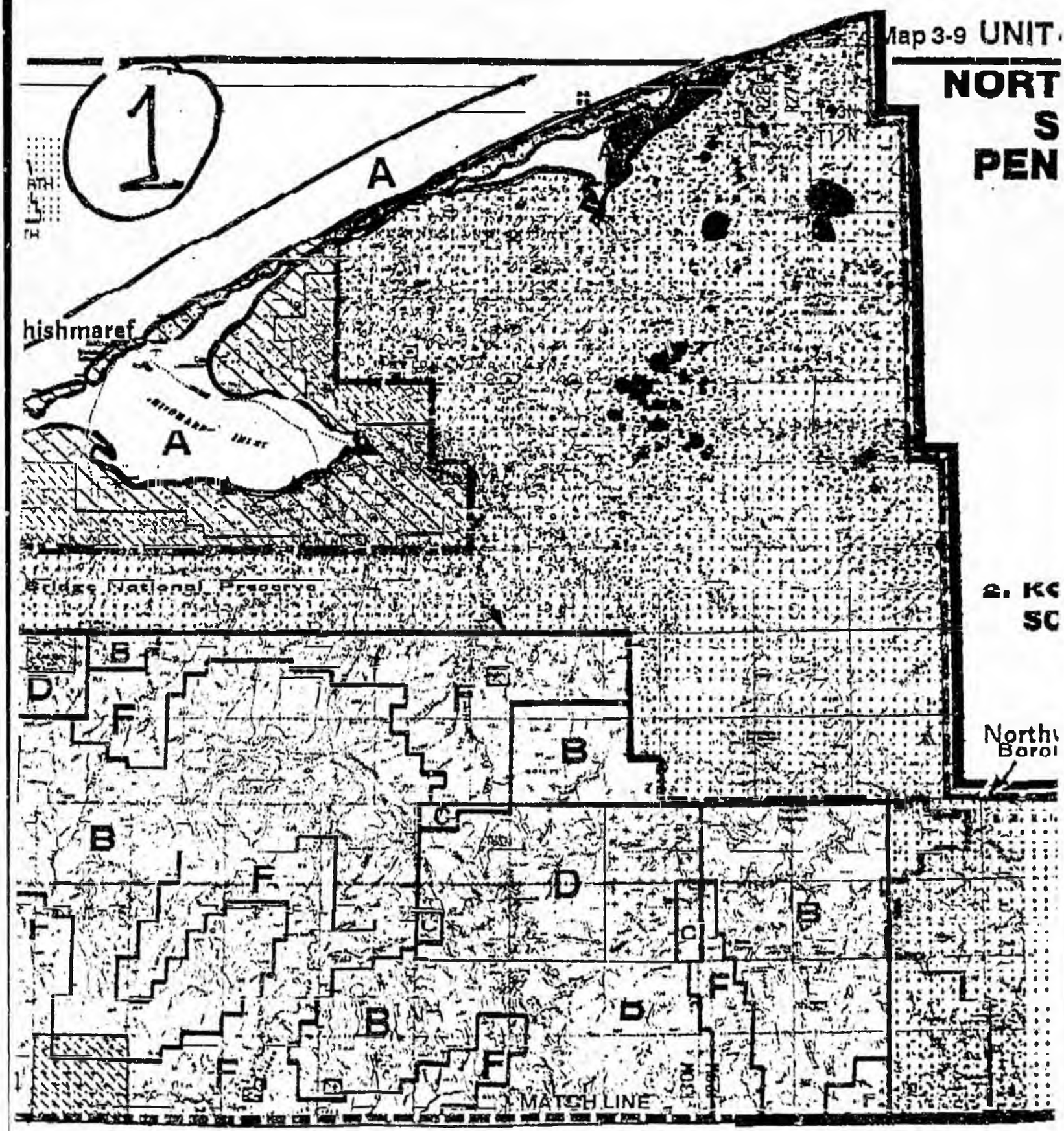
Distribution (by preparer):
Legislative Finance
Legislative Sponsor
Requestor
Office of Management and Budget
Impacted Agency(ies)

Proposed area




Map 3-9 UNIT
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