

Yukon Fishery

~ Nenana ~

Register 82; am 5/11/85, Register 94; am ___/___/88, Register ___)

Authority: AS 16.05.251

5 AAC 07.365 is amended to read:

5 AAC 07.365. KUSKOKWIM RIVER SALMON MANAGEMENT PLAN. (a) The objectives of the Kuskokwim River Salmon Management Plan are to provide guidelines for the management of the Kuskokwim River commercial salmon fishery that will result in sustained yields of the salmon stocks large enough to provide for subsistence needs and an economically viable commercial fishery.

(b) It is the intent of the Board of Fisheries that the Kuskokwim River king salmon stock be managed in a conservative manner consistent with sustained yield principles and the subsistence priority and, consistent with this intent, that the available surpluses of other salmon stocks be taken. To accomplish these objectives, the department shall manage the Kuskokwim River commercial salmon fishery as follows:

(1) there shall be no directed commercial king salmon fishery;

(2) for the years 1988 and 1989, the fishery shall open no later than June 20;

(3) only those waters of District 1 downstream of ADF&G regulatory markers located at Bethel shall be open during the first fishing period;

(4) there shall be at least three eight hour fishing periods in June;

(5) although no directed fishery on king salmon is allowed, the incidental catch guideline harvest level for king salmon taken during fisheries directed on other species is 15,000 to 35,000 fish;

(6) to the extent possible, the department shall provide at least 24 hours advance opening of District 1 fishing periods;

(7) District 1 fishing periods are from 1:00 p.m. until 7:00 p.m.; when longer fishing periods are allowed, the extra time is to be equally divided before 1:00 p.m. and after 7:00 p.m. (Eff. 6/10/87, Register 102; am ___/___/88, Register ___)

Authority: AS 16.05.060
AS 16.05.251

5 AAC 07.367 is added to Article 3 to read:

5 AAC 07.367. DISTRICT 4 SALMON MANAGEMENT PLAN. (a) The objectives of the District 4 Salmon Management Plan are to maintain a level of sustained yield that will provide for subsistence needs, the long term economic health of the commercial and sport fishing industries, and recreational opportunities in the district and freshwater systems flowing into the district.

(b) The District 4 commercial salmon fishery is to open before June 16.

(c) When the catch of chinook salmon in the commercial fishery is less than 50 percent of the catch of chinook and sockeye salmon combined, the department shall manage, to the extent possible, the commercial salmon fishery based on the strength of the sockeye salmon return.

(d) Commercial salmon fishing periods are established by emergency order. The department shall allow at least one fishing period per week, unless a severe conservation problem develops.

(e) When a closure of the commercial salmon fishery is required, the department shall decide on or before the tenth day of the closure whether to close the sport fishery to the taking of the species of biological concern and whether additional management actions on the sport fishery are needed. (Eff. ___/___/88, Register ___)

Authority: AS 16.05.060
AS 16.05.251

JOINT STATEMENT ON THE MANAGEMENT OF THE KUSKOKWIM RIVER SALMON FISHERY

The Board of Fisheries, the Department of Fish and Game, the Local Fish and Game Advisory Committees, and local subsistence and commercial fishermen agree to work together towards the goal of increasing the sustained yield of Kuskokwim River salmon stocks to provide for subsistence needs and an economically viable commercial fishery. To achieve that goal, the parties agree to the following:

(1) Kuskokwim River salmon users will form a working group;

(2) the local department staff will meet with the Working Group to discuss preseason and inseason management of the fishery and evaluate items such as, but not limited to:

(A) test fishery data;

(B) CPUE data from historic and inseason commercial fisheries; and

(C) inseason subsistence catch data;

(D) it is understood that the purpose of these meetings shall be to arrive at a consensus regarding the openings and closures of the Kuskokwim River fishery; if a consensus can not be reached emergency order authority will continue to be at the area management biologist's discretion;

(3) the department will announce the opening of the first commercial fishing period by June 10;

(4) the fishing periods may be separated by six days to assist king salmon passage;

(5) the department and the Working Group will work towards the development of a comprehensive management plan for all of the Kuskokwim River salmon stocks, and report to the board on their progress;

(6) ~~calls for~~ Working Group\Staff meetings will be ^{CALLED} at the discretion of the chair of the Working Group.

FROM KOSKOKWIM ARE - PLAN

Continuing our market report on the farmed salmon industry, this month we look at trends in the USA, Canada, New Zealand and Chile.

FARMED SALMON

New suppliers on stream



Canada: a cautious approach

THIS year 1,000 tonnes of farmed salmon are expected to come out of Atlantic Canada. Next year that figure is expected to increase to 1,600 tonnes, followed by 2,200 tonnes in 1989 and 3,000 tonnes in 1990, reports *Gloria Langlands*.

Most of the Atlantic farmed salmon is marketed by the Atlantic Silver cooperative in St George, NB, and there are plans to improve the effectiveness of this operation along the lines of schemes in Scotland and Norway.

Essentially all product is sold as fresh, with 90 per cent consumed in Eastern Canada. The rest is exported to the USA.

The Atlantic fish farming industry is proceeding cautiously and judiciously in its development, while on the Pacific coast there have been problems encountered through rapid growth.

This year 1,700 tonnes of

Pacific farmed salmon are expected, following a massive growth curve over the past four years from just 125 tonnes in 1983. Next year production is expected to more than triple to 5,700 tonnes and then quadruple to 22,600 tonnes in 1989, reaching 30,000 tonnes the following year.

Four species of Pacific salmon are farmed: *Onchorynchus keta* (chum), *O kisutch* (coho), *O tshawytscha* (chinook) and *O gorbuscha* (pink).

Initially, when the industry was still in its infancy, direct communication between the Government and the industry was feasible. However, growth is now such that steps are being taken to organise contact on a more formal basis.

The Pacific industry, in comparison to that on the Atlantic, is obviously set for rapid growth, due partly to growing investment from Europe and North America.

However, in some quarters it is felt that there has been irresponsible growth in the Pacific; two firms have already collapsed. It is also felt that the only money to be made in the short term, is not in the salmon

farm itself, but by speculating in the shares of companies on the stock exchange!

The salmon farming industry in Canada is still very young and as each problem arises it presents a challenge for solution and improvement.

New Zealand: aiming for top quality

COMMERCIAL salmon cultivation has made a relatively slow start in New Zealand, but there are now 15 salmon sea-cage farms, 15 fresh water pond farming operations, 12 ocean ranches and one onshore sea water pumping salmon farm, reports *Jim Campbell*. Most companies involved in this developing — and therefore high risk — industry also have other business interests, often combining the enterprise with mussel farming.

It is estimated that these operations have the capacity to produce up to 2,000 tonnes of

chinook (*O. tshawytscha*) per annum. In 1985, 310 tonnes of salmon were produced and 120 tonnes were exported round weight. These figures doubled in 1986 and the 1987 forecast is for 950 tonnes production, 600 tonnes of which will go to export.

Almost all 1986 exports were as gilled and gutted fish. Approximately 25 per cent of exports went to Japan and the remaining 75 per cent to the west coast of the USA. While exports were predominantly as chilled, fresh product, there were some deliveries of frozen, whole fish.

Salmon can be packed to specific customer requirements and can be delivered fresh, chilled to Northern Hemisphere Pacific Coast markets within 18 hours of harvesting.

There has been a considerable development of smoked salmon and Pacific countries took both smoked and filleted salmon last year. The largest producer in New Zealand of smoked salmon is *Angus McNeill Ltd* of Nelson.

From the outset, the New Zealand salmon industry has aimed at achieving the highest possible quality and all farms are



Filloting Norwegian salmon before smoking.

Processing Norwegian product

NORWEGIAN owned Orkney Seafoods Ltd, specialising in the supply of live lobster and fresh farm-raised Atlantic salmon, last month commissioned a new smoking plant and processing facility in Kirkwall, the capital of the Orkney Islands.

Present capacity of the new plant is about 5 tonnes of smoked salmon a week. Products will include 200g and 500g retail packs of sliced salmon as well as whole sides.

A company spokesman told *Seafood International* that around 80-90 per cent of the salmon smoked in the new plant will be from Norwegian farms, and will be shipped to Orkney in frozen form for processing.

Though Orkney Seafoods also farms salmon in Orkney, most of this fish is marketed in fresh form, not smoked.

When *Seafood International* visited the new plant, the first batch of 'Superior Orkney Smokehouse' salmon was being smoked in the firm's new Swedish-made Foodco computer-controlled kiln.

Orkney Seafoods' processing

plant is based in existing premises, which have been completely remodelled and modernised. A new floor has been laid and the factory has the high standard of finish expected of a modern food processing plant.

Situated close to Kirkwall harbour, the plant is divided into three areas. The first, which has direct access from the street, houses the firm's lobster holding tanks and offices. The salmon is filleted, trimmed, salted and smoked in the central area of the factory; then sliced, weighed and packed in the third area.

The self-cleaning Foodco smoking kiln, which has a capacity of 500kg of salmon per load, is fitted with two doors, one at the front and one at the back. This enables the trolley containing the fish to be wheeled into the kiln in one room and taken out after the smoking programme has been completed, in the other. Smoking capacity could be increased as there is plenty of space for another kiln next to the first.

All the plant's stainless steel filleting, trimming and packing

tables were supplied by Sotra Rustfri Industri A/S of Norway, and the smoked salmon is packaged in printed film by a Swiss-made Multivac R5100 packaging machine.

Established in 1973, Orkney Seafoods is an associate of Konrad Sekkinstad A/S of Sotra, Norway, which has many years experience of handling seafood, particularly lobster and salmon.

The company markets its products in many parts of the UK and Europe. Italy and Sweden are two significant importers of the firm's smoked salmon.

Orkney Seafoods farms salmon in 15 cages in the Lamb Holm area of Orkney; this year's production is estimated at about 250 tonnes. The company also acts as a marketing agent for certain other farmers on the Islands.

According to Orkney Seafoods, the clean waters of the islands are an ideal environment for the production of firm fleshed salmon.

Enquiries: Orkney Seafoods Ltd, 10 Ayre Road, Kirkwall, Orkney, UK. Tel: (0856) 2173.



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New Zealand can offer chinook salmon during the country's spring and summer seasons, when Northern Hemisphere producers have much less fresh product available. Photo: Fletcher Fishing.



Photo: Glory Seafoods.



Photo: Pacific Kitchen, Seattle.

licensed by the Government. Processing, cleaning and packing of fish for export is done under strict regulations.

One advantage which New Zealand enjoys is the ability to offer chinook salmon in top condition during the country's spring and summer period, when Northern Hemisphere producers have much less fresh product available.

Now that more salmon are being released to the sea there is concern among anglers and salmon farmers that the

trawlers operating off the east coast of the South Island are taking a higher proportion of salmon than is desirable. Commercial trawler operators have said that the by-catch of salmon comes through the increase in target fishing for such quota species as red cod and barracouta.

The Government is now controlling the disposal of salmon caught by trawlers, which is sold under its supervision. However, there is some speculation that the development of ocean ranching may be retarded by the

risk of losses to trawlers.

While chinook is the main commercial species, there are a few surviving sockeye and Atlantic salmon in the landlocked south Islands lakes (first introduced over 100 years ago by British settlers). Attempts are now being made to breed from the species for future farming enterprises.

Alaska: opposition to farming

IN Alaska, where commercial fishermen harvest 43 per cent of the world's wild salmon catch and 90 per cent of the US salmon catch, the growing farmed salmon industry has raised a fearsome spectre among the state's high seas fishermen.

Fishermen fear the growth of salmon farming for three reasons: first it will decimate markets for wild salmon; second that high startup and operating costs will mean only large corporations (probably Norwegian)

could afford to build them, with profits moving out of the area and high marketing competition; and third that pen-reared salmon might introduce non-indigenous diseases into the wild Pacific salmon stocks.

Although opposition is strident, pro-development supporters are countering with their own theories. Technology is developing to decrease the likelihood of disease in fish farms and some say it's easy to prevent intermingling between wild and farmed salmon by building the salmon farm inland and pumping in seawater.

A few reports have indicated that farmed salmon may not harm wild salmon markets but might actually enhance those markets by moving salmon from a delicacy item to a year-round entree item on menus, at fish counters, and in the minds of consumers.

Particularly relevant to the Alaskan situation is the fact that, whether or not Alaskans enter the pen-reared salmon industry, British Columbia and Norway are already in it, and the output from those countries must be considered an important factor in making a decision in Alaska.

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Chilean coho salmon at RJ Cornellus.



'Alaska fishermen will face competition from farmed salmon regardless of whether or not they come from Alaska farms,' reads a mariculture report published by the Alaska legislature.

Supporters also insist that investment in Alaska from large US or foreign companies is good, not bad, as long as Alaskans are employed and some profits stay in Alaska.

Norwegians reportedly have invested \$50m in British Columbia fish farms, and they are now looking to Alaska. This summer Norway hosted a contingent of Alaskan legislators who wanted to see first-hand how Europeans were dealing with the industry.

Meanwhile, Alaskan corporations, unable to develop an industry at home, are now investing in fish farms elsewhere in the USA. Sealaska Corp has purchased 49 per cent of Swecker Salmon Farms of Olympia, Washington, a company that raises its own salmon and processes salmon grown in Idaho, Oregon, Washington and British Columbia.

Will Alaska be able to compete in the salmon industry? No, not unless it starts immediately, supporters say. If it does, potential annual revenues from even a 'modest Alaskan industry' are estimated to reach \$100m and provide 'thousands of jobs', according to one consultant.

Will the wild salmon fishery and its attendant 11,000 fishermen survive? Not unless the industry is developed slowly and regulated carefully, say salmon farming opponents. Whatever happens next will be watched carefully by those on both sides of the issue in Alaska and abroad.

Chile: major jump in production

THE Chilean salmon industry will have delivered some 4,000 tonnes of fresh salmon to the international market last harvesting season (1986/87). This represents a big jump from the 1,600 tonnes harvested the previous year (1985/86), but half of what the production forecast is for the 1988/89 season.

What has brought such an extraordinary growth rate to what was virtually a non-existent industry just four years ago? Some of the reasons are: the excellent geographical conditions in the south of Chile; the low cost of labour and feed, compared with Northern Hemisphere countries; high growth and food conversion rates and low mortality; plus the fact that Chilean producers can supply the international market at a time when there is no fresh farmed salmon available from Northern Hemisphere producers.

Since 1981, coho salmon culture in Chile has seen a dramatic growth (table 1).

The real 'boom' started in 1982, when trout and salmon farming projects experienced a

quantum leap. By March 1986 there were 58 companies authorised to install salmon farming facilities; 49 of these are now in operation.

In the last year another 11 new salmon farm operators have come onto the scene. Official figures (Undersecretariat of Fisheries) estimate that 70 per cent of these will be operative for the next season. There are now 91 farms operating in Chile, 24 of which have hatching facilities. Official data report that 70 per cent of these salmon farms are located in the Tenth Region (40 deg South) with most concentrated in the island of Chiloe.

It is estimated that the existing hatching facilities could produce some 50 million salmon ova annually. Taking 2.5kg adult fish as an average, and assuming a 50 per cent death rate, these ova could produce over 40,000 tonnes of salmon per year.

The farming of Atlantic salmon is now beginning in Chile, and may experience rapid growth in the near future, following the importation of Atlantic salmon ova by six companies last summer. Norwegian and Scottish companies are also investing in this area, bringing in to the country their own technology.

Analysts forecast that in 1989 20 per cent of the Chilean salmon production will be of the Atlantic species (*Salmo salar*) (table 2).

One interesting feature of the Chilean salmon farming industry is the relatively important size of

the farms (or companies). In fact, over 50 per cent of the companies can produce between 100 and 500 tonnes (12 companies), another 20 per cent can produce over 500 tonnes (four companies).

Only one company **Salmones Antartica Ltd** is successfully operating a salmon ranching programme in Chile, although it still has limited commercial output. However, another three companies are active in this area, although results are as yet unknown.

In 1986 a Chilean salmon farmers marketing association was set up — **Asociacion de Productores de Salmon y Truchas AG** — to develop exports and establish quality standards.

These standards were defined with the help of **Fundacion Chile** and are now compulsory for all member companies. The standard code adopted by the Association regulates the grades, and specifications that producers must meet to obtain a quality seal, as well as other aspects related to feed, medical treatments, harvesting procedures, degutting, packing specifications, etc.

Starting this month, the Association will begin — with the help of a US based seafood promotions agency — an advertising campaign and taste sampling in the East Coast of the USA that will culminate at the Boston Seafood Show in March.

The budget for this venture, although modest, indicates that Chilean salmon producers are taking things seriously and seek to consolidate their market participation.

The strongest market for Chilean farmed fresh salmon is — and probably will continue to be — the USA, specifically during the off-season for the fresh capture Pacific salmon fishery.

The distance to that market is 6,000km so fresh fish has to be airfreighted at \$1.50 per kg. Some experts believe that this is the only major disadvantage for Chilean salmon farmers in the world market.

However, because production costs are said to be lower in Chile, its salmon is likely to remain competitive compared with salmon from New Zealand, and even from Europe. ■

Table 2: Estimated production per season all salmon (tonnes)

Species	1986-87	1987-88	1988-89
Coho	1,600	7,125	12,500
Atlantic	—	277	2,790
Chinook	120	120	120
Grand Total	1,720	7,522	15,410

Source: Undersecretariat of Fisheries

Table 1: Production figures 1981-87

Year	(coho salmon) Production (tonnes)
1981	70
1982	80
1983	94
1984	104
1985/6	1,300
1988/87	1,600



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List of Agency Personnel to Testify

Department of Fish and Game

Division of Commercial Fisheries

- ✓ Ken Parker, Director
- Craig Whitmore, Herring Research Biologist
- Fred Andersen, Yukon Area Management Biologist

Division of F.R.E.D.

- Brian Allee, Director

Division of Subsistence

Terry Haynes, Interior and Arctic Regional Supervisor

Elizabeth Andrews, Western Regional Supervisor

Department of Public Safety

Craig Smithson, Sergeant

Possibles: Lt. Rudell and/or
Colonel Jack Jordon, Director,
Division of Fish and Wildlife Protection

The Governors Office may also be in attendance.

List of Requested Witnesses

① **Yukon Canada Negotiating Group**

Dave Cooper - Marshal
Harry Wild - Mt. Village
Jimmy Walker - Holy Cross
Terry Johnson - Fairbanks

Manley Hot Springs

(Sharon Said Someone
was driving over, did
not give me names)

② **Interior Fish and Wildlife**

Wayne Taylor
Terry Clark
- Doug Boren
Mike Holts

Tanana Chiefs Conference

Mitch Demientieff
Ron Silas

Tanana Fish and Game Association

Bill Fliris
and others

Independents

Mike Coombs
JEFF DATES

③ Sam Demientieff - Doyon & FBKs Native Ass'n

Location: Nenana Civic Center

Issues: Sale of Roe from Subsistence Catches
Fish Counts
Enforcement Procedures
Enhancement Alternatives

Schedule:

Friday, March 18: Depart Juneau after Session
Staff will meet you upon arrive in
Fairbanks with transportation.

Hearing Times:

Saturday, March 19: Transportation has been arranged to
Nenana via Bus

7:15am - Depart Fairbanks WestMark

8:30am to 10:15am - Agency Testimony
10:30am to 12:00pm - Requested
Witnesses

12:00pm to 1:30pm - Lunch

1:30pm to 3:15pm - Agency Testimony
3:30pm to 5:30pm - General Public
Participation

5:30pm - Reception Following Hearing

7:00pm - Dinner

The focus of Saturdays hearing is identifying the problems and
investigating possible short term solutions, primarily.

Sunday, March 20: 8:00am to 8:45am - Continental
Breakfast or the local cafe

9:00am to 11:00am - General Public *Agency staff*
Participation

11:00am to 1:00pm - Local Tour and *Hatchery Tour*
Lunch

1:00pm to 3:30pm - Conclude Hearings

The focus of Sundays hearing is to look for possible long term
solutions to the problem and complete the public testimony
record.

4:00pm - Depart Nenana via Bus for
Fairbanks

5:00pm - Approximate Arrival in
Fairbanks

9:10pm - Arrive Juneau on Alaska

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Division of Commercial Fisheries

Ken Parker, Director
Craig Whitmore, Herring Research Biologist
Fred Andersen, Yukon Area Management Biologist

Division of F.R.E.D.

Brian Allee, Director

Division of Subsistence

Terry Haynes, Interior and Arctic Regional
Supervisor

Elizabeth Andrews, Western Regional Supervisor

Department of Public Safety

Craig Smithson, Sergeant

Possibles: Lt. Rudell and/or
Colonel Jack Jordon, Director,
Division of Fish and Wildlife Protection

The Governors Office may also be in attendance.

CLEAR STATE FISH HATCHERY

Clear Hatchery was completed at Clear Air Force Station near Nenana in January 1980. The site was selected because of the availability of heated waste water which allows a flexible rearing program.

The hatchery consists of a main building 130'x40' which contains an office, laboratory, shop, incubation and startup area, four concrete raceways, and a water treatment tower. The incubation and rearing areas contain six incubation stacks, eight startup troughs, seven 3'x6' circular tanks, and 6'x60' concrete raceways.

The primary goal of this facility is to culture and release six species of sport fish into over 100 lakes and streams in the interior. These fish will enhance and provide more diversified angling opportunities for interior sport fishermen.

The secondary goal is to develop culture techniques for Arctic grayling, Arctic char, sheefish, and Lake trout.

FY-88 Facility Budget: \$383,500

Facility Staffing: Three fulltime personnel and two permanent
----- seasonals @ 5.5 months each.

FY-88 PRODUCTION GOALS

SPECIES	# FISH RELEASED	SIZE
Coho Salmon	160,000	2.1 grams
" "	380,000	4.0 grams
Sheefish	100,000	12.0 grams
" "	125,000	3.0 grams
Rainbow Trout	1,000,000	2.0 grams
" "	110,000	25.0 grams
Arctic char	125,000	4.0 grams
Arctic grayling	1,000,000	Unfed fry
" "	210,000	4.0 grams
Lake Trout	50,000	4.0 grams

	2,260,000	

PROBLEM AREAS IDENTIFIED BY THE FISH TASK FORCE OF
THE FAIRBANKS NORTH STAR BOROUGH

1. The fish counting techniques currently being utilized by the Alaska Department of Fish and Game on the Yukon River have proven to be inadequate to accurately predict the run strength. The ADFG has submitted a request for funds to purchase a dual beam sonar (\$188,000), and accessory equipment, such as boats, tents and nets, (\$44,000). Additional funds of \$25,000/month have been requested to operate the equipment for a 4 month period. We urge our Interior Delegation to support this \$332,000 funding request.
2. The Task Force would like to see an interior commercial fisherman (one who lives and fishes here) appointed to one of the 2 current vacancies on the Fish Board. We recognize that the sports fisherman also want representation on the Board. We urge that this requirement be met by filling a position other than the traditional Interior position, with a sports fisherman.
3. The Task Force would like to see state funding restored to the Clear Hatchery.
4. The Task Force would like for the Alaska Seafood Marketing Institute to assist interior fishermen in obtaining markets for the river run fish.
5. The Task Force would like to see additional funding for fish enforcement personnel.
6. The Task Force endorses the False Pass tagging effort done in 1987.

WAYNE E. TAYLOR
Nenana, Alaska

Fishing has occurred on the Y & T Rivers for hundreds, possibly thousands, of years.

The first documented fishing on the Tanana was 1899 by Alfred Brooks of the U.S. Geological Survey. He reported Indians were catching and curing salmon of an undetermined species.

Local Natives remember being in fish camps above and below Nenana, at the Wood River, Toklat, Nenana River, Kantishna, Tolavana, and the Tanana River around Manley. They first fished with fish traps and dip nets. It is believed Abraham Albert built the first fish wheel in 1918 and it fished at Rock Crossing by the mouth of the Kantishna.

This was a yearly occurrence, as they depended upon the fish for food, barter and dog feed. (Dogs were their only means of winter transportation.)

Commercial fishing for cash or barter or subsistence fishing or both and commercial fishing for cash has been occurring for many, many years. They are still catching the same fish - no matter what terms you want to call the fishing.

Bob Coghill remembers stacking bales of dried salmon in their fish house during the 1930's and 40's. They would buy or barter them from whoever needed money, goods or cash. He recalls his dad buying fish from Dominic Donetti in Holy Cross and the fish arriving here. He and Jack would have to stack them in the fish house after school. They would stack the bales on top of each other and then stand on one tier to stack another layer until they reached the ceiling. He said "Boy, they stunk!!"

Then his dad would sell them to dog mushers in Fairbanks and Anchorage or whoever and usually ship them by the ton on the train. He believes they handled anywhere from 9 tons to 20 tons per year.

The rule of thumb was one dried fish to the pound. This equates to handling 18,000 fish to 40,000 fish.

Norm Suckling who managed the Northern Commercial Store in Manley from 1945-1956 remembers doing the same thing. He indicated they handled about 20 tons per year, which again is about 40,000 fish.

These runs were not regulated in any way. If there was fish, people fished; if there were not any fish, they did not fish. Everyone knew there had to be spawners and they left the ones at the spawning grounds alone.

The run survived without formal management or regulations. How or why, by modern technology, who knows - but, every

year there is living proof that it has worked. What has happened in Alaska's management of fisheries? It has been a long, slow process; but, statewide it has been very positive. There have been a number of different major players in developing fisheries management in Alaska. It has been a cooperative effort between industry, science and government.

Role of Industry

Commercial processing began in Alaska in the 1880's with curing and salting of salmon. Soon thereafter, canning of salmon was started. Peak harvest years occurred in 1918, 1936, 1941, with the processing of over 500 million pounds. The Federal government passed the White Act in 1924, which required that 50% of the run had to escape. So people fished until 50% of the run went by and then had to stop. This led to overfishing and there was not any protection or enforcement by the Feds. The fishing stocks in the late 40's declined dramatically. This caused the processors to look to science and they hired Dr. Thompson from the University of Washington to establish a system of research information and tying it to fisheries management decisions. The industry wanted and needed a healthy continuous fishing industry.

Role of Science

The role of research in commercial fisheries in Alaska began in the 1940's. They started by doing basic fish population studies, then tying it to sustainable yield catches and escapement.

The Statehood act in 1959 really accelerated fisheries research, which has made substantial contributions to the scientific basis for fisheries management.

Role of Government

Aboriginal Alaskans considered they owned the natural resources, including the fish. Salmon were a basic necessity to living and to life. Europeans brought the concept of Roman law, that fish of the commons (rivers, lakes, salt water) were not owned until captured and that everyone has a right to fish in the commons. The salmon industry started out small and grew into a very powerful force, both financially and politically. Competition by processors encouraged over-fishing and elimination of competition. Territorial control of fishing did not start until 1949. There was never local control nor was there much attempt at control or management by the Federal government. This one fact probably contributed a lot to the Statehood Act. Many people were fed up with Federal control or lack of it with fisheries. Salmon production in 1959 was the lowest it had been for 60 years. One of the State's top

priorities after Statehood was to revive fisheries. The Legislature decided to eliminate the White Act to help fisheries management and try to eliminate the Federal ineptness of fisheries management which had led to widespread violations of existing regulations.

The new management system grew dramatically with the advent of the Alaska Dept. of Fish and Game - Commercial Fishery Division. There were four regional divisions with 22 management districts. They were staffed with management personnel who were to live in their districts, know the resources, the people and during the season have a daily knowledge of fishing activities and catches. They emphasized that fisheries management was like a company that depended on input from everyone concerned.

Limited entry passed the legislature in 1973. It was supposed to help fisheries management separate much of the politics of conservation from the politics of economics or equity. It has helped but has not always been the case. Fisheries management conservation based upon scientific findings is willingly accepted but those decisions based upon politics, economics, or a whim, are definitely not accepted.

Salmon management is an extremely complicated process because of the large volume of information the forecaster must work with, all of which is marginally reliable. Each spawning unit of a tributary of a stream or lake, bays of lakes is a separate genetic unit. There are thousands of genetic units in Alaska. There are hundreds of genetic units on the Yukon and Tanana Rivers. Each unit needs to be managed as a separate entity, but due to the numbers, it is impossible. It is possible to manage in a number of groups that return on similar schedules through defined fishing areas. Each area and period must be regulated to allow genetic groups to pass while allowing others to be caught - allowing fish to spawn and fish to be caught. Decisions on fishing periods must be based on forecasts of size and timing of each run. Fisheries managers who are successful based their decisions upon the best scientific information available and maintained good communications with all the people concerned.

Twenty-eight years ago the State took over the management of fisheries and, by good management practices, have built healthy runs that maximize natural resources for all users.

The Yukon/Tanana River fisheries problems amongst users, processors and ADF&G are by no means an isolated case. The Kuskokwin, Copper, Russian, Kenai, Naknek, Nushagak/Wood River systems have all experienced competition, lawsuits and unhappiness among user groups. There are not any easy answers. The general tendency is to feel isolated and picked upon by either Commercial fish, Sport fish or

Protection. Most people have found the only way they can be heard by ADF&G, Board of Fisheries or the legislature is to form into groups and see who can get the most people and/or money together and fight or control the system.

There is another way and the only way that will actually work in order to provide maximized utilization of resources. That is to form management councils for the different river systems that include all user groups and management. This means a sharing of information, knowledge, and planning. It means user groups will have to break out of that syndrome of "they are my fish and not yours and if I do not get to fish, I will get my fair share anyway." It also means a system of self-policing.

It also means that management needs to share run and catch projections, escapement plans, long-term management plans, etc. It is a give and take situation on both sides and a sharing of information on both sides.

Based upon what has happened this year and in some years past, management and users appear to be wrong. For instance, to keep a fishing season closed affecting all fishermen to maybe run a sting operation for one or two is wrong. While processing fish or products that cannot be sold is also wrong.

The decision of whether or not to open the fishery should not be based upon politics, money or anything else other than the conservation of the sustained yield of the fishery.

To process fish or fish products that may have been caught legally, but which cannot be sold legally, is also not the correct approach. If it is against the law, then the law should be evaluated.

The selling of roe from subsistence and personal use salmon fishermen is another problem that needs to be addressed. At the current time, it is against the law. At one point in time, it was not against the law. A study was done by ADF&G about the selling of subsistence salmon roe from 1974 to 1978 and it recommended against the selling of salmon roe by subsistence fishermen due to the "waste" of carcasses. Perhaps the throwing away of eggs is also almost as big a waste. This provision should be evaluated again because the first study did not take into account limited entry, buyers moving in and out of areas (now they are more stable) and the change-over from a subsistence economy to a cash economy.

The whole situation needs to be evaluated based upon conservation of the fishing runs, utilization by fishing groups and of fishing resources.

There appeared to be a lot of fish in the are by catch records. This whole situation needs to be evaluated and maybe readjusted based upon all facets and avenues of information.

STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

OFFICE OF THE COMMISSIONER

P. O. BOX 3-2000
JUNEAU, ALASKA 99802-2000
PHONE (907) 465-4100

February 16, 1988

The Honorable Jack Coghill
Alaska State Legislature
P. O. Box V
Juneau, AK 99811

RECEIVED

FEB 19 1988

F.R.L.D.
ANCHORAGE REGIONAL OFFICE

Dear Senator Coghill:

Your aide, Mr. Mike Coombs, requested that the Alaska Department of Fish and Game (ADF&G) provide you with a cost estimate for a 20 million-fry chum salmon hatchery at Clear. Our review indicates that it would cost approximately \$4.86 million to build this facility. I expect that such a facility will yield an annual chum salmon return of approximately 220,000 adult fish. This adult return projection is based upon survivals (1.1 percent marine survival) achieved with experimental chum salmon releases from the Clear Hatchery.

Both the Fisheries Rehabilitation, Enhancement and Development (FRED) and Commercial Fisheries Divisions have examined this proposal. They envision that this facility should focus on fall chum salmon and that the focus of the hatchery program should be to rebuild and supplement the natural chum salmon stocks that return to the Toklat, Delta, and mainstem Tanana Rivers. Eggs would be collected from these natural stocks and fry returned to their parental stream for imprinting and release. You will note that the bioengineering criteria are based upon a release near the hatchery; however, the implementation of this wild-stock rehabilitation strategy will not affect the facility construction costs. Given the natural chum salmon stock rehabilitation strategy for the Toklat, Delta, and mainstem Tanana Rivers, the annual operational costs for the hatchery are estimated at \$300,000 to \$350,000.

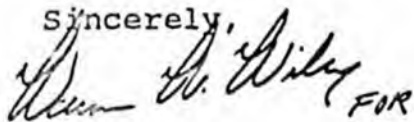
Please be aware that a chum salmon hatchery program will not yield adult returns until four years after the facility is constructed and would probably not reach maximum production for eight years. Please also note that chum salmon returning from hatchery releases will be harvested by sport and subsistence fisheries along the length of the Tanana River drainage. Some unknown portion of the harvest of fish produced by this rehabilitation project will occur in the lower portion of the river. There is the possibility of a terminal harvest of fish in the

Tanana River in the vicinity of the fry release sites. A tag and recovery program would be implemented as part of the hatchery releases allowing ADF&G to monitor the timing and migration patterns of hatchery returns to assist in the development of management that will optimize production of both hatchery and wild stocks. A four-year program for tag recovery of hatchery returns would have an estimated annual cost of \$50,000.

The overall plan should include development of a sonar enumeration program in Tanana River to permit in-season run assessment. The plan should also include some evaluation of potential for hatchery coho salmon production in the likelihood that commercial harvest of chum salmon would impact wild coho salmon stocks.

If I can provide further assistance, please let me know.

Sincerely,

A handwritten signature in cursive script, appearing to read "Don W. Collinsworth", followed by the word "FOR" in capital letters.

Don W. Collinsworth
Commissioner

Enclosure

cc: Brian Allee
Ken Parker

CLEAR CHUM SALMON PROPOSAL

DRAFT THREE OF: February 3, 1988

CLEAR STATE FISH HATCHERY

GOAL: Supplemental production of 220,000 adult chum salmon per year returning to the Yukon River.

STRATEGY: Release twenty million chum salmon fingerlings per year near Clear. These smolt would be produced at Clear State Fish Hatchery from eggs taken at Clear. Fingerlings would be transported the 7 miles to the release site. Ample opportunity to grow and smolt would be provided by the almost 800 mile down river journey. To insure return to Clear eggs source would be local Clear stocks and release would also be at Clear. Intent is to supply river with chum to offset downstream harvest.

ASSUMPTIONS:

RELEASE SIZE IN GRAMS	1.00		ADULTS
SURVIVAL TO RELEASE	83.00%	HARVEST	165,000
SURVIVAL TO ADULT	1.10%	SPAWNERS	17,524
HARVEST IN RIVER	75.00%	ESCAPEMENT	37,476
FECUNDITY	2,750		
TOTAL ADULTS DESIRED	220,000	EGGS REQUIRED	24,096,000
ADULT WEIGHT EACH	8.50	RELEASES REQUIRED	20,000,000
VALUE PER POUND	\$0.50		
PRODUCTION COST FISH	\$0.0120	VALUE HARVEST	\$701,250
CAPITAL COST TOTAL	\$4,868,000	PRODUCTION COST	\$239,870
		YEARLY CAPITAL COST	\$243,400
		VALUE-COST	\$217,980

SIMPLISTIC RATIO OF BENEFITS/ COSTS

1.5

This simplistic approach suggests that this concept should receive further work since the ratio of benefits to cost is over 1. More detailed work will most likely result in a higher cost and thus a lower ratio.

See attached sheets for detailed costs.

ESTIMATED CAPITAL COSTS

CLEAR CHUM SALMON PROPOSAL

CLEAR STATE FISH HATCHERY

RACEWAYS REQUIRED	12	CUBIC METERS EACH	60.00
COST PER M ³	\$600	COST FOR RACEWAYS	\$432,000
FLOW REQUIRED	5,871	COST GPM	\$135
		COST FOR WATER	\$793,000
BUILDING	11,000	SQUARE FEET AT	\$242
		COST FOR BUILDING	\$2,662,000

SUBTOTAL \$3,887,000

EGG TAKE SITE DEVELOPMENT \$170,000

SUBTOTAL \$170,000

COST OF CONTRACT AND EQUIPEMENT \$4,057,000

CONTIGENCY (included in totals above) \$0

SUBTOTAL \$4,057,000

DOTPF DESIGN & ADMINISTRATION 20% \$811,000

GRAND TOTAL \$4,868,000

ESTIMATED /ADDITIONAL OPERATIONAL COSTS
CLEAR CHUM SALMON PROPOSAL
CLEAR STATE FISH HATCHERY

OPERATIONS

MAINTENANCE MAN		\$70,000	\$70,000
ELECTICAL	426,210 KW	0.08	\$31,097
TOTAL OPERATIONS			\$104,097

EGG TAKE

24,096,000	EGGS	EGGS PER DAY	1,800,000
CREW SIZE	10	REQUIRED DAYS	134
COST PER DAY/PERSON	\$165	TOTAL LABOUR	\$22,110
PERDIAM, DAYS	134	\$40	\$5,360
VEHICLE EXPENSE	3000 MI	\$0.26	\$780
AIR CHARTER, EGGS	20.00 hrs	\$185	\$3,700
TOTAL EGG TAKE			\$31,950

CUBATION

WATER PUMPING			
24,096,000	EGGS	FOR DAYS	161
623	GPM	COST FOR PERIOD	\$2,000
EGG SORTING			
HOURS	301	COST PER HOUR	\$12
		COST FOR SORTER	\$3,614
SUBTOTAL			\$5,614
SUPPLIES			
10 PER CENT OF SUBTOTAL		COST OF SUPPLIES	\$561
TOTAL INCUBATION \$			\$6,176

REARING

WATER PUMPING

2,936 GPM MEAN

DAYS OF REARING

81

COST OF PUMPING

\$4,756

FISH FEED

40,656 POUNDS AT

\$0.52

PER POUND

TOTAL FEED COST

\$21,141

FREIGHT ON FISH FOOD

40,656 POUNDS AT

\$0.30

PER POUND

TOTAL FREIGHT COST

\$12,197

SUBTOTAL

\$33,419

REARING SUPPLIES

25.00% SUBTOTAL

\$8,355

TOTAL FOR REARING

\$41,774

MARK & TAG

% OF RELEASE TO TAG

2.00% OR

400,000

FISH

COST PER TAG

\$0.12

TOTAL TAGS

\$48,000

RELEASE

FISH PER TRIP

254,000

TRIPS

79

COST PER TRIP

\$100

TOTAL COST

\$7,871

GRAND TOTAL OPERATIONAL COST

\$239,870

TWO WAY WHAT-IF TABLE

SHOWS B/C FOR DIFFERENT RELEASE SIZES AT VARIOUS OCEAN SURVIVALS

OCEAN SURVIVALS		RELEASE SIZE in GRAMS EACH			
		0.70	1.00	1.50	2.00
1	0.90%	1.4	1.3	1.2	1.1
	1.10%	1.5	1.5	1.3	1.2
	1.30%	1.6	1.5	1.4	1.3
	1.50%	1.7	1.6	1.5	1.4
	1.70%	1.7	1.7	1.6	1.5

HATCHERY: CLEAR
 PROGRAM: Fingerling
 SPECIES: CHUM
 RELEASE NUMBER: 20,000,000
 RELEASE SIZE: 1.00 GRAMS EACH
 RELEASE DATE: 31-May-90
 EGG TAKE DATE: 1-Oct-89
 EGGS/FEMALE: 2,750 EGGS
 FEMALES PER MALE: 1.00
 TU TO ALL FEED: 850.00 TEMP.UNIT
 START WT EACH: 0.34 GRAMS EACH
 K FACTOR: 8.00E-06 K
 CONVERSION: 1.40
 DIET COST/KG: \$1.76
 WATER COST /LPM: \$0.0200
 % SAT. DO IN: 95%
 MIN DO OUT: 7.00 MG/LITER
 TOTAL FISH MORTALITY: 5.00% EGG MORT: 15%
 GROWTH MM/TU: 0.00 MM/TU
 MAX DENSITY: 60.00 GRAM /M^3
 EGGS PER LITER: 5.00 LPM
 FLOW PER LITER EGGS: 0.00 LPM
 MINIMUM EXCHANGE R: 0.00 PER HOUR
 M^3 PER RACEWAY: 60.00 METER^3

HOW MANY TEMPERATURE UNITS REQUIRED ?
 1228 TU 2210 FTU
 MEAN DAILY TEMPERATURE REQUIRED?
 5.07 C 47.13 F
 DAYS IN PERIOD INCUBATION REARING
 242 161 81
 START LENGTH =
 34.90 MM 1.37 INCH
 END LENGTH =
 50.00 MM 1.97 INCH
 END SPACE REQUIRED AT MAXIMUM DENSITY ?
 667 CUBIC METERS 23,540 FT^3
 END FLOW REQUIRED AT MEAN TEMP ?
 22,222 LPM 5,871 GPM
 APPROXIMATE EGGS REQUIRED LITERS OF EGGS
 24,000,000 4800
 NUMBER OF FEMALES INCUBATOR FLOW =
 8,727 2,400 LPM
 NUMBER OF MALES 623 GPM
 8,727
 RACEWAYS REQUIRED AT END R
 11 2.0
 MORTALITY RATE PER DAY
 EGGS = 0.08% FISH = 0.06%

SALE OF ROE FROM SUBSISTENCE CAUGHT
SALMON IN THE ARCTIC-YUKON-KUSKOKWIM
REGION, 1974-1977

REPORT TO THE ALASKA BOARD OF FISHERIES
DECEMBER 1977

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF COMMERCIAL FISHERIES
ANCHORAGE, ALASKA

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Preface

The sale of roe from subsistence caught salmon has been allowed in the Arctic-Yukon-Kuskokwim region since 1974. Section 16.05.827 of the Alaska Statutes, providing for legalization of these sales, has expired. The Legislature has directed the Department to recommend if the sale of subsistence salmon roe should be continued beyond the 1977 season.

This report comprises an updating of the 1976 report presented to Legislature and, with the benefit of additional information from the 1977 fishing season, presents a more comprehensive review of this issue. Slight revisions have been made to some of the data previously presented in the 1976 report.

SALE OF ROE FROM SUBSISTENCE-CAUGHT SALMON
IN THE ARCTIC-YUKON-KUSKOKWIM REGION

Introduction and Background

In years past when native people were experiencing a traditional or "pure" subsistence type of livelihood, all or nearly all portions of fish captured were probably utilized. Salmon roe, a fish by-product, was consumed by people with probably greater quantities fed to their sled dogs. Due to recent changes in employment and welfare opportunities, there has been a gradual decline in the dependence upon subsistence fishing in many areas. Replacement of sled dogs with snowmachines has also been a very important influence on the decline in utilization of salmon and salmon roe. Reports received from various village residents, indicated that much of the roe from subsistence caught salmon was discarded in the recent years prior to 1974. Actual amounts of salmon roe either discarded or utilized during these earlier years were never documented.

Initial interest in permitting sales of subsistence caught salmon roe came from commercial salmon buyers. Beginning with the 1973 season, most Kuskokwim area buyers and a few buyers in the upper Yukon illegally augmented their roe production to some extent from subsistence fishing channels. It was estimated that illegal purchases of subsistence salmon roe represented 10-15 percent of the reported commercial roe production for the Kuskokwim area in 1973.

Three different bills were introduced in the 1974 Legislature that involved legalization of the sale of subsistence caught salmon roe. None of these bills passed as they remained in committee through adjournment.

It was apparent that in the spring of 1974 several commercial salmon buyers were gearing up to illegally purchase even larger amounts

of subsistence roe. Both the Department's of Fish and Game and Public Safety assigned additional personnel for fishery patrol in an attempt to minimize the illegal purchases of subsistence roe. The major thrust of the enforcement program consisted of increased surveillance of buying and processing stations. News releases and public notices were issued to clarify existing regulations.

An emergency regulation with an effective date of June 15, 1974 was issued by Commissioner James Brooks which allowed the unrestricted sale of salmon roe obtained as an unavoidable product of legal subsistence fishing throughout the entire A-Y-K region. Issuance of the emergency regulation, in effect for 120 days, was coincidental with the beginning of the salmon runs.

The Legislature finally adopted an Act in 1975 (Appendix I) with an effective date of May 29 that legalized subsistence salmon roe sales only in the A-Y-K region. These statutes contained the following important provisions:

1. Expiration date was January 1, 1977 which was subsequently extended to encompass the 1977 fishing season. Sales after this time will presumably depend on further review and action by the Legislature and the Board of Fisheries.
2. No person may purchase or trade for subsistence salmon roe unless he possesses an annual permit issued by the Commissioner.
3. The Commissioner may close any or all areas to the sale of subsistence salmon roe if the waste of carcasses, damage to stocks or circumvention of management programs is occurring. A separate section defining the "waste of salmon" and penalties for violators was included.

4. If the subsistence catch in an area exceeds or is likely to exceed by 10 percent the 1974 subsistence catch for that area, the Commissioner shall close that area to the sale of subsistence salmon roe.
5. The Board of Fisheries may adopt regulations necessary to allow the sale of roe based on traditional subsistence needs coupled with the maintenance of salmon stocks on a sustained yield basis.

To administer the legislation, Commissioner Brooks issued an emergency regulation in June of 1975. This emergency regulation contained provisions pertaining to permitting and reporting requirements in addition to prohibiting subsistence roe sales in areas where the salmon runs were especially vulnerable or where recent subsistence salmon catches were negligible.

The Board of Fisheries in December of 1975 adopted regulations for the 1976 season that were similar to the provisions contained in the aforementioned emergency regulation. The Board regulations contain an additional important provision which provides that sale of subsistence roe may be prohibited when the subsistence catch exceeds or is likely to exceed the 1970-74 average annual harvest in any district, subdistrict or portions thereof. These regulations, including several adopted at the December 1976 meeting, will remain in effect until changed by future Board action or superceded by legislation (Appendix II).

General Description and Management of the Roe "Fishery"

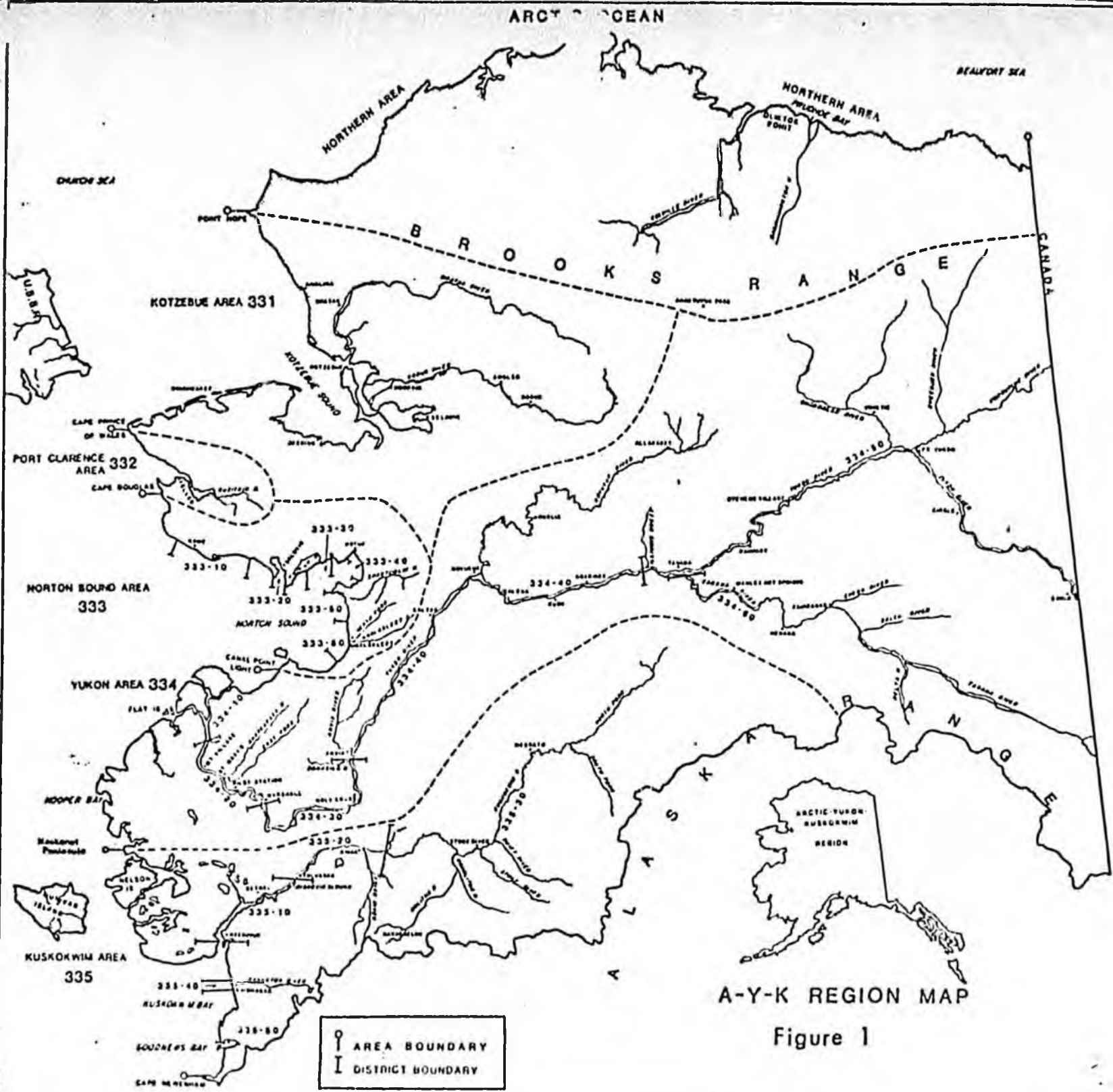
Current Board of Fisheries' regulations allow the sale of subsistence salmon roe only in the main Yukon River, main Tanana River downstream of the Chena River, main Kuskokwim River downstream of the Kolmakof River, Goodnews Bay and at Quinhagak. Although permitted over a greater

portion of the region in 1974 and 1975, the vast majority of sales occurred in the aforementioned areas (Figure 1).

Since subsistence fishing occurs in many widely scattered villages and fish camps, the roe buyers have developed an extensive collection system. Buyer representatives are placed in most villages and the larger fish camps where subsistence roe sales are permitted. Fishermen are given plastic buckets in which to place roe and these are transported almost daily by boat or aircraft to processing plants, most of which are located in Bethel, Galena, Manley Hot Springs, Nenana and Fairbanks. For the most part, processing is done by Japanese technicians who salt and pack the roe using conventional methods required for marketing in Japan.

Due to the extensive nature of the subsistence fishery, the critical task of monitoring roe sales is time consuming and expensive. Accurate and timely information regarding the amounts of roe sold is essential since sales are prohibited when subsistence harvests exceed levels specified in the regulations. For example, with subsistence fishing occurring from 5 to 7 days a week, as much as 45,000 pounds of roe representing a subsistence catch of nearly 100,000 fish can be made in the Kuskokwim River during a single week. Pounds of roe by species sold daily and weekly are obtained from written reports and special roe tickets provided by buyers.

Annual subsistence harvests since statehood have been obtained by comprehensive surveys consisting of personal interviews of fishermen made at the end of the fishing season. Present regulations require that estimates of in-season catches also be obtained. This is accomplished by translating pounds of subsistence roe sold to numbers of fish using sex ratio and average roe weight information which are obtained each week from catch samples.



A-Y-K REGION MAP

Figure 1

○ AREA BOUNDARY
 I DISTRICT BOUNDARY

Several emergency orders were issued during 1975-1977 prohibiting subsistence roe sales in various subdistricts and sections when subsistence catch levels or "quotas" specified in the regulations were attained. These "quotas", which have been utilized for management purposes since 1975, represent traditional recent harvests made prior to the legalization of subsistence roe sales. Subsistence fishing was legal after roe sales were prohibited, but it was observed that effort in many areas declined sharply following the sales closures.

King and chum salmon "quotas" are based on the 1974 (+10%) harvest and the 1970-1974 average annual harvest respectively. The Department has exercised the option provided in current statutes and regulations of selecting the base period for establishing "quotas" of moderate magnitudes.

The Legislature in FY 1977 appropriated a total of \$19,000 to the Department for the purpose of monitoring roe sales. Several temporary fishery technicians have been hired to monitor subsistence fisheries and roe sales in key villages and to assist management biologists in tabulating and analyzing roe sales data. In addition to expenditures associated with monitoring roe sales, the Department spends approximately \$16,000 annually for monitoring subsistence salmon catches in all Yukon and Kuskokwim villages.

Production, Value and Participation

Table 1 presents information on the poundages of subsistence roe sold, number of persons making sales and economic values for each management area and year. Chum salmon roe comprised approximately 75 percent (by weight) of all sales with the remainder being king salmon roe. Small amounts of roe from the other salmon species were sold and these are included in the chum salmon totals.

Table 1. Subsistence salmon roe sale information by management area and year, Arctic-Yukon-Kuskokwim Region, 1974-77.

	Pounds of raw product			Value of sales	Number of persons reporting sales	Average sales value per person	Number of processors	First wholesale value ^{4/}
	King	Chum	Total					
<u>1974</u>								
Kuskokwim	34581	98602	133,183	\$180,000	1438	\$ 125	4	\$360,000
Yukon ^{1/}	2452 ^{2/}	79565 ^{2/}	82,017 ^{2/}	61,513 ^{3/}	237 ^{3/}	260 ^{3/}	11	123,026
Total	<u>37033 ^{2/}</u>	<u>178167 ^{2/}</u>	<u>215,200 ^{2/}</u>	<u>241,513 ^{3/}</u>	<u>1675 ^{3/}</u>	<u>144 ^{3/}</u>	<u>15</u>	<u>483,026</u>
<u>1975</u>								
Kuskokwim	24399	57711	82,110	\$124,000	1200	103	4	\$248,000
Yukon ^{1/}	2467	70540	73,007	84,908	263	323	14	169,816
Total	<u>26866</u>	<u>128251</u>	<u>155,117</u>	<u>208,908</u>	<u>1463</u>	<u>143</u>	<u>18</u>	<u>417,816</u>
<u>1976</u>								
Kuskokwim ^{1/}	62210	95541	157,751	336,000	1321	254	6	672,000
Yukon ^{1/}	5830	68657	74,487	99,430	331	300	14	198,860
Total	<u>68040</u>	<u>164198</u>	<u>232,238</u>	<u>435,430</u>	<u>1652</u>	<u>262</u>	<u>20</u>	<u>870,860</u>
<u>1977</u>								
Kuskokwim	51174	116000	167,174	635,876	1304	488	7	1,271,860
Yukon	15407	63430	78,837	209,539	632	332	15	419,078
Total	<u>66581</u>	<u>179430</u>	<u>246,011</u>	<u>845,415</u>	<u>1936</u>	<u>437</u>	<u>20 ^{5/}</u>	<u>1,690,938</u>
<u>Totals (all years)</u>								
Kuskokwim	172364	367854	540,218	1,275,876	-	-	7	2,551,860
Yukon	26156	282192	308,348	455,390	-	-	15	910,780
Total	<u>198520</u>	<u>650046</u>	<u>848,566</u>	<u>1,731,266</u>	<u>-</u>	<u>-</u>	<u>20 ^{5/}</u>	<u>3,462,640</u>

1/ Slight revisions made in previously reported data.

2/ Includes small amount of roe taken in Norton Sound.

3/ Does not include small undetermined number of Norton Sound fishermen.

4/ Based on 2x that of fishermen value.

5/ Two buyers purchased roe from both areas.

A total of 849,000 pounds of roe was sold in the Yukon and Kuskokwim areas during 1974-77 worth \$1.7 million to the fishermen. During the same period the commercial salmon catch in these areas totaled 45 million pounds, worth \$17.2 million to the fisherman (Appendix V). Subsistence salmon catches totaled 2.2 million fish during this period (Appendix VI).

Record roe sales were made in 1977 totaling 246,000 pounds from all species. Totals of 215,200, 156,000 and 232,000 pounds were sold in 1974, 1975 and 1976 respectively. Record sales were also made in 1977 from the standpoint of fishermen earnings (\$845,000), average earnings (\$437) and first wholesale value (\$1,691,000).

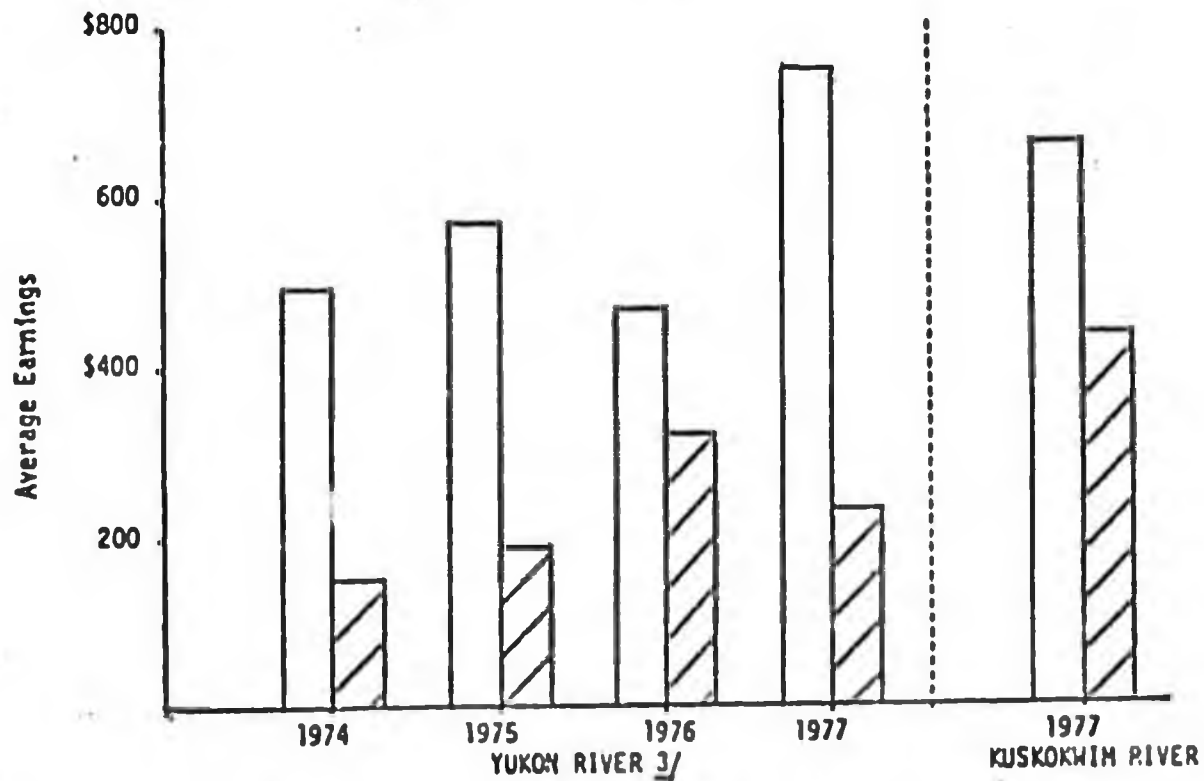
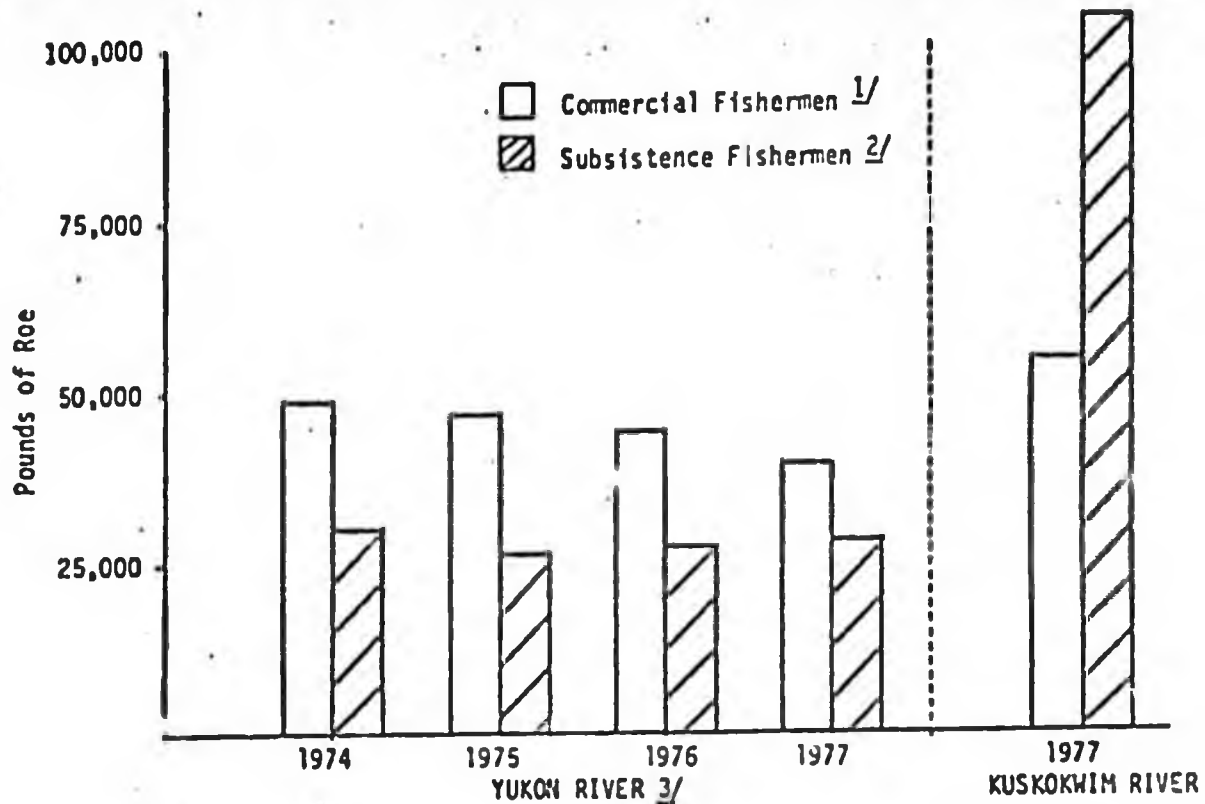
The numbers of persons making roe sales each year ranged from 1463 to 1936. In 1977 it was determined that of the 1936 persons selling roe, approximately 34% (663) held an entry permit and probably fished commercially. Forty two percent had fished commercially in 1976. All persons that made sales were probably not fishermen since it was common practice for the parents to give roe to their children to sell, especially in Kuskokwim River villages.

Twenty subsistence roe buyers operated in the region during 1977 with the five major buyers processing 80 percent (by weight) of all roe purchased. Thirteen buyers operated in the Yukon area, 5 in the Kuskokwim area and 2 in both areas. Two Bethel based buyers processed 50 percent of the roe. Only one Yukon based buyer was among the top five with only 7 percent of the production. Prices paid to Kuskokwim River fishermen averaged \$3.80/pound an increase of \$1.68/pound over 1976 prices. Yukon fishermen received an average of \$2.65/pound, an increase of \$1.27/pound. It was difficult to obtain accurate first wholesale values which was finally estimated at twice the value received by fishermen.

Commercial fishermen comprised about 35 percent of all persons making roe sales in each river. Yukon River commercial fishermen sold 60 percent by weight of the subsistence caught roe during the last four years. Kuskokwim River commercial fishermen in 1977 sold only 34 percent of the subsistence caught roe (Figure 2). The average earnings from subsistence roe sales were substantially greater for commercial fishermen. Yukon River commercial fishermen earnings in 1977 averaged \$748 compared to \$230 for subsistence fishermen. Kuskokwim River commercial fishermen for the same year earned \$658 compared to \$437 for subsistence fishermen (Figure 2).

Annual production and value information is presented by sub-area for the Kuskokwim and Yukon areas in Appendices III and IV respectively. The largest quantities of roe were sold in the following sub-areas during 1974-77: lower Kuskokwim River downstream from Tuluksak (49% by weight), mid-Yukon from Anvik to Ruby (15%), mid-Kuskokwim River from Tuluksak to Chuathbaluk (13%) and Tanana River (11%). Small amounts were sold in the lower and upper Yukon River areas and in some coastal villages. Although it was legal to do so, no roe was sold in the Yukon River drainage upstream of Beaver or in several villages near the mouth. The small subsistence fisheries or remote locations of these latter areas has made it uneconomical to date to transport the roe long distances to central processing plants.

Figure 2 Comparison of subsistence roe sales and average earnings between commercial and subsistence fishermen, Yukon River, 1974-77; Kuskokwim River, 1977.



1/ persons that sold roe from subsistence-caught fish and also fished commercially based on possession of a commercial fishing entry permit

2/ persons that sold roe from subsistence-caught fish and did not fish commercially; includes family members of commercial fishermen

3/ upstream of Holy Cross

Special Management Considerations and Problems

Traditionally, the subsistence salmon fishery was naturally limited by personal food requirements and the numbers of salmon that could be handled in a day and hung to dry or smoke during the season. These restraints do not apply to any fishery where the profit motive becomes of major importance. For example, a Kuskokwim River subsistence fisherman currently is paid an average of \$10.00 and \$3.00 for the roe sold from a single king and chum salmon respectively. These prices, especially for chum salmon roe, are only slightly less than what the carcasses of these species are worth to a commercial fisherman in the same area. The high value of subsistence salmon roe is an incentive for some individuals - buyers and fishermen - to risk violating either the intent or legal wording contained in existing statutes and regulations. Wastage, misuse and overfishing of the salmon resource were documented for specific times and locations during the past four seasons.

A possible consequence resulting from the continuation of subsistence roe sales is that the concept and management of subsistence fishing may be permanently altered. Subsistence fishing regulations in the A-Y-K region are quite liberal which has been in recognition of the supplemental protein needs of a large rural population. If the problems cited in this section continue, then the state policy which assigns the highest priority among beneficial uses to subsistence fishing must be re-examined. Most salmon populations are being harvested at maximum levels, and an increase in subsistence fishing effort and utilization must be countered with additional restrictions on subsistence fishing, commercial fishing or on both fisheries.

The remainder of this section is a discussion of special problems associated with subsistence salmon roe sales.

Catch Reporting: Table 2 compares the catch "quotas" with in-season estimates from roe sales and catches from end of the season surveys. Differences between these data point out the difficulty associated with determining the magnitude of subsistence catches by any method. Large differences between catches derived from these two methods are generally the result of the following: 1) continued legal fishing after roe sales are prohibited; 2) incomplete catch documentation during end of season surveys; 3) intentional and unintentional reporting errors by fishermen and 4) all roe from subsistence caught salmon is not sold.

Kuskokwim and Yukon River king salmon catches obtained from fishermen interviews have always been larger than catches derived from roe poundages. The major reason for this is that legal subsistence fishing normally continues after roe sales for this species have been prohibited.

The average chum salmon catch obtained from Kuskokwim River fishermen interviews during 1974-77 has been approximately 25 percent smaller than the average catch estimated from roe poundages. Fishermen from four villages (Napaskiak, Kwethluk, Bethel and Tuluksak) in 1977 reported catches that were 40 percent less than those estimated from roe sales. It is believed that this is a result of the incompleteness of Department surveys and reporting errors by fishermen. From close inspection of individual records, there is little doubt that some fishermen are intentionally underreporting their catches. The reasons for this are not clear, but may involve a sense of guilt for harvesting more salmon than required.

Due to difficulties involved with obtaining timely and accurate in-season estimates, annual king and chum catch "quotas" for the Kuskokwim River were substantially exceeded before roe sales for these species

Table 2. Comparison between "quotas" and actual catches obtained from roe sales and from fishermen interviews, AYK Region, 1974-77. (1977 actual catches are preliminary).

<u>King Salmon</u>	<u>Kuskokwim River (subdistricts 1 & 2)</u>			
	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>
"Quota" <u>1/</u>	None	27,600	27,600	27,600
Catch <u>2/</u>	20,300	32,000	43,000	36,300
Catch <u>3/</u>	25,100	45,400	59,600	53,700
 <u>Chum Salmon</u>				
"Quota" <u>1/</u>	None	169,800	169,800	169,800
Catch <u>2/</u>	313,000	185,100	246,100	222,900
Catch <u>3/</u>	260,900	158,250	202,800	176,350
 <u>King Salmon</u>				
<u>King Salmon</u>	<u>Yukon River (excluding Yukon Territory)</u>			
	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>
"Quota" <u>1/</u>	None	17,050	17,050	17,050
Catch <u>2/</u>	637	2,363	3,533	10,378
Catch <u>3/</u>	14,237	12,806	10,371	10,417
 <u>Chum Salmon</u>				
"Quota" <u>1/</u>	None	207,491	207,491	207,491
Catch <u>2/</u>	131,567	142,656	171,567	114,451
Catch <u>3/</u>	222,798	199,794	162,217	153,802

- 1/ "Quotas" established by Department in 1975 and adopted as Board regulations in 1976: subsistence roe sales prohibited when king salmon catches exceed 1974 recorded catches by 10% and when chum salmon catches exceed 1970-74 average annual recorded catches.
- 2/ Catches estimated in-season from lbs. of subsistence roe sold using sex ratio and average roe weight per fish information.
- 3/ Catches from systematic personal interview and survey of subsistence fishermen conducted at end of fishing season, 1977 catch data preliminary.

were prohibited by emergency order. During the 1977 season, buyers were required to submit written reports twice a week, but this was largely ineffective in monitoring production due to reporting errors and the large amounts of roe often sold during a single day.

Wastage: Department of Fish and Game and Public Safety personnel documented only five or six instances of intentional fish wastage during the past four years involving carcasses left to rot in garbage dumps or along the shore. Violation citations were not issued due to lack of evidence regarding names of persons involved. Fish wastage during the fishing season is difficult to detect and prosecute since the disposal of carcasses must be witnessed and is relatively easy to conceal (by throwing fish into the river or into bank vegetation).

However, many reports or complaints have been received from local residents involving the intentional wastage of salmon carcasses. A total of nine reports involving wastage were received in 1977, more than in any other year. Most of these alleged violations were reported for the middle Yukon and Tanana River areas ranging from a few fish to over 1000 fish. Although many of these alleged violations were personally witnessed, informants would not indicate the names of persons involved. In nearly all the aforementioned instances of documented and alleged carcass disposals, the roe had been removed from the female salmon.

Another difficult to detect, but potentially greater form of wastage exists. Large quantities of dried salmon captured the previous summer have been observed by Department personnel in caches and smokehouses of several Kuskokwim villages during the spring. If properly cared for, dried salmon can be kept overwinter to be utilized as dog food the following summer. Due to the poorer condition of these fish, many probably have been discarded when fishing during the current year's run

begins. Often the portion of the catch in excess of real need is stored in the open and is very susceptible to spoilage. Again, local residents have reported that this form of wastage does occur in some Yukon and Kuskokwim River communities.

At the beginning of the 1977 season, Department personnel examined 34 caches (storehouses) in several lower Kuskokwim River villages and fish camps. A total of 2210 dried salmon harvested during the 1976 season were observed in 23 of these caches. Eleven caches did not contain any salmon from the previous year. Most cache owners were fishing and beginning to dry salmon (1977).

While visiting one of the villages located downstream of Bethel in mid-June of 1977, a Department employee learned that one or more local residents were broadcasting over citizens band radio that last year's dried fish should be discarded. The reason that prompted this action is not clear, but may include an attempt to "hide" fish taken in excess of need.

Violation Citations: Protection officers working out of the Bethel office during the summer of 1977 issued seven citations involving violations of regulations pertaining to the sale of subsistence salmon roe. Six of these were issued for the Kuskokwim River with one issued for the Yukon River. The majority of these violations involved illegal purchases or sales of subsistence roe during closed periods. Three violations were successfully prosecuted, two were closed with no leads, one was closed as no violation and one is still pending adjudication. Few violation citations involving subsistence roe sales were issued prior to the 1977 season.

Exceptionally Large Individual Catches and Sales: Individual records were examined to pinpoint extremely large subsistence catches and earnings from roe sales which were made by a small minority of the fishermen. Records were examined during all years for Yukon fishermen and during only 1977 for Kuskokwim fishermen. The largest Yukon individual catches, composed of a majority of chum salmon, occurred in the middle Yukon and Tanana River. Villages in these areas generally have a large number of sled dogs that are used for competitive racing. Several fishermen captured in excess of 5,000 chum salmon each season with a high individual catch of 15,000 reported. Four or five fishermen each year made unusually large chum salmon catches but owned relatively few dogs. These fishermen captured a total of 84,317 chums during the four year period which averaged 900 fish per dog each year. One fisherman with three persons in the family and owning only three dogs took 8,000 chum salmon in a single season. Highest individual earnings from subsistence roe sales of \$9,200 was made by a Tanana fisherman in 1977. Another Tanana River fisherman made \$9,000 in 1974 when roe prices were approximately one-third of current prices.

Individual catches for the Kuskokwim River during 1977 in excess of 300 kings and 1200 chums were considered substantially above average. Most of the large individual catches were made in the middle Kuskokwim area and in one or two lower river villages. The largest catch of 400 kings and 2900 chums was made by a fisherman with four persons in the family owning only two dogs. An individual high of \$8,300 in roe sales was made from this catch. The next greatest individual earnings from roe sales was \$6,800.

Circumvention of Regulatory and Statutory Intent: Other incidences that

were documented by Department personnel were not violations, but involved attempts to circumvent the intent of existing regulations and statutes. Fishermen who hold entry permits can fish for commercial and subsistence purposes. Many Yukon fishermen sell only male salmon in the round to commercial fish buyers and retain females for subsistence selling the roe. At least two Yukon buyers, specializing in subsistence roe production, continued to purchase only females (\$2.00 ea.) after the close of the subsistence roe "season". Also several commercial salmon buyers complained that many deliveries made to their plants consisted of nearly all males which was not in their best economic interests.

Changes in Subsistence Catches and Fishing Effort: Prices increased substantially in all areas during the 1977 season and there was intense competition between buyers for subsistence roe. A carnival like atmosphere developed near the end of the roe "seasons" in the Kuskokwim River when buyers began bidding against one another. Some buyers offered fishermen price increases of up to \$1.00 a pound during the last day or two of the "season". In the Kuskokwim River the largest amounts of king salmon roe (approx. 22%) were sold on the last day of the season. In the middle river (subdistrict 2) the pounds of king salmon roe sold on the last day of the season was twice that for any other day. Similarly the pounds of chum salmon roe sold during the last day of the season in this same area was three times that for any other day. Chum roe sales in the lower river (subdistrict 1) did not demonstrate this trend and were spread more evenly throughout the "season". This information along with observations made during 1977 aerial and boat surveys indicated that fishing effort, except during the subdistrict 1 chum salmon run, increased after the announced roe "season" closures and declined sharply after the roe "seasons" were closed. These conditions are symptomatic of a fishery exhibiting profit motivation.

Subsistence catches of chum salmon, the most abundant species, declined throughout a majority of the A-Y-K region during 1966-73 due to decreased effort resulting from fewer sled dogs being kept and more employment opportunities. Kuskokwim River catches did not exhibit a similar decline during this period. Yukon and Kuskokwim River chum salmon catches in areas open to subsistence roe sales increased substantially during 1974-77 compared to previous recent years. This increase was probably due to a combination of factors that included above average run magnitudes and increased fishing effort due to the ability to sell subsistence roe.

Table 3 compares subsistence catch trends for selected Kuskokwim River villages during the four year period prior to and after the legalization of subsistence roe sales. The average 1970-74 catch for villages representative of the area of legal roe sales increased 35 percent compared to the 1970-73 period. The average 1970-74 catch for villages representative of the closed area decreased 4 percent compared to the 1970-73 period. The average 1970-74 catch for Upper Kalskag and Lower Kalskag, in the area open to roe sales, increased 111 percent compared to the previous four years. Other villages in the area of legal roe sales with substantially increased catches during the 1970-74 period included Napaskiak, Akiak, Tuluksak and Aniak.

Table 4 compares subsistence catch trends for selected Yukon River villages. The average 1974-77 catch for villages representative of areas where a majority of the roe sales occurred increased 69 percent compared to the previous four years. Increased catches were the greatest for Anvik, Grayling and Manley Hot Springs. All villages exhibited increased harvests during 1974-77 with Tanana having the smallest increase. The average 1974-77 catch for villages representative of areas either closed to roe sales or where sales did not occur increased 22 percent

Table 4 . Comparison of subsistence salmon catch trends for selected Yukon River villages for periods 1970-73 and 1974-77^{1/}

Village Roe Sales Permitted (1974-77)

Village	Roe Sales Prohibited					Roe Sales Permitted					
	1970	1971	1972	1973	Average	1974	1975	1976	1977	Average	(% change)
Anvik	9,991	8,273	3,761	20,923	10,737	29,372	31,007	26,744	23,914	27,759	(+159%)
Grayling	12,703	7,316	6,613	13,294	9,982	27,968	24,576	27,617	15,751	23,978	(+140%)
Nulato	27,190	18,839	8,012	13,875	16,979	38,473	23,671	14,221	13,596	22,490	(+ 32%)
Tanana	23,378	25,701	14,569	11,760	18,852	13,236	26,422	22,930	19,648	20,559	(+ 9%)
Manley	170	-0-	105	62	84	196	6,213	9,726	16,944	8,270	(+9745%)
Nenana	11,755	21,364	21,755	14,837	17,428	20,828	27,167	15,209	24,909	22,028	(+ 26%)
Totals	85,187	81,493	54,815	74,751	74,062	130,073	139,056	116,447	114,762	125,034	(+ 69%)

Village Roe Sales Prohibited (or did not occur)

Village	1970	1971	1972	1973	Average	1974	1975	1976	1977	Average	(% change)
	Alakanuk	11,583	9,011	6,243	7,012	8,462	13,312	3,786	11,229	6,804	8,783
Emmonak	7,446	5,714	5,128	11,206	7,374	7,596	5,391	8,795	7,563	7,336	(0%)
Hughes	6,483	17,280	2,804	2,573	7,285	8,796	5,454	4,435	4,929	5,903	(- 19%)
Huslia	4,030	1,473	535	4,517	2,639	6,670	5,048	8,812	3,603	6,033	(+129%)
Allakaket	7,887	9,041	892	2,538	5,090	7,172	5,760	4,446	3,808	5,296	(+ 4%)
Ft. Yukon	7,367	4,204	2,117	3,610	4,325	1,172	19,673	2,281	14,691	9,454	(+119%)
Totals	44,796	46,723	17,719	31,456	35,174	44,718	45,112	39,998	41,397	42,806	(+ 22%)

^{1/} king and chum catches combined

compared to the previous four years. Four of these villages exhibited no appreciable change in catch trends over the eight year period, but two villages, Huslia and Ft. Yukon, exhibited substantial increases although the total numbers of fish were small.

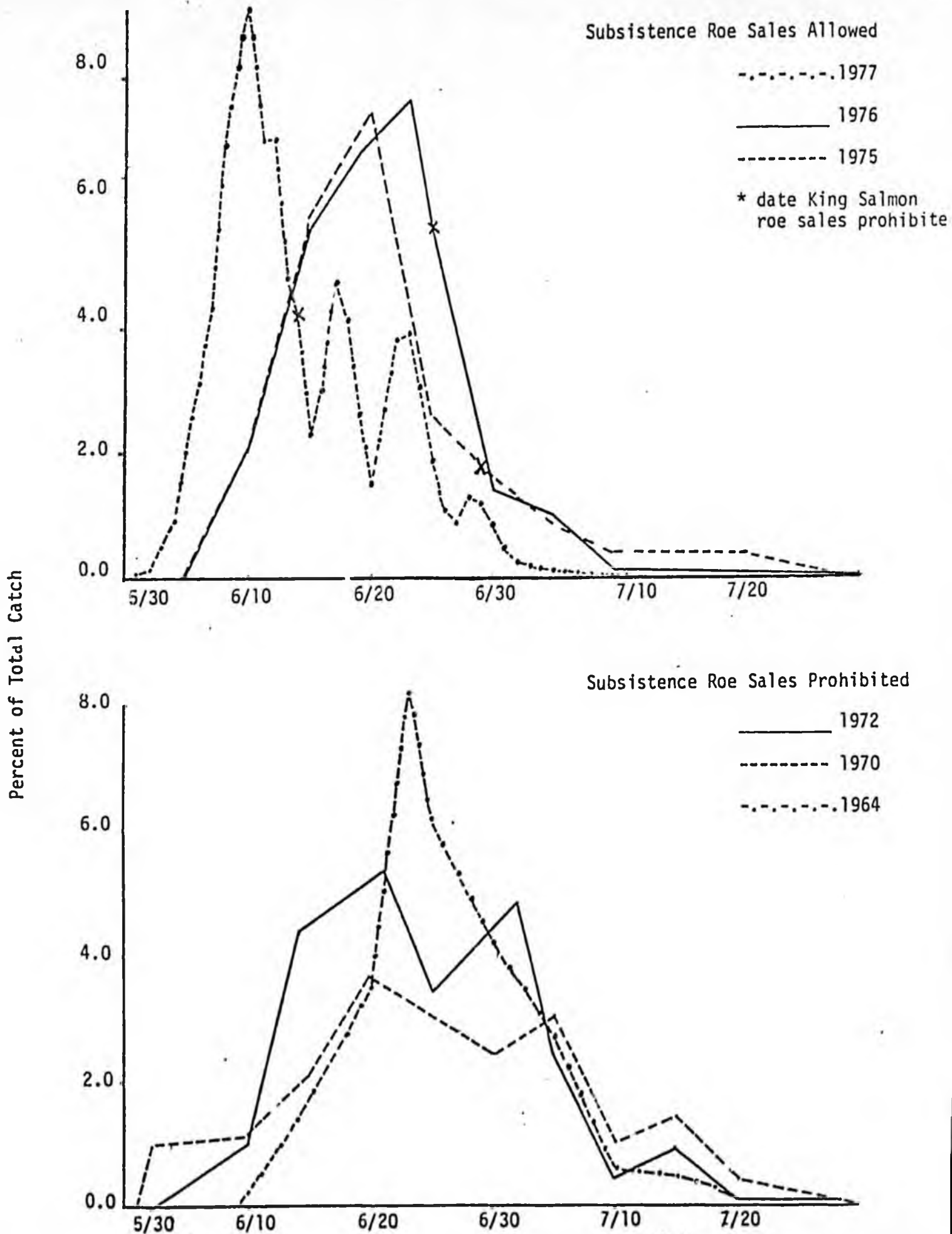
There are some indications that subsistence fishermen are exerting more effort during the early portion of the season (and runs) which may be in response to competing with other fishermen for an increased share of the subsistence roe sales. Figure 3 shows seasonal catch patterns for the Kuskokwim River during and prior to the legalization of subsistence roe sales. Generally these graphs show catches were made during a longer time span during years when roe sales were not allowed. The 1964 season was an exception, but the run that year was exceptionally late and of short duration. If this trend of greater fishing effort early in the season continues, then measures will have to be taken to spread subsistence harvests throughout the run to prevent overharvesting of specific stocks. This will require additional weekly closures.

Due to increasing subsistence effort, mainly in the middle Yukon and Tanana River, increased subsistence fishing weekly closures for all major fisheries were promulgated by the Board of Fisheries beginning with the 1977 season. Also the large subsistence king salmon catches made in the Kuskokwim River during the last two years has resulted in shorter commercial fishing seasons for that species.

Conclusions and Recommendations

The issues associated with subsistence roe sales are complex and require careful examination of economic and social as well as biological factors. The Legislature has requested that the Department make a recommendation on the fate of future subsistence roe sales. The Board of Fisheries, which is ultimately responsible for the promulgation of all fisheries regulations and the Legislature itself, must make the

Figure 3. Kuskokwim River (subdistrict 1) daily subsistence king salmon catches.



final decision.

The opposition to continued subsistence roe sales being expressed by local residents must be given strong consideration. The first hand knowledge of persons residing year round in rural communities cannot be duplicated by occasional surveys and visits to these same communities by State employees. As previously indicated, abuses associated with the subsistence roe fishery are difficult to detect by conventional fishery surveillance methods.

Five separate proposals have been submitted for consideration at the December 1977 meeting of the Board of Fisheries recommending complete prohibition of continued subsistence roe sales. All of these were submitted by local residents or organizations representing local residents including the Lower Kuskokwim and Lower Yukon Fish and Game Advisory Committees. Two other proposals were also submitted by local residents that involve greater restrictions upon subsistence roe sales. For the first time in four years, fishermen have openly discussed problems associated with roe sales not only among themselves, but with Department biologists and Fish and Wildlife Protection officers indicating a growing unrest over this issue.

It is the Department's recommendation to the Board of Fisheries and the Legislature that the sale of subsistence salmon roe be prohibited statewide beginning with the 1978 fishing season. This recommendation is based on several factors which include:

- 1) Continuation of the sale of subsistence salmon roe will require further fishing restrictions and re-examination of the Department's policy of affording subsistence fishing the highest priority among beneficial fishery uses. A relatively few persons fishing primarily for the purpose of selling roe will adversely

affect others who are much more dependant on a subsistence livelihood.

- 2) The growing opposition by local fishermen who are the direct beneficiaries of continued roe sales, indicate that abuses associated with subsistence roe sales are more widespread and serious than indicated.
- 3) The trends of increasing subsistence catches and effort, apparently in response to profit motivation, could jeopardize future maintenance of salmon stocks especially during years of small runs.

The loss of revenues to both fishermen and processors resulting from the prohibition of subsistence roe sales can be expected to be controversial. Individual fishermen and processors will be affected differently depending on the availability of alternate resources and incomes. Although a comprehensive analysis of the economic impact of roe sales prohibition was beyond the purview of this report, preliminary analysis indicate that relatively few individuals are making substantial incomes from subsistence roe sales.

If subsistence roe sales are prohibited, attention must be focused on methods of preparation and storage of roe for local use. Salmon roe was apparently used as a foodstuff for both humans and dogs to a greater extent many years ago. Fuller use locally could result in a decrease in subsistence demands and other expenses. Sled dogs are on the increase in some villages and use of salmon roe as a dogfood supplement will reduce the need for subsistence salmon and commercial dogfood.

The popularity of subsistence roe sales in upriver areas was due partly to the limited commercial fishing opportunities existing in these areas that included small commercial catch quotas, lack of markets, and persons ineligible for entry permits. Restrictions have since been

relaxed in some of the upstream fisheries. For example, average earnings by commercial fishermen in the Anvik - Ruby area now rival those in the lower Yukon.

Prohibition of roe sales is expected to result in the stabilization or reduction of subsistence salmon catches in the near future, especially for chum salmon. If substantial catch declines occur and the biological status of the runs are unchanged, a surplus would be available for commercial harvesting. The Board of Fisheries could exercise the option of allowing the surplus to be harvested in the local commercial fishery.

Prohibition of subsistence roe sales can be expected to result in attempts at blackmarketing. Due to the small department staff, remoteness and vast size of the fisheries and the existence of subsistence fisheries within major commercial fishing areas, special steps will have to be taken to minimize blackmarketing of subsistence roe to include:

- 1) Require buyers of commercial salmon to submit weekly reports detailing production of both fish and commercial roe. The Department will continue to sample catches each week for average roe weight and sex ratio information to determine amounts of roe contained in the commercial catch. "Overages" will indicate possible illegal purchases of subsistence roe which will not be allowed to exceed established limits.
- 2) Units of processed (boxes) or unprocessed (buckets) of roe will be assigned consecutive numbers by each buyer and these units must be examined by a department representative prior to being shipped to another location.
- 3) Commercial buyers will be required to purchase both male and female salmon in the same ratio obtained from the fishing gear; fishermen will be required to follow the same conditions.

- 4) Temporary fishery technicians will continue to be used to monitor subsistence catches in selected communities. A coordinated surveillance program targeting commercial buyers must be worked out in advance with the Division of Fish and Wildlife Protection.

APPENDICES



LAWS OF ALASKA

1975

Source

SB 451 am

Chapter No.

49

AN ACT

Relating to the sale of subsistence caught salmon eggs; and providing for an effective date.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF ALASKA:

• Section 1. INTENT. (a) It is the intent of sec. 2 of this Act to permit the sale or trade of salmon roe in the Arctic-Yukon-Kuskokwim District under strict permit and regulatory provisions to assure the health of subsistence economies in areas where such use will not jeopardize or interfere with the maintenance of existing salmon stocks.

(b) It is the intent of sec. 3 of this Act to control the waste of salmon resources.

• Sec. 2. AS 16.05 is amended by adding a new section to read:

Sec. 16.05.827. SALE OF SUBSISTENCE SALMON ROE. (a) Notwithstanding sec. 940(17) of this chapter, the board may adopt regulations permitting the sale of subsistence salmon roe under conditions the board considers advisable.

(b) The board may permit subsistence salmon roe sales under (a) of this section if

(1) the accustomed contribution of salmon to particular subsistence economies will be maintained, as modified by current needs; and

(2) subsistence salmon roe sales will not jeopardize or interfere with the maintenance of salmon stocks on a sustained yield basis.

(c) No person may purchase or trade for or attempt to purchase or trade for subsistence salmon roe unless he

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possesses an annual permit issued by the commissioner. The commissioner may specify terms and conditions of a permit required under this section. No license, emergency permit or interim permit is required for the specific act of selling subsistence salmon roe. No person may purchase, transport or attempt to purchase or transport salmon roe which he knows or has reason to know was taken in violation of this section or regulations adopted under it.

(d) If the commissioner finds that sale of subsistence salmon roe is resulting in waste of salmon carcasses, damage to salmon stocks, or circumvention of salmon management programs, he may close any or all areas to subsistence salmon roe sale by emergency order. If the commissioner finds that the subsistence catch in an area exceeds or is likely to exceed, by 10 per cent, the 1974 subsistence catch for that area, he shall close that area to subsistence salmon roe sale by emergency order.

(e) Original purchasers of subsistence salmon roe shall record information required by the department on fish tickets supplied by the department.

(f) The board may adopt regulations it considers necessary for the administration of this section. The board may delegate its authority under this section to the commissioner.

(g) A person who violates this section or a regulation adopted under it is punishable by a fine of not more than \$10,000, or by imprisonment for not more than six months, or by both.

(h) In this section, "subsistence salmon roe" means salmon roe incidentally obtained as an unavoidable by-product of lawful subsistence fishing.

Sec. 3. AS 16.05 is amended by adding a new section to read:

Sec. 16.05.331. WASTE OF SALMON. (1) It is unlawful for a person to waste salmon intentionally, knowingly, or with reckless disregard for the consequences. In this section, "waste" means the failure to utilize the majority of the carcass, excluding viscera and sex parts, of salmon which are to be

- (1) sold to a commercial buyer or processor;
- (2) utilized for consumption by humans or domesticated animals; or
- (3) utilized for scientific, educational, or display purposes.

(b) The commissioner may authorize other uses of salmon upon request if he finds that to do so would be consistent with maximum and wise use of the resource.

(c) A person who violates this section or a regulation adopted under it is punishable by a fine of not more than \$10,000, or by imprisonment for not more than six months, or

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by both. In addition, a person who violates this section is subject to a civil action by the state for the cost of replacing the salmon wasted.

• Sec. 4. Sections 1(a) and (2) of this Act expire January 1, 1977.

• Sec. 5. This Act takes effect immediately in accordance with AS 01.10.070(c).

-3-

Approved by governor: May 29, 1975
Actual effective date: May 30, 1975

**ARTICLE 8.
PURCHASE AND SALE OF
SALMON ROE**

Section

805. Sale of salmon roe

810. Salmon roe sales prohibited

§ AAC 03.805. SALE OF SALMON ROE. (a) Salmon roe incidentally obtained as an unavoidable by-product of lawful subsistence fishing may be purchased or sold only in accordance with the provisions of AS 16.05.027 and the provisions of this section and sec. 810 of this chapter.

(b) Each person who purchases or processes subsistence-caught salmon roe shall obtain an annual permit issued by the commissioner or his authorized representative. Permits must be retained in the possession of the permittee and readily accessible for inspection at all times. Permits shall be obtained by the permittee in person from a representative of the department at least 48 hours prior to purchasing or processing any subsistence-caught salmon roe. A separate permit must be obtained for each district, as described in sec. 200 of this chapter, in which purchases are made. No person may initiate any purchase of or accept any subsistence-caught salmon roe, unless that person has a valid permit for the district. Permits may designate requirements for weekly reports, roe ticket reporting, times and areas open to sale or processing and plant inspection.

(c) Purchasers of subsistence-caught salmon roe shall complete all purchases on the basis of the price per pound of unprocessed roe.

(d) Any permittee who violates the terms of his permit or any other regulation or provision of law may have his permit revoked immediately by the commissioner.

(e) Each person who purchases or processes salmon roe shall submit weekly reports to a local representative of the department containing the following information:

(1) weight in pounds by species of unprocessed subsistence-caught salmon roe purchased;

(2) weight in pounds by species of unprocessed commercially caught salmon roe purchased; and

(3) number of whole salmon by species purchased from commercial fishermen.

(f) Information required by (e) of this section must be in the form of totals for the previous week and for the entire season to date.

(g) Permittees shall record information for each purchase of subsistence-caught salmon roe on roe tickets provided by the department. All entries on the roe ticket shall be completed by the permittee. Roe tickets required by this section may not be used to record information pertaining to purchases of commercially caught salmon or salmon roe. Roe tickets required by this section shall be completed at the time the transfer of roe to the permittee is made. A copy of each roe ticket shall be given to the fisherman selling the roe and to the local representative of the department.

(h) Unless waived by stipulations contained in the permit required by this section, permittees shall comply with provisions of § AAC 03.130(a) and (b), fish ticket requirements in § AAC 03.130(b) apply to roe tickets.

(i) All purchases of subsistence-caught salmon roe may be made only from the fisherman who

took the salmon or a member of his immediate household. No person may act as a sales agent or in a similar capacity for purposes of vending subsistence-caught salmon roe to any permittee or other person.

(j) The sale of subsistence-caught salmon roe will be prohibited by emergency order in any district or subdistrict when the subsistence salmon catch exceeds or is likely to exceed the 1970-74 average annual harvest. In no instance will the sale of subsistence-caught roe be allowed to continue in any district or subdistrict if the subsistence salmon harvest exceeds or is likely to exceed the 1974 subsistence harvest by 10 percent.

(k) If the commissioner closes any district, subdistrict, or other area to subsistence-caught roe sales, no person may initiate, enter into, or consummate any purchase agreement within the closed area for subsistence-caught roe after the closure becomes effective.

(l) No person may enter into, initiate, or consummate any purchase agreement for any subsistence-caught salmon roe in any district or subdistrict which is closed to the sale of subsistence-caught salmon roe. No permittee may purchase or process roe from any subsistence-caught salmon which he knows or has reason to know were taken from waters described in sec. 810 of this chapter.

(m) As used in this section, "purchase" means to buy, trade for, or otherwise receive subsistence-caught salmon roe for valuable consideration. No person may give or receive without valuable consideration subsistence-caught salmon roe.

(n) In areas open to the sale of subsistence-caught salmon roe, salmon taken for subsistence purposes must be consumed by the fisherman taking the fish or by a member of his immediate household.

Authority: AS 16.05.027

§ AAC 03.810. SALMON ROE SALES PROHIBITED. No person may sell, trade, purchase, transport, or attempt to do any of these acts with roe from subsistence-caught salmon taken from any of the following waters:

(1) all waters in the Northern, Kotzebue, Port Clarence and Norton Sound districts;

(2) in the Yukon district, all waters listed under sec. 350 of this chapter;

(3) in the Kuskokwim district, all waters listed under sec. 350 of this chapter except in the lower portions of the Eek and Awethluk Rivers as indicated by stream markers placed by the department;

(4) in any waters closed to subsistence salmon fishing.

Authority: AS 16.05.827

Appendix III. Subsistence salmon roe sale information by sub-area and year, Kuskokwim area, 1974-77.

	Year	Pounds of unprocessed roe		Value of sales	No. persons reporting	Av. value per person ^{1/}
		King salmon	Chum Salmon			
Lower Kuskokwim River Mouth to Akiak	1974	28,350	93,643	\$ 164,934	1187	\$ 139
	1975	19,811	40,839	\$ 91,358	977	\$ 94
	1976	53,678	65,448	\$ 256,848	987	\$ 260
	1977	29,930	80,657	\$ 407,827	929	\$ 439
	(Average)	(32,987)	(70,147)	(\$ 230,242)	(1020)	(\$ 226) ^{1/}
Mid-Kuskokwim River, Akiak - Chauthbalok	1974	3,932	4,861	\$ 11,871	160	\$ 131
	1975	2,304	16,534	\$ 28,257	128	\$ 108
	1976	6,300	27,134	\$ 69,239	227	\$ 269
	1977	17,994	31,376	\$ 203,211	290	\$ 701
	(Average)	(7,633)	(19,976)	(\$ 78,145)	(201)	(\$ 389) ^{1/}
Totals - Kuskokwim River	1974	32,462	98,504	\$ 176,805	1347	\$ 131
	1975	22,115	57,373	\$ 119,615	1105	\$ 108
	1976	59,978	92,582	\$ 326,087	1214	\$ 269
	1977	47,924	112,033	\$ 611,038	1219	\$ 501
	(Average)	(40,620)	(90,123)	(\$ 308,386)	(1221)	(\$ 253) ^{1/}
Quinhagak	1974	1,631	93	\$ 2,327	91	\$ 26
	1975	2,284	236	\$ 3,780	92	\$ 41
	1976	2,232	2,959	\$ 10,066	107	\$ 94
	1977	3,250	1,967	\$ 24,838	85	\$ 292
	(Average)	(2,349)	(1,814)	(\$ 10,252)	(94)	\$ 109) ^{1/}
Godnews Bay	1974	488	5	\$ 666	<u>2/</u>	<u>2/</u>
Hooper Bay	1975	0	102	\$ 153	3	\$ 51
Area Totals	1974	34,581	98,602	\$ 179,798	1433	\$ 125
	1975	24,399	57,711	\$ 123,548	1200	\$ 103
	1976	62,210	95,541	\$ 336,153	1321	\$ 254
	1977	51,174	116,000	\$ 635,876	1304	\$ 488
	(Average)	(43,091)	(91,964)	(\$ 318,844)	(1316)	(\$ 242) ^{1/}

^{1/} Average sales value ÷ average number of persons for sub-area

^{2/} Information not available

Appendix IV. Subsistence salmon roe sale information by sub-area and year, Yukon area, 1974-1977

		Pounds of unprocessed roe		Value of Sales	Number of Persons Reporting	Value of Sales Per Person
		King Salmon	Chum Salmon			
<u>Lower Yukon</u> <u>(Mouth to Holy Cross)</u>	1974	0	4,342	\$ 3,256	35	\$ 93
	1975	612	4,908	7,296	44	165
	1976	2,253	1,830	6,286	50	125
	1977	7,143	4,585	41,766	194	218
	(Averages)	(2,502)	(3,916)	(\$14,651)	(81)	(\$181) ^{1/}
<u>Mid Yukon (Anvik-Ruby)</u>	1974	51	26,670	20,041	91	220
	1975	45	32,478	37,401	108	346
	1976	494	38,532	48,783	126	387
	1977	2,872	29,640	60,280	222	366
	(Averages)	(866)	(31,830)	(\$46,876)	(137)	(\$343) ^{1/}
<u>Upper Yukon</u> <u>Tanana - Upstream</u>	1974	1,701	14,613	12,236	69	177
	1975	1,300	14,787	18,500	75	246
	1976	1,377	11,303	15,850	83	191
	1977	2,582	10,497	32,698	126	259
	(Averages)	(1,740)	(12,800)	(\$19,821)	(88)	(\$225) ^{1/}
<u>Tanana River</u>	1974	700	33,940	25,980	42	619
	1975	510	18,367	21,711	36	603
	1976	1,706	16,992	28,511	72	396
	1977	2,810	18,708	53,795	90	598
	(Averages)	(1,432)	(22,002)	(\$32,499)	(60)	(\$542) ^{1/}
<u>Area Totals</u>	1974	2,452	79,565	\$61,513	237	\$260
	1975	2,467	70,540	84,908	263	323
	1976	5,830	68,657	99,430	331	300
	1977	15,407	63,430	209,539	632	332
	(Averages)	(6,539)	(70,548)	(\$113,847)	(366)	(\$311) ^{1/}

^{1/} Average sales value divided by average number of persons for sub-area.

Appendix V.

Commercial salmon catches and fishermen values for the Kuskokwim and Yukon Rivers, 1974-1977.

<u>Kuskokwim</u> ^{1/}	<u>King</u>	<u>Numbers of Fish</u>			<u>Totals</u>	<u>\$ Value to Fishermen</u>
		<u>Chum</u>	<u>Red, Coho, Pink</u>			
1974	31,000	196,000	269,000	496,000	\$1,056,000	
1975	28,000	224,000	128,000	380,000	899,000	
1976	49,000	232,000	167,000	448,000	1,380,000	
1977	58,000	299,000	282,000	639,000	3,675,000	
<u>Totals</u>	<u>166,000</u>	<u>951,000</u>	<u>846,000</u>	<u>1,963,000</u>	<u>\$7,010,000</u>	
[Averages]	[42,000]	[238,000]	[212,000]	[491,000]	[\$1,753,000]	
<u>Yukon</u>						
1974	98,000	879,000	16,000	993,000	\$1,921,000	
1975	64,000	985,000	2,000	1,051,000	1,793,000	
1976	89,000	762,000	5,000	856,000	2,151,000	
1977	96,000	795,000	36,000	927,000	4,300,000	
<u>Totals</u>	<u>347,000</u>	<u>3,421,000</u>	<u>59,000</u>	<u>3,827,000</u>	<u>\$10,165,000</u>	
[Averages]	[87,000]	[855,000]	[15,000]	[957,000]	[\$2,541,000]	
<u>Totals</u>						
1974	129,000	1,075,000	285,000	1,489,000	\$2,977,000	
1975	92,000	1,209,000	130,000	1,431,000	2,692,000	
1976	138,000	994,000	172,000	1,304,000	3,531,000	
1977	154,000	1,094,000	318,000	1,566,000	7,975,000	
<u>Total</u>	<u>513,000</u>	<u>4,372,000</u>	<u>905,000</u>	<u>5,790,000</u>	<u>\$17,175,000</u>	
[Average]	[128,000]	[1,093,000]	[226,000]	[1,448,000]	[\$4,294,000]	

^{1/} Also includes catches from Quinhagak and Goodnews Bay.

Appendix VI. Subsistence salmon catches made in the Kuskokwim and Yukon Rivers 1964-77
(catches rounded to nearest 1000 fish).

Year	Kuskokwim River			Yukon River		
	King	Chum ^{1/}	Total	King	Chum ^{1/}	Total
1964	29,000	190,000	219,000	16,000	481,000	497,000
1965	27,000	283,000	310,000	17,000	449,000	466,000
1966	50,000	175,000	225,000	12,000	206,000	218,000
1967	58,000	205,000	263,000	16,000	275,000	291,000
1968	30,000	260,000	290,000	12,000	179,000	191,000
1969	40,000	199,000	239,000	14,000	208,000	222,000
1970	69,000	246,000	315,000	14,000	222,000	236,000
1971	43,000	116,000	159,000	25,000	221,000	246,000
1972	40,000	120,000	160,000	20,000	135,000	155,000
1973	39,000	179,000	218,000	24,000	207,000	231,000
1974	27,000	277,000	304,000	20,000	302,000	322,000
1975	48,000	176,000	224,000	12,000	282,000	294,000
1976	58,000	224,000	282,000	18,000	254,000	272,000
1977 ^{2/}	53,000	190,000	243,000	17,000	251,000	268,000
Totals	611,000	2,840,000	3,451,000	237,000	3,672,000	3,909,000
[Averages]	44,000	203,000	247,000	17,000	262,000	279,000

^{1/} Includes small numbers of other salmon species.

^{2/} Preliminary catches.

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF COMMERCIAL FISHERIES

1987
YUKON AREA
SALMON REPORT

to the
Board of Fisheries
November 1987

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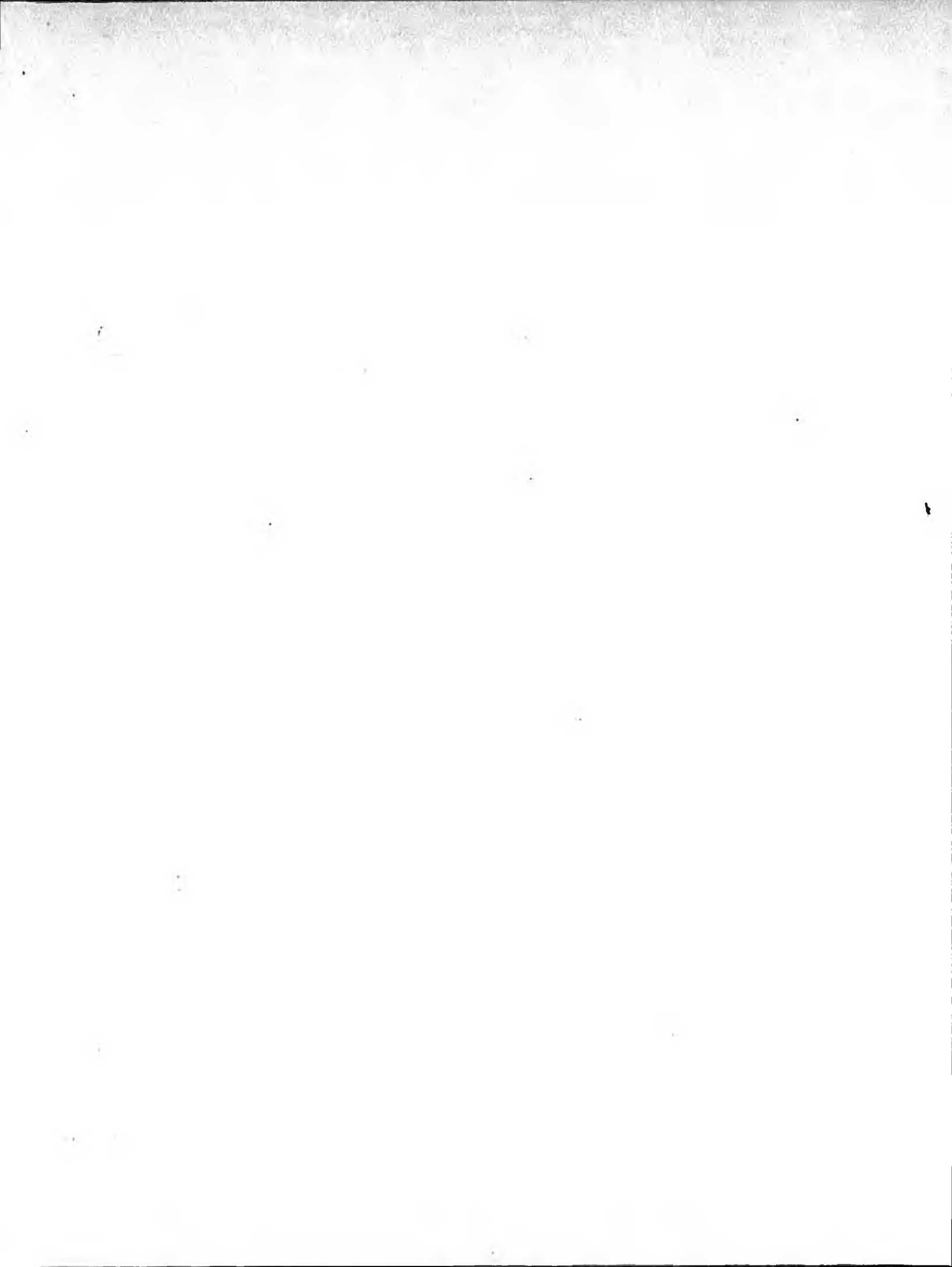


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BACKGROUND

Area Boundaries and Legal Gear

The Yukon area includes all waters of the Yukon River drainage in Alaska and coastal waters from Canal Point light near Cape Stephens to the Naskonat Peninsula. For management purposes, the area is divided into six districts and 10 subdistricts (Figure 1). Commercial and subsistence fishing occurs along the 1,200 mile length of the Yukon River (in Alaska) and in the lower 220 miles of the Tanana River. The Lower Yukon area (Districts 1, 2, and 3) includes the coastal waters of the area and that portion of the drainage from the mouth to Old Paradise Village (river mile 301). The Upper Yukon area (Districts 4, 5 and 6) is that portion of the drainage upstream of Old Paradise Village to the US/Canada border, including the Tanana River drainage. Commercial and subsistence fishing additionally occurs in Canada, with fishery management activities conducted by Canadian Department of Fisheries and Oceans (DFO). Annual Yukon River drainage salmon harvests have exceeded 1.1 million fish since 1974 (Tables 1-5).

Legal commercial fishing gear consists of set and drift gill nets in the lower Yukon area and fishwheels and set gill nets in the upper Yukon area. Open skiffs powered by outboard motors are used to operate the fishing gear and to deliver fish to tenders or shore based buying stations. Subsistence gear commonly used to capture salmon include gill nets and fishwheels.

Management Considerations

The overall objective of the Department's research and management program is to manage the various salmon runs for optimum sustained yield.

Subsistence has been designated by the legislature (State Law 151) as the highest priority among beneficial uses of fish and game resources. Except in areas where intensive commercial fisheries occur, the subsistence fishery is subject to few restrictions in order to give preference to subsistence users. The majority of Yukon River fishermen usually take salmon for both commercial and subsistence purposes in major commercial fishing areas. Therefore, in order to enforce commercial fishing regulations, it is necessary to place some restrictions on the subsistence fishery. For example, during the commercial salmon fishing season in most areas, subsistence fishing is allowed only during the open commercial fishing periods. During the course of the year, however, substantially more subsistence fishing time is allowed than commercial fishing time.

Management is made difficult by the character of salmon runs, the nature of the various fisheries (for example, the rapid evolution of the lower Yukon set net fishery into a drift net fishery), and the river itself. Since most of the commercial fisheries have only developed or expanded in recent years, there is a lack of adequate escapement and return data on which to fully evaluate the effects of increased commercial harvests. The various Alaska fisheries, which are scattered over 1,400 river miles, harvest mixed stocks usually several weeks and hundreds of miles from their spawning grounds. Because the Yukon River commercial fisheries harvest mixed stocks, some tributary populations may be under- or overharvested in relation to their actual abundance. For example, in a mixed-stock fishery, where it is impossible to manage each stock separately, some small spawning populations may be reduced to very low levels or even eliminated.

Research projects are underway and additional studies are planned, once additional funding becomes available, to obtain the biological information necessary for better management of the

salmon runs. The current projects include: (1) chinook and fall chum salmon stock separation studies using scale pattern analysis and electrophoretic techniques, (2) side-scanning sonar and tower counting to obtain accurate daily and seasonal escapement estimates in important tributaries (Anvik, Andreafsky, and Sheenjek Rivers), and (3) main river sonar study (near Pilot Station) to obtain estimates of total Yukon River salmon abundance.

Management of the Yukon River commercial salmon fishery must be conservative because of the difficulty in determining run size, harvesting of mixed stocks, increased effort and efficiency of the commercial fleet, allocation problems, and the need to provide for upriver escapements and subsistence requirements. Important management techniques in addition to utilizing guideline harvest ranges include establishing gill net mesh-size restrictions, weekly fishing periods, and season closures. If it becomes apparent during the fishing season (based on analysis of commercial and test fish catch data and hydroacoustic abundance estimates) that the run is substantially smaller or larger than needed for escapement and subsistence requirements, commercial fishing time is adjusted through the use of emergency order or, less frequently, emergency regulation authority.

Status of Fishery, Stocks, and Management Strategies

All five species of Pacific salmon occur in the Yukon River, with chum salmon being the most abundant, followed by chinook, coho, pink, and sockeye salmon. Commercial salmon fishing (for chinook salmon) of the Yukon River dates back to 1918, but the multi-species salmon fishery did not become fully developed until the mid-1970's. In the Alaskan portion of the Yukon River for the period 1982-1986, the average commercial salmon harvest was 1.0 million fish and 200,000 lbs roe (Table 2). The harvest of male summer chum salmon taken incidental to the roe directed fishery

is not included in this total. The average subsistence harvest 1982-1986 was 508,000 fish (Table 3).

Approximately 800 commercial fishermen (665 in the 3 lower districts) and 20 processors participate in the fishery. The ex-vessel value of the commercial salmon catch has averaged \$6.6 million for the period 1982-1986. Approximately 1,000 fishing families from 37 communities with a total population of nearly 9,000 (not including the greater Fairbanks area) harvest salmon for subsistence utilization within the Yukon River drainage in Alaska.

Salmon run timing into the Yukon River is quite variable. Chinook salmon generally begin entering the river during late May or early June in response to spring weather conditions. By early to mid-June the summer chum salmon migration is in progress. The chinook salmon migration has usually passed through the lower river by the first week of July, being of short duration, while summer chum salmon are usually present in the lower river in significant numbers through the middle of July. Fall chum salmon generally begin entry into the river by the middle of July and are present into September. Coho salmon generally begin entry into the river by the end of the first week of August and entry continues well into September.

Initiation of the commercial salmon fishery in the lower Yukon area occurs by emergency order in response to run timing, generally 5-15 June. A guideline harvest range of 60,000-120,000 chinook salmon has been established for Districts 1 and 2 and 1,800-2,200 for District 3. Harvests toward the mid-point of the guideline harvest ranges should be expected if the run is of average magnitude. No summer chum salmon guideline harvest range has been established. The commercial fishery is only opened after it has been determined (by monitoring test fishing and subsistence catches) that a sustained migration of chinook salmon

is occurring and that the early portion of the run has passed through the lower river. Generally, initial fishing periods have occurred on a twice weekly, 24-hour period schedule utilizing unrestricted mesh size gill nets directed toward the harvest of chinook salmon. During the 1986 season the first commercial period was directed toward the harvest of summer chum salmon due to an early and strong return. Prior to the 1985 season it was only on achievement of the chinook salmon harvest goal that mesh size restrictions were implemented to direct the harvest toward summer chum salmon. Since 1985, during years of high summer chum salmon abundance and early run timing, restricted mesh size periods have been implemented to harvest available summer chum salmon prior to the end of the chinook salmon directed fishery. Management of the summer chum salmon fishery is greatly dependent on action taken toward chinook salmon since both species exhibit similar run timing.

In the upper Yukon area (districts 4-6) commercial salmon fishing begins 15 June by regulation. Individual chinook salmon guideline harvest ranges are in effect for each district with a combined harvest range of 5,550-6,950 fish. Fishing generally occurs twice weekly during 48-hour fishing periods.

The fall chum and coho salmon fishing season is established by emergency order. Fall chum salmon harvest levels are governed by guideline harvest ranges in the lower Yukon area (0-110,000 fish) and by combined fall chum and coho salmon guideline harvest levels in the upper Yukon area (0-50,250 fish). No coho salmon guideline harvest level is in effect in the lower Yukon area. Harvest levels are dependent on management action taken toward fall chum salmon. In each district, fishing frequency and duration is dependent on the Department's perception of the strength of the fall chum salmon return.

Chinook Salmon

Chinook salmon spawning populations are widely distributed throughout the Alaskan and Canadian portions of the Yukon River drainage. Major spawning streams include the Andreafsky, Anvik, Nulato, Salcha and Chena Rivers; in the Canadian portion of the drainage (Yukon Territory), important chinook salmon systems include the Big Salmon and Nisutlin Rivers.

Total utilization (subsistence and commercial catch combined) of chinook salmon in the Yukon River has increased during the recent 5-year period as compared to prior years. In Alaska for the period 1982-1986 total harvest (commercial and subsistence combined) averaged 169,000 fish, an increase of 7% compared to the previous 5-year average (1977-1981) of 157,000 fish (Tables 2 and 3). This increase was due to a 36% increase in subsistence catches from the 1977-1981 average as compared to the 1982-1986 average, while the average commercial catch during the same time periods were similar. In addition, during these same periods Canadian total utilization of chinook salmon has increased 72% (Table 4).

Information obtained from scale pattern analysis and tagging studies indicates that some chinook salmon stocks have undergone increased exploitation in recent years resulting in escapements which will not maintain sustained yield. These high exploitation rates are the result of excessive chinook salmon harvests during recent years on runs of average magnitude. Unusually large returns during 1979-1981 set a trend for high harvest levels. Beginning in 1982 run strength dropped but harvests remained high.

In general, chinook salmon escapement trends, (index stream escapements) from 1976 through 1981 were consistently above other

years (Table 6). Total utilization of the returns from these parent years have been in excess of that which can be sustained.

The Alaska Board of Fisheries has not addressed chinook salmon regulation proposals since November 1984. In response to increased commercial fishing fleet efficiency and increased utilization by subsistence fishermen, it has become increasingly necessary for the department to utilize emergency order authority to implement changes from traditional fishing schedules to allow for adequate spawning area escapements. It may become necessary to reduce commercial chinook salmon fishing time below that of recent years, or further increase the delay in opening the season to provide for adequate spawning area escapement and to allow for the subsistence use priority.

Summer Chum Salmon

Summer chum salmon are the more abundant of the two chum salmon runs that occur in the Yukon River. Summer chum salmon can be distinguished from fall chum salmon by the following characteristics: (1) earlier run timing (early June to mid-July in the lower river); (2) rapid maturation in fresh water, (3) smaller body size (6-7 lb), (4) greater population size, and (5) spawning occurs primarily in lower 600 miles of the drainage.

The Anvik River supports the largest spawning population; other important spawning areas include the Andrafsky, Nulato, Rodo, Salcha, and Hogatza River drainages. Although runs fluctuate greatly in abundance from year to year, Yukon River summer chum salmon stocks, with possible exceptions, have not experienced declining escapements (Table 7). Documented harvests and escapements during recent years show minimum run sizes ranging from 1.2 to 5.6 million fish.

Total utilization of summer chum salmon has averaged over a million fish annually (1977-1986). Average commercial related catches, including males taken during roe directed fisheries, decreased 4% during 1982-1986 as compared to those of 1977-1981, while subsistence catches increased 24% during the same time periods (Tables 2 and 3). Since 1978, due to relatively poor flesh quality of upriver summer chum salmon, a roe directed fishery has occurred primarily in sub-district 4A. The average roe harvest taken during 1982-1986 was 198,000 lbs, double the average harvest taken from 1978-1981.

The Alaska Board of Fisheries has not addressed summer chum salmon regulation proposals since November of 1984. At that time the Board endorsed a regulation to implement summer chum salmon directed fishing periods in the lower Yukon area by emergency order. This allows for harvest of summer chum salmon prior to termination of the directed chinook salmon season. This management strategy will be implemented during years summer chum salmon run strength is average or better in magnitude.

Fall Chum Salmon

Fall chum salmon have the following differentiating characteristics from summer chum salmon: (1) later run timing (mid-July to early September in the lower river), (2) larger size (7-9 lbs), robust body shape, and bright silvery appearance in the lower river, (3) smaller population size, and (4) spawning that occurs in the upper portions of the drainage in spring fed streams.

Major spawning areas are located in the Porcupine River drainage (Sheenjek River in Alaska and Fishing Branch River in Canada), Chandalar River in Alaska, Tanana River drainage in Alaska (Toklat River, Delta River, and mainstem Tanana upstream of

Fairbanks) and the upper Yukon River drainage in Canada (Kluane River and mainstem Yukon River). Spawning occurs during September through November.

Tagging studies conducted in the 1970's indicated Porcupine River and upper Yukon River fall chums are distinguished from Tanana River fall chums by their earlier run timing and their orientation along the north bank of the Yukon River in the Ruby area (mile 530-700), as opposed to the south bank orientation of Tanana drainage fall chums.

In the lower Yukon area the majority of the fall chum salmon is used for commercial purposes while in the upper Yukon area an increased proportion of fall chum salmon is utilized for subsistence. Increased total utilization (commercial and subsistence catch combined) of fall chum salmon in Alaska occurred through 1985. For the period 1981-1985 catches averaged 477,000 fish, an increase of 20% compared to the previous 5-year average (1975-1980) of 398,000 fish (Tables 2 and 3). This was due to an increase of 37% and 13% for subsistence and commercial fisheries, respectively, from the 1976-1980 average catch to the 1981-1985 average catch. During these same periods Canadian total utilization of Yukon River fall chum salmon increased 93% (Table 4).

There has been a serious decline in fall chum salmon escapements in recent years (especially 1982-1984) for most of the major spawning areas (Figure 2 and Table 8). Average escapement in the Sheenjek, Fishing Branch, Toklat, and Delta Rivers for the period 1982-1984 were 40%, 60%, 59%, and 25%, respectively, below escapement objectives.

In response to poor escapements in recent years, difficulties in assessing in-season run strength, and the increasing efficiency of the fleet, the Alaska Board of Fisheries has adopted several

regulatory restrictions beginning in 1983. Initially, these restrictions included a commercial fishery closure during late July in the lower Yukon area to protect the early portion of the run, establishment of a coastal "Set-Net-Only Area" which prohibited drift net operation, establishment of emergency order authority to implement fishing periods, and a reduction in commercial fishing time. For the 1986 season on a trial basis, and extended for the 1987 season by regulation, the Alaska Board of Fisheries established a more restrictive Fall Chum Salmon Management Plan. These regulations provided for fishery closures by date at the end of the summer season, emergency order authority to establish seasons and fishing periods, reduced guideline harvest ranges, reduced commercial fishing time, and provided for no commercial fishing unless the run was determined to be average or better in magnitude.

Coho Salmon

Coho salmon enter the river during August and early September. Escapement information is very limited. Comparative escapement information for this species is available only from the Tanana River drainage, where escapements appear to have been relatively stable during the last 10 years (Table 9). The Delta Clearwater River near Delta Junction supports the largest known population within the Yukon drainage.

The commercial harvest of coho salmon in the lower Yukon area is dependent upon the timing and duration of the fall chum season. Coho migration in the lower river peaks during mid to late August. Coho salmon are taken incidentally to the fall chum fishery in most districts, but in some years contribute substantially to the commercial and subsistence harvests. Commercial catches in the Yukon area during the period 1982-1986 have averaged approximately 47,500 coho salmon (Table 2). Approximately 35,000 cohos are also taken annually (recent 5-year average) for subsistence (Table 3).

1987 SEASON SUMMARY

Area Summary

In 1987 a total of 574,209 salmon was commercially harvested in Alaska. The catch was composed of 131,971 chinook, and 442,238 summer chum salmon (Table 5). Additionally, 122,259 lbs summer chum salmon roe was harvested. No commercial fishery was allowed for fall chum or coho salmon during 1987. The chinook salmon catch was 3% above the recent 5-year average (1982-1986), the summer salmon catch and roe harvest were 27% and 38%, respectively, below the recent 5-year average. The commercial harvest by Canada was 10,701 chinook salmon 3% below their recent 5-year average, and 40,000 fall chum salmon, 86% above their recent 5-year average (Table 4).

Yukon River fishermen in Alaska received an estimated \$7,161,500 for their catch, a 26% increase from the recent 5-year average. Ten buyer-processors operated in the lower Yukon area, and 17 buyer-processors and registered catcher-sellers operated in the upper Yukon area of Alaska.

In 1987, lower Yukon fishermen received an average price of \$1.98 per lb for chinook salmon, and \$0.48 per lb for summer chum salmon. Upper Yukon commercial fishermen received an estimated per-pound average price of \$0.79 for chinook salmon, \$0.19 for summer chum salmon, and \$2.22 for salmon roe.

Subsistence harvest survey information is still being compiled, but it is projected that the Alaskan catch will approximate 45,000 chinook salmon, 225,000 summer chum salmon, 175,000 fall chum salmon, and 35,000 coho salmon (Table 3).

Chinook Salmon

The lower Yukon River was generally free of ice 30 May. Chinook salmon migratory timing into the lower river appeared to be average. The lower river commercial fishery was opened by emergency order after approximately 9 days of increasing subsistence and test net catches in the lower river. The fishing season was opened on a staggered basis in lower river districts: 15 June in District 1, 17 June in District 2, and 21 June in District 3. A fishing schedule of two 24-hour periods per week was established with provisions incorporated to reduce fishing time if the catch exceeded a level beyond which run strength could support.

The first three periods in Districts 1 and 2 were allowed to occur as initially scheduled, after which the combined harvest for the two districts was approximately 83,000 chinook salmon. At that time it was determined that the chinook salmon return was above average in magnitude based on cumulative test net indices and hydroacoustic enumeration. Although the midpoint of the guideline harvest range had not been reached it was warranted to reduce the next fishing periods in Districts 1 and 2 from 24 hours in duration to 12 hours. This action was taken in consideration of the guideline harvest range, harvest to date, the harvest from scheduled fishing periods, and the anticipated incidental harvest of chinook salmon during subsequent restricted mesh size fishing periods. Following the fourth unrestricted mesh size fishing period in Districts 1 and 2 the combined chinook salmon harvest was 102,274 fish. Restrictions were then implemented to allow for the use of gill nets of 6-inch maximum mesh size to direct harvest toward summer chum salmon. Three additional commercial fishing periods of six to 24-hours in duration were allowed in both Districts 1 and 2 between 29 June and 10 July. An additional 21,827 chinook salmon were harvested

during these restricted mesh size periods, which was twice the recent 5-year average (1982-1986) for the same time period. The total District 1 and 2 catch was 121,101 fish, 3% above the upper end of the guideline harvest range and 4% above the recent 5-year average. Comparative test net catch data indicated that the 1987 chinook salmon return was most similar to the 1981 return from which 145,278 fish were harvested. During 1981 good spawning area escapements were documented throughout the Yukon River drainage.

In District 3 a total of three unrestricted mesh size fishing periods (two 24-hour, one 12-hour) and one restricted mesh size fishing period (24-hour) was allowed 21 June - 2 July. The initial delay in opening District 3 allowed the first segment of the chinook salmon return to pass through the district prior to commercial fishing. A total of 2,039 chinook salmon was harvested from District 3, which was approximately the midpoint of the guideline harvest range, and 23% below the recent 5-year average (1982-1986).

In Districts 4, 5, and 6, (upper Yukon area) the commercial fishing season opened as established by regulation. Fishery closures were established by emergency order authority except within one subdistrict (4A) of District 4 which closed by regulation on 1 August. Emergency order closures became effective on 1 August in the remainder of District 4 (subdistricts 4B and 4C), 11 July in a portion of District 5 (subdistricts 5A, 5B, and 5C), 20 July in the remainder of District 5 (subdistrict 5D), and 14 August in District 6. In District 6, commercial (21 July - 12 August) and subsistence (31 July - 7 August) fishing closures were implemented in response to harvest levels and spawning area escapement requirements. The subsistence closure affected that portion of the district from the mouth of the Chena River to the mouth of the Salcha River. The subsistence closure was in response to unexpectedly low

numbers of spawning chinook salmon documented by aerial surveys on 24 and 27 July. Additionally, department gill net and sport fish creel census data from the Salcha River indicated a weak Salcha River return.

The total upper Yukon area commercial chinook salmon harvest was 5,831 fish, slightly below the midpoint of the combined districts guideline harvest range (5,550-6,950) and 6% above the recent 5-year average (1982-1986). The harvest of chinook salmon in Districts 4 and 5 was 4,629 fish, 25% below the combined districts guideline harvest range (4,950-6,150) and 4% above the recent 5-year average (1982-1986).

In-season chinook salmon abundance indicators including lower river cumulative test net catches, sonar enumeration, districts 4 and 5 cumulative commercial harvests, and reported subsistence catches, identified a return of above average magnitude. However the strength of chinook salmon spawning escapements in 1987 was variable between spawning areas in the lower, middle, and upper portions of the Yukon River drainage. Spawning escapements were generally near or above objective levels in the lower Yukon River tributaries, and below objective in Tanana River tributaries and in Canadian spawning areas.

Spawning escapement survey counts of 3,281 chinook salmon for the West Fork Andreafsky River, 1,608 for the East Fork, and 1,179 for the Anvik River achieved the objectives for each of these spawning areas (Table 3). The West Fork count was the largest ever recorded, while a counting tower estimate of 2,011 chinook salmon was obtained for the East Fork. Counts of 1,128 chinook salmon for the North Fork and 493 for the South Fork of the Nulato River met the escapement objective of 500 fish for each fork. Historical survey data are sporadic for the Gisasa River, in the Koyukuk River drainage, but 731 chinook salmon were counted by aerial survey in 1987. Escapement objectives were not

achieved in the Chena and Salcha Rivers, the major producers in the Tanana River drainage, which had peak survey counts of 1,312 and 1,898 chinook salmon, respectively.

In contrast to the Alaska portion of the drainage but similar to 1986, chinook spawning escapements in Canadian Yukon tributaries were below desired levels. A total of 327 chinook was enumerated at the Whitehorse fishway which compared poorly with both the 1986 count of 541 and recent 5-year average of 669 fish (1982-1986). Aerial surveys of the principle index area of the Nisutlin River resulted in a peak count of 183 fish compared to the recent 5-year average of 595 chinook salmon.

Surveys of other Teslin tributaries (Morley, Wolf, and Swift Rivers) all indicated a poor escapement to this drainage. However, this trend was not consistently observed throughout other Canadian chinook salmon spawning streams. For example, aerial survey evaluation of the Big Salmon (1,121 fish) and Little Salmon Rivers (468 fish) were somewhat above average, and above the 1986 comparative data. In contrast the 1987 Big Salmon weir count of 998 was approximately one half the 1986 count. Approximately the same number of chinook salmon were seen in Tatchum Creek in 1987 (159 fish) compared to 1986.

Chinook salmon spawning escapement in the Canadian portion of the mainstem Yukon River was estimated at 21,500 fish (preliminary) based on DFO mark and recapture study. This is above recent estimates for 1985 (11,000 fish) and 1986 (17,000 fish), although it is about 40% below the midpoint of the interim spawning escapement objective (33,000-43,000).

Summer Chum Salmon

Summer chum salmon run strength was below average, with average migratory run timing. Summer chum salmon directed fishing

periods were implemented in the lower Yukon area after termination of the chinook salmon directed fishery. Three restricted mesh size fishing periods (6-inch maximum mesh size) were allowed in Districts 1 and 2 and a single period was allowed in District 3 between 29 June and 10 July. Due to below average summer chum salmon run strength, fishing period duration and frequency were significantly reduced from prior years. This was the first time in the history of the summer chum salmon fishery that fishing periods were reduced or eliminated. The lower Yukon area summer chum salmon harvest was 401,275 fish, 28% below the recent 5-year average (1982-1986) and the lowest since 1977.

The upper Yukon area summer chum salmon harvest was 40,963 fish and 122,259 lbs roe, 16% and 38% below the recent 5-year averages (1982-1986), respectively. In response to below average summer chum salmon run strength, commercial fishing restrictions implemented in Districts 4 and 6. Fishing time in District 4 reduced from two 48-hour periods per week to a single 48-hour period per week beginning 7 July and continuing through the of the season. Additionally, on achievement of the District chinook salmon commercial harvest guideline, the district closed with the closure extended in duration from recent years afford additional protection to summer chum salmon.

Summer chum salmon spawning escapements were below objective levels in 1987 (Table 7). The East Fork Andreafksy River tow count estimate of 45,221 summer chum salmon was 67% below the average of 135,400 fish since 1981. An aerial survey count of 35,535 summer chum salmon for the West Fork Andreafksy River was well below the objective of 116,000 fish. Sonar estimate of escapement of 455,876 summer chum salmon in the Anvik River was 6% below the escapement objective of 487,000 fish, and 27% below the 1972-1986 average of 628,000 fish. The aerial survey count of 11,257 summer chum salmon for the Nulato River (both forks and mainstem combined) was well below the objective of 53,000 fish

for the North Fork alone. Spawning escapement to the Salcha River was at the objective level based on an aerial survey count of 3,657 fish, but 34% below the 1982-1986 average.

Fall Chum and Coho Salmon

In anticipation of a poor return of fall chum salmon, regulation changes implemented for the 1986 season were again adopted for the 1987 season. This action provided for a conservative management plan consisting of decreased harvest guidelines, shorter fishing periods and a season closure. The fishing season closed 10 July in the lower Yukon area due to conservation measures taken during the summer chum salmon directed fishery. A continuation of the mid-season closure was necessary to afford increased protection to the early run segment of fall chum salmon and to assess run strength.

In-season evaluation of the 1987 return of fall chum salmon indicated that the return was not of sufficient magnitude to provide for a commercial fishery, although it would provide for achievement of spawning area escapement objectives and a subsistence harvest similar to prior years. Coho salmon, which exhibit later run timing, are generally taken incidental to the more abundant fall chum salmon. No commercial fishery was allowed for coho salmon since fall chum salmon run strength was determined to be at a level which would not allow incidental harvest. Run size evaluation techniques included lower Yukon test net cumulative catch rates, hydroacoustic evaluation, Ruby test fishwheel cumulative catch rates, and subsistence catch monitoring.

The early portion of the fall chum salmon migration was weak, with the first major pulse of salmon entering the river from 30 July to 1 August. The entry of fall chum salmon into the lower river remained fairly stable at low to moderate levels after this

time through the end of August. Evaluation of prior year test net catch data indicated that during recent years 40-60% of the fall chum salmon return had entered the lower river by 3 August. An in-season total return estimate was made on 4 August indicating the 1987 return was most similar to returns during which escapement objectives were not met. Although the 3 August test net catch was relatively good, catches dropped off 4 August and remained at low levels through 7 August. It was determined on 7 August, based on an assessment of the Main River sonar fish passage estimate, that the total Yukon River fall chum salmon return would be between 444,000-667,000 fish. A total fall chum salmon return toward the lower end of the range was considered to be the best estimate based on relative run timing information and the preseason projection. To insure achievement of spawning area escapement objectives and subsistence harvest levels similar to recent year averages, the decision was made and announced on 7 August that no further commercial salmon fishing would be allowed in the lower Yukon area during the 1987 season.

Ruby (river mile 594) test fishwheel catch data supported and reinforced the assessment of fall chum salmon run size obtained from the lower river. However, subsistence catch reports from District 5 fishermen indicated the run was of greater strength than determined by department programs. Given the Department's demonstrated tendency to overestimate run strength and the overriding need to satisfy spawning ground escapement requirements, a decision was made to allow no commercial harvest in Districts 4 and 5.

Fall chum salmon postseason escapement information indicates that the 1987 return was increased in abundance from years during which spawning area escapements were below objective (1982, 1984, and 1986) (Table 8). Escapements to the Delta, Toklat, Sheenjek, and Fishing Branch Rivers combined were 56% above the combined escapement objective for these systems. On an individual basis

the Sheenjek and Delta Rivers were more than double the escapement objective while the Toklat River escapement was 33% below objective. The Fishing Branch River escapement was 2% below the lower end of the objective range (50,000-120,000 fish). Fall chum salmon escapement into the Canadian portion of the mainstem Yukon River was estimated at 81,000 fish (preliminary) based on DFO mark and recapture study. This is above the 1985 estimate (59,000 fish), below the 1986 estimate (88,000 fish) and 10% below the lower end of the interim spawning escapement objective (90,000-135,000 fish).

Limited coho salmon escapement information is obtained annually. During 1987 aerial surveys of three spawning index areas were conducted, at the time of this report. Escapements were well above average in areas surveyed (Table 9).

OUTLOOK FOR 1988

Chinook Salmon

The majority of chinook salmon returning to the Yukon River are 6-year-old fish, however, 5- and 7-year-old fish make a significant contribution to the run. The 1982 brood year (6-year-olds in 1988) was judged average to below average in abundance as judged by comparative escapement information. Survival and production by the 1982 brood year is apparently below average based on preliminary findings of lower than normal contribution of 5-year-old fish to the 1987 return. It is expected that the 1988 return of 5-year-olds (1983 brood year) will be near average based on 1983 run strength and escapements. The return of 7-year-old fish (1981 year class) is expected to be above average as the return of this year class in 1986 as 5-year-olds and 1987 as 6-year-olds was above average. Overall, the 1988 chinook salmon run is anticipated to be below average in strength, similar in abundance and age structure to the 1986

return. The commercial harvest in Alaska is expected to total 70,000 to 100,000 fish.

Summer Chum Salmon

Yukon River summer chum salmon return primarily as 4-year-old fish, although substantial 5-year-old returns often result from good brood survival years. The return of 4-year-old fish in 1988 will be dependent on production from the 1984 brood year and survival of the resulting cohort. Based on available catch and limited escapement data, the magnitude of the 1984 summer chum run was judged above average in abundance. The return of 5-year-olds in 1988 is expected to be below average in strength based on the poor return of 4-year-old fish in 1987. In summary, based on evaluation of brood year run size data and assuming average survival, it is expected that the Yukon River summer chum salmon return in 1988 will be average to above average in magnitude. The commercial harvest is expected to be similar to the recent 5-year average (600,000 fish and 190,000 lbs roe).

$\approx \sim 300K \text{ fish} \therefore TH = 900K$

Fall Chum Salmon

Similar to the summer run, fall chum salmon return primarily as 4-year-old fish. Escapements in 1984 (which will produce 4-year-olds in 1988) were below average. The return of 5-year-olds (1983 brood year) is expected to be average to below average based on the number of 4-year-olds in 1987. In summary, based on evaluation of brood year escapements and assuming average survival, a below average return of fall chum salmon is expected in 1988. A projection of the fall chum salmon return, based on an estimate of total parent year escapements, the average maturity schedule and expected returns per spawner, indicates a limited commercial fishery may be allowed during 1988. The commercial harvest in Alaska is expected to total 0-80,000 fish.

Coho Salmon

Coho salmon return primarily as 4-year-old fish. Comprehensive escapement information for coho salmon is lacking, but escapement surveys in the Tanana River system indicated above average run strength in 1984. The proportion of 3-year-old fish in 1987 test fish catch samples further suggests the 1988 return of coho salmon will be above average in magnitude. The commercial harvest in Alaska will be dependent on the timing and frequency of fishing periods allowed for fall chum salmon, but is expected to be 0-50,000 fish.

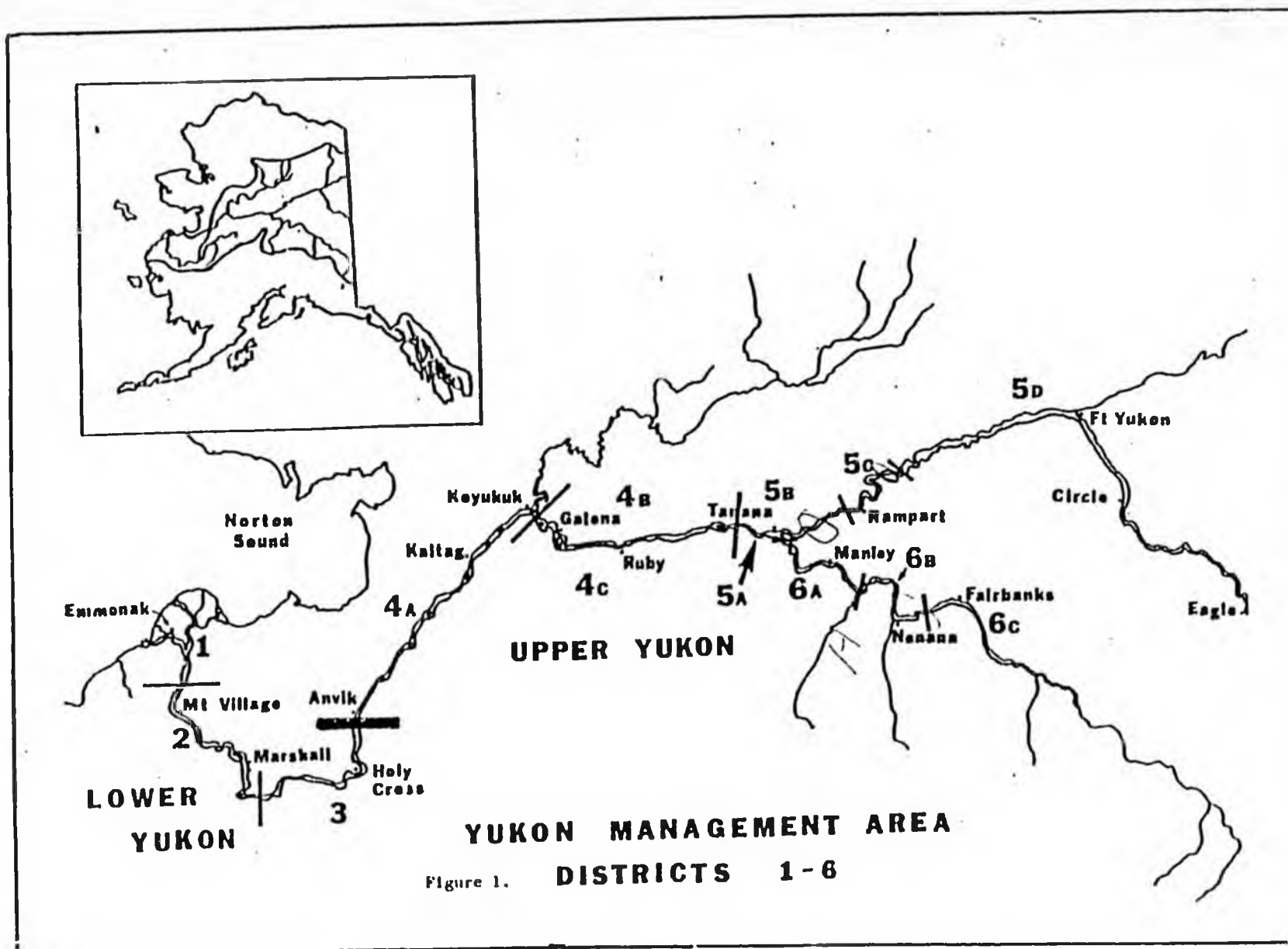


Figure 1. YUKON MANAGEMENT AREA
DISTRICTS 1-6

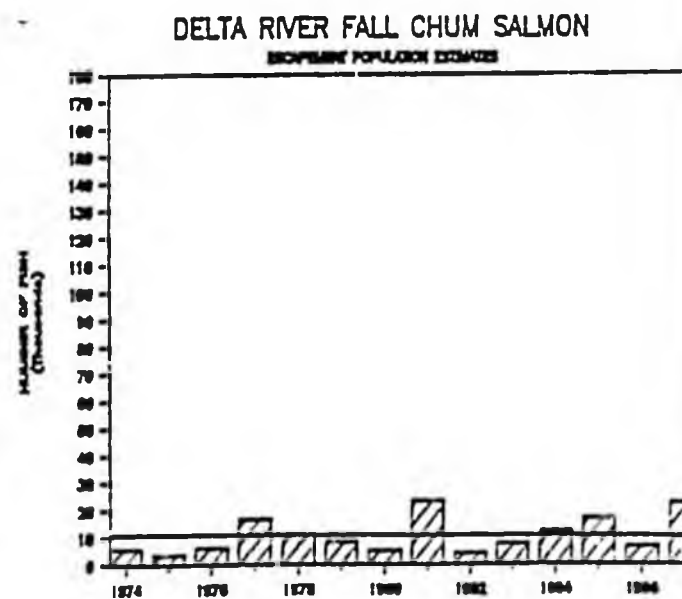
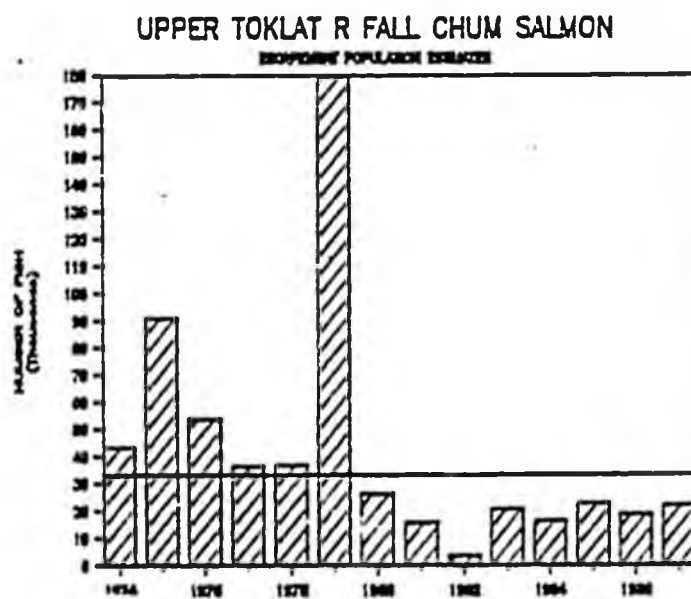
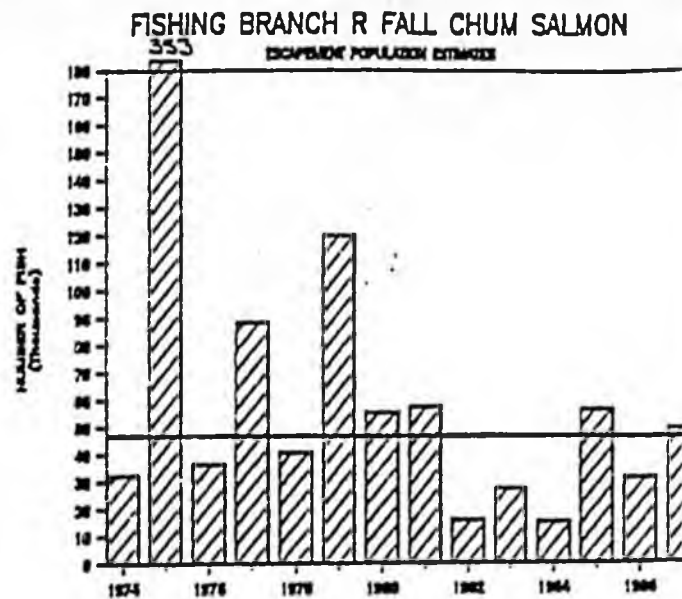
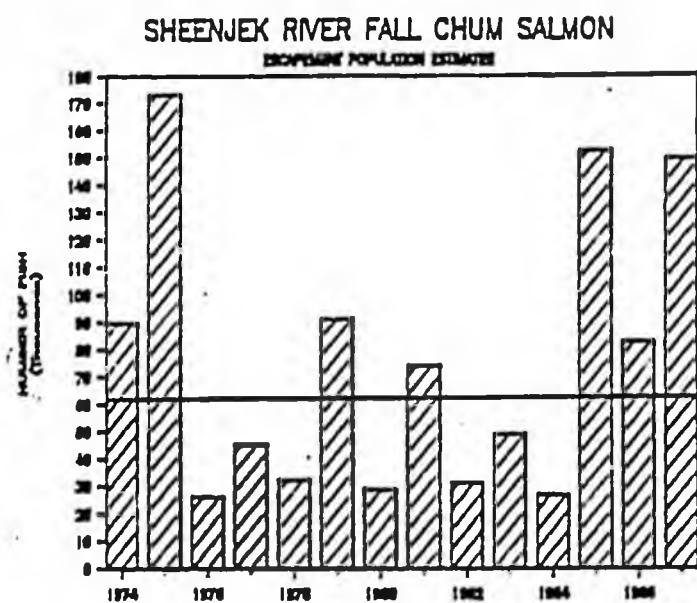


Figure 2. Fall chum salmon expanded escapement population estimates for four selected Yukon River spawning areas, 1974-1987.

Table 1. Total utilization (Alaska and Canada) of Yukon River salmon, 1961-1987.

Year	Chinook	Summer Chum a	Fall Chum a,b	Coho a,b	Total
1961	154,398	305,317	144,233	12,047	615,995
1962	119,781	261,856	140,401	32,456	554,494
1963	151,987	297,094	99,031	33,271	581,383
1964	117,226	361,080	128,707	14,633	621,646
1965	140,086	336,848	135,600	12,139	624,673
1966	109,339	154,508	122,548	32,446	418,841
1967	151,254	217,168	107,018	28,211	503,651
1968	123,674	148,350	97,552	24,916	394,492
1969	107,651	218,157	183,373	22,869	532,050
1970	97,682	303,510	265,096	17,154	683,442
1971	142,638	271,577	246,756	29,115	690,086
1972	118,827	243,674	188,178	29,765	580,444
1973	104,192	446,521	285,760	46,877	883,350
1974	123,684	817,703	383,552	28,423	1,353,362
1975	82,883	922,183	361,600	23,254	1,389,920
1976	110,607	787,766	228,717	10,425	1,137,515
1977	121,865	694,377	340,757	55,196	1,212,195
1978	135,346	1,266,283	340,816	33,949	1,776,394
1979	169,053	1,010,820	615,377	26,959	1,822,209
1980	219,255	1,288,284	488,305	28,903	2,024,747
1981	205,517	1,397,330	677,257	44,908	2,325,012
1982	168,710	839,238	373,175	73,070	1,454,193
1983	216,040	1,144,649	525,018	37,215	1,922,922
1984	178,827	1,040,299	412,322	130,960	1,762,408
1985	204,960	1,091,757	515,481	89,936	1,902,134
1986	165,316	1,371,250	318,312	81,725	1,936,603
1987 c	194,172	800,000	219,500	35,000	1,248,672
5 Yr Avg 1977-81	170,207	1,131,419	492,502	37,983	1,832,111
5 Yr Avg 1982-86	186,771	1,097,439	428,862	82,581	1,795,652

a Alaskan subsistence catches estimated for 1961-1976 since catches of salmon other than chinook salmon were not differentiated by species until 1977.

b Minimum estimates for 1961-1978 because subsistence surveys were typically conducted well before the end of the fishing season.

c Preliminary estimates.

Table 2. Alaskan commercial catch of Yukon River salmon, 1961-1987. a

Year	Chinook	Summer Chum		Fall Chum		Coho	Total	
		Numbers	Roe	Numbers	Roe		Numbers	Roe
1961	119,664	-	-	42,461	-	2,855	164,980	-
1962	94,734	-	-	53,116	-	22,926	170,776	-
1963	117,048	-	-	0	-	5,572	122,620	-
1964	93,587	-	-	8,347	-	2,446	104,380	-
1965	118,098	-	-	23,317	-	350	141,765	-
1966	93,315	-	-	71,045	-	19,254	183,614	-
1967	129,656	10,935	-	38,274	-	11,047	189,912	-
1968	106,526	14,470	-	52,925	-	13,303	187,224	-
1969	91,027	61,966	-	131,310	-	15,093	299,396	-
1970	79,145	137,006	-	209,595	-	13,188	438,934	-
1971	110,507	100,090	-	189,594	-	12,203	412,394	-
1972	92,840	135,668	-	152,176	-	22,233	402,917	-
1973	75,353	285,509	-	232,090	-	36,641	629,593	-
1974	98,089	589,892	-	289,776	-	16,777	994,534	-
1975	63,838	710,295	-	275,009	-	2,546	1,051,688	-
1976	87,776	600,894	-	156,390	-	5,184	850,244	-
1977	96,757	534,875	-	257,986	-	38,863	928,481	-
1978	99,168	1,052,226	25,761	236,383	10,628	26,152	1,413,929	36,389
1979	127,673	779,316	40,217	359,946	18,466	17,165	1,284,100	58,683
1980	153,985	928,609	139,106	293,430	5,020	8,745	1,384,769	144,126
1981	158,018	1,006,938	189,068	466,451	11,285	23,680	1,655,087	200,353
1982	123,644	461,403	152,819	224,187	805	37,176	846,410	153,624
1983	147,910	744,879	149,999	302,598	5,064	13,320	1,208,707	155,063
1984	119,904	588,597	167,224	208,232	2,328	81,940	998,673	169,552
1985	146,188	516,597	248,625	267,744	2,525	57,672	988,601	251,150
1986	99,970	721,469	271,691	139,442	577	47,255	1,008,136	272,268
1987	131,971	442,238	122,259	0	0	0	574,209	122,259

5 Yr Avg								
1982-86	127,523	606,669	198,072	228,441	2,260	47,473	1,010,105	200,331

5 Yr Avg								
1982-86	122,028	557,574	0	172,991	0	40,295	892,888	0

5 Yr Avg								
1982-86	5,495	49,095	198,072	55,450	2,260	7,178	117,218	200,331

a Catches reported in numbers of fish sold in the round and pounds of unprocessed roe.

Table 3. Alaskan subsistence catch of Yukon River salmon, 1961-1987.

Year	Chinook	Summer Chum a	Fall Chum a,b	Coho a,b	Total
1961	21,488	305,317	101,772	9,192	437,769
1962	11,110	261,856	87,285	9,480	369,731
1963	24,862	297,094	99,031	27,699	448,686
1964	16,231	361,080	120,360	12,187	509,858
1965	16,608	336,848	112,283	11,789	477,528
1966	11,572	154,508	51,503	13,192	230,775
1967	16,448	206,233	68,744	17,164	308,589
1968	12,106	133,880	44,627	11,613	202,226
1969	14,000	156,191	52,063	7,776	230,030
1970	13,874	166,504	55,501	3,966	239,845
1971	25,684	171,487	57,162	16,912	271,245
1972	20,258	108,006	36,002	7,532	171,798
1973	24,317	161,012	53,670	10,236	249,235
1974	19,964	227,811	93,776	11,646	353,197
1975	13,045	211,888	86,591	20,708	332,232
1976	17,806	186,872	72,327	5,241	282,246
1977	17,581	159,502	82,771	16,333	276,187
1978	30,297	197,137	94,867	7,797	330,098
1979	31,005	196,187	233,347	9,794	470,333
1980	42,724	272,398	172,657	20,158	507,937
1981	29,690	208,284	188,525	21,228	447,727
1982	28,158	260,969	132,897	35,894	457,918
1983	49,478	240,386	192,930	23,895	506,689
1984	42,428	230,747	174,823	49,020	497,018
1985	39,771	264,828	206,472	32,264	543,335
1986	45,282	290,888	164,034	34,470	534,674
1987 c	45,000	225,000	175,000	35,000	480,000
5 Yr Avg 1982-86 Alaska	41,023	257,564	174,231	35,109	507,927
5 Yr Avg 1982-86 Lower Yukon	14,019	59,187	23,303	13,536	110,045
5 Yr Avg 1982-86 Upper Yukon	27,004	198,377	150,928	21,573	397,882

- a Catches estimated for 1961-1976 since catches of salmon other than chinook salmon were not differentiated by species until 1977.
- b Minimum estimates for 1961-1978 because surveys were typically conducted well before the end of the fishing season.
- c Preliminary estimates.

Table 4. Canadian catch of Yukon River chinook and fall chum salmon, 1961-1987.

Year	Chinook			Fall Chum		
	Commercial	Non-Commercial a	Total	Commercial	Non-Commercial a,b	Total
1961	3,446	9,800	13,246	3,276	5,800	9,076
1962	4,037	9,900	13,937	936	8,500	9,436
1963	2,283	7,794	10,077	2,196	25,500	27,696
1964	3,208	4,200	7,408	1,929	10,258	12,187
1965	2,265	3,115	5,380	2,071	9,718	11,789
1966	1,942	2,510	4,452	3,157	10,035	13,192
1967	2,187	2,963	5,150	3,343	13,618	16,961
1968	2,212	2,830	5,042	453	11,180	11,633
1969	1,640	984	2,624	2,279	5,497	7,776
1970	2,611	2,052	4,663	2,479	1,232	3,711
1971	3,178	3,269	6,447	1,761	15,150	16,911
1972	1,769	3,960	5,729	2,532	5,000	7,532
1973	2,199	2,323	4,522	2,806	7,329	10,135
1974	1,808	3,823	5,631	2,544	9,102	11,646
1975	3,000	3,000	6,000	2,500	18,100	20,600
1976	3,500	1,525	5,025	1,000	4,200	5,200
1977	4,720	2,807	7,527	3,990	8,489	12,479
1978	2,975	2,906	5,881	3,356	6,210	9,566
1979	6,175	4,200	10,375	9,084	13,000	22,084
1980	9,500	13,046	22,546	9,000	13,218	22,218
1981	8,593	9,216	17,809	15,260	7,021	22,281
1982	8,640	8,268	16,908	11,312	4,779	16,091
1983	13,027	5,625	18,652	25,990	3,500	29,490
1984	9,885	6,610	16,495	22,932	6,335	29,267
1985	12,573	6,428	19,001	35,746	5,519	41,265
1986	10,797	9,267	20,064	11,464	3,372	14,836
1987 c	10,701	6,500	17,201	40,000	4,500	44,500
5 Yr Avg 1982-86	10,984	7,240	18,224	21,489	4,701	26,190

a Indian Food Fish and Domestic fisheries combined.

b Includes small numbers of coho salmon taken at Old Crow.

c Preliminary estimates.

Table 5. Alaskan commercial catch of Yukon River salmon in 1987.

District Subdist.	No. of Fishermen	Chinook	Summer Chum		Fall Chum		Coho	Total Salmon	
			Numbers	Roe (lbs) a	Numbers	Roe (lbs)		Numbers	Roe (lbs)
1	440	76,643	222,898	0	0	0	0	299,541	0
2	239	47,458	174,876	0	0	0	0	222,334	0
Subtotal	655	124,101	397,774	0	0	0	0	521,875	0
3	13	2,039	3,501	0	0	0	0	5,540	0
Total Lower Yukon	659	126,140	401,275	0	0	0	0	527,415	0
4 A	67	91	29,314	110,977	0	0	0	29,405	110,977
4 B,C	29	1,433	677	10,497	0	0	0	2,110	10,497
Subtotal	--	-----	-----	-----	--	--	--	-----	-----
District 4	87	1,524	29,991	121,474 b	0	0	0	31,515	121,474
5 A,B,C	27	2,539	362	44	0	0	0	2,901	44
5 D	3	566	0	0	0	0	0	566	0
Subtotal	--	-----	-----	-----	--	--	--	-----	-----
District 5	30	3,105	362	44	0	0	0	3,467	44
6	25	1,202	10,610	741	0	0	0	11,812	741
Total Upper Yukon	141	5,831	40,963	122,259	0	0	0	46,794	122,259
Total Yukon Area	800	131,971	442,238	122,259	0	0	0	574,209	122,259

a May include small amount of chinook salmon roe.

b 121,474 lbs of roe equals 121,474 females (1 lb roe/female). Including males not sold, it is estimated that 209,800 summer chum salmon were harvested during roe directed fishery.

1.7

Table 6. Chinook salmon escapement counts for selected spawning areas in the Yukon River drainage, 1959-1987. a

Year	Andreafsky		Anvik		Nulato	Chena	Salcha	Big Salmon	Nisutlin	Whitehorse Fishway	Canada Mainstem Tagging
	E. Fork	W. Fork	Aerial	Tower							
1959	-	-	-	-	-	-	-	-	-	1,054	-
1960	1,020	1,220	1,950	-	756	132 d	1,660	-	-	660	-
1961	1,003	-	1,226	-	543 d	-	2,878	-	-	1,068	-
1962	675 d	762 d	-	-	-	-	937	-	-	1,500	-
1963	-	-	-	-	-	137 d	-	-	-	484	-
1964	867	705	-	-	-	-	450	-	-	587	-
1965	-	355 d	650 d	-	-	-	408	-	-	903	-
1966	361	303	638	-	-	-	800	-	-	563	-
1967	-	276	336 d	-	-	-	-	-	-	533	-
1968	380	383	310 d	-	-	-	739	827 d	407	414	-
1969	231 d	274 d	296 d	-	-	-	461 d	286 d	105 d	334	-
1970	665	574 d	368	-	-	-	1,882	670	615	625	-
1971	1,904	1,682	-	-	-	193 d,e	158 d	200 d	650	856	-
1972	798	582 d	-	1,198	-	138 d,e	1,193	560	237	391	-
1973	825	788	-	613	-	21 d	391	75 d	36 d	224	-
1974	-	285	-	471 d	78 d	1,035 e	1,857	70 d	150 d	273	-
1975	993	301	-	730	204	316 e	1,055	153 d	239	313	-
1976	818	643	-	1,154	648	531	1,641	86 d	102	121	-
1977	2,008	1,499	-	1,371	487 d	563	1,202	316 d	77 d	277	-
1978	2,487	1,062	-	1,324	920	1,726	3,499	524	375	725	-
1979	1,180	1,134	-	1,484	1,507	1,159 d	4,789	632	713	1,184	-
1980	958 d	1,500	1,330	-	1,323 d	2,541	6,757	1,568	975	1,383	-
1981	2,146 d	231 d	807 d	-	791 d	600 d	1,237 d	2,411	1,626	1,539	-
1982	1,274	851 d	-	-	-	2,073	2,534	757	578	473	20,200
1983	-	-	653 d	-	1,006	2,553	1,961	540	701	905	29,500
1984	1,573 d	1,993	641 d	-	-	501	1,031	1,044	832	1,042	-
1985	1,617	2,248	1,051	-	2,780	2,553	2,035	801	409	536	10,800
1986	1,954	3,158	1,118	-	2,974	2,031 d	3,368	745	459 d	541	17,500
1987	2,011 d,f	3,281	1,179	-	1,638	1,312 d	1,898	1,121	183	327	21,500 g

- a Data obtained by aerial survey unless otherwise noted. Only peak counts are listed.
- b Big Salmon Lake - Souch Cr.
- c Sidney Cr. - 100 Mile Cr.
- d Incomplete survey and/or poor survey timing or conditions resulted in minimal or inaccurate count.
- e Boat survey.
- f Tower count.
- g Preliminary estimate.

Table 7. Summer chum salmon escapement counts for selected spawning areas in the Yukon River drainage, 1973-1987. a

Year	Andreafsky			Anvik				
	E. Fork		W. Fork	Tower and Aerial	Sonar	Nulato	Hogatza	Salcha
	Aerial	Sonar						
1973	10,149 b	-	51,835	86,665 b	-	-	-	-
1974	3,215 b	-	33,578	201,277	-	51,160	-	3,510
1975	223,485	-	235,954	845,485	-	138,495	22,355	7,573
1976	105,347	-	118,420	406,166	-	40,001 b	20,744	6,474
1977	112,722	-	63,120	262,854	-	69,660	10,734	677 b
1978	127,050	-	57,321	251,339	-	54,480	5,102	5,405
1979	66,471	-	43,391	-	280,537	37,104	14,221	3,060
1980	36,823 b	-	115,457	-	492,676	14,946 b	19,786	4,140
1981	81,555	147,312	-	-	1,479,582	14,348 b	-	8,500
1982	7,501 b	181,352	7,267 b	-	444,581	-	4,984 b	3,756
1983	-	110,608	-	-	362,912	21,012 b	28,141	716 b
1984	95,200 b	70,125	238,565	-	891,028	-	-	9,810
1985	66,146	-	52,750	-	1,080,243	29,838	22,566	3,178
1986	83,931	167,614 c	99,373	-	1,189,602	64,265	-	8,028
1987	-	45,221 c	35,535	-	455,876	11,257	5,669 b	3,657

a Data obtained by aerial survey unless otherwise noted. Only peak counts are listed.
 b Incomplete survey and/or poor survey timing or conditions resulted in minimal or inaccurate count.
 c Tower count.

Table 8. Fall chum salmon escapement estimates for selected spawning areas in the Yukon River drainage, 1974-1987. a

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987 s
TANANA RIVER DRAINAGE														
Upper Toklat River b	34,310	42,418 c	35,190 d	21,800 c	35,000	96,550 d	23,054	13,907	3,309 e	15,105 e	15,861	21,824 d	12,708 d	18,000 d
Lower Toklat River		35,867 c	(2,000) d			64,540	(2,140)							
Upper Tanana River														
Benchmark #735 Slough	1,450 c		336	1,270	1,705 c	2,714	1,900 e	22,168 c,e,g	3,433 e	7,230 e	12,327 e	11,093	6,703 h	20,464 h
Delia River	1,010	3,734 h	6,312 h	16,876 h	10,051 c	8,125	4,637					17,276 h		
South Bank Tanana I	1,840 f		1,197	3,767	5,700	20,820	3,744				3,150 c	975 c	1,610 c	
Bluff Cabin Slough	1,840 f	5,000 c,d	1,197	6,491	5,340	6,875	3,190		1,156 e	12,715 e	4,017 e	2,555 c	3,458 e	9,400 e
One Mile Slough	1,235	745 d	1,552	1,900	475	3,850 c	885 c	6,120		1,115 c	560 c	365 c	1,949	
Subtotal	16,102	9,479 j	16,376	30,334	23,271	42,384	14,056	36,358	4,589 j	22,410 j	19,054 j	22,365	13,720 j	j
Total Tanana Index	50,412	87,764 j	51,566	52,134	58,271	203,474	37,110	50,265	7,898 j	37,515 j	34,915 j	44,189	26,428	
PORCUPINE RIVER DRAINAGE														
Sheenjek River	40,507	78,060	11,866	20,506	14,610 c	41,140	13,027	74,560 k	31,421 k	49,392 k	27,130 k	152,763 k	83,197 k	150,000 k
Fishing Branch River (YT)	31,525 l	353,282 l	13,450	32,500	15,000	44,000	20,319 c	10,549 j	5,846	10,000	5,570	56,016 l	31,173 l,q	49,000 l,q
Total Porcupine River	72,032 m	431,342 m	25,316	53,006	29,610	85,220	33,346	85,109 m	37,267 m	59,392 m	32,700 m	208,784 m	114,370 m	199,000 m
UPPER YUKON TRIBUTARIES														
Chandalar River	17,455	6,345 c,l	58 c,j	4,183								2,535 o	59,313 o,k	49,400 o,k
Siyeh River (YT)	350 j	362 e,f	20 f	3,555			2,607	4,906 n,j	1,145 n	1,378 e		7,538	16,686	12,000
Yukon River (YT) p		7,671			0 f	4,640 e	3,150	25,606	1,020	7,560 u,j	7,200	10,760	825	6,000
MAINTENANCE YUKON CANADA (tagging)									34,000 r	89,000 r		59,000 r	80,000 r	80,500 r

a Data are peak aerial survey estimates rated fair to good unless otherwise indicated.
 b Includes following areas: Toklat River in vicinity of Knight's Roadhouse; Sushana River; Celger Creek. Lower Toklat River counts are included in Total Tanana River Index for years 1975 and 1979.
 c Poor survey.
 d Combined aerial and ground surveys.
 e Ground surveys.
 f Survey rating not given.
 g Peak aerial count was 10,664.
 h Population estimate based upon replicate ground surveys.
 i Richardson Highway to Blue Creek.
 j Incomplete, partial survey of index area(s).
 k Hendrix side scan sonar estimate. (for Sheenjek River -- includes expansion for uninsonified mid-river zone).
 l Weir counts.
 m Figure includes sonar or weir estimate and is not comparable on a year to year basis.
 n Fair to poor survey rating.
 o USFS estimates.
 p Vicinity of Ft. Selkirk to Carmacks.
 q Preliminary figure.
 r Estimated total escapement to Canada (excluding Porcupine R.) from DFO tagging project.
 s Preliminary estimates.

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Table 9. Coho salmon escapement counts for selected spawning areas in the Yukon River drainage, 1972-1987. a

Year	Nenana River Drainage				Subtotal	Delta	Clearwater	Richardson
	Lost Slough	Clear Creek	Wood Creek b	17 Mile Slough		Clearwater River d,e	Lake and Outlet	Clearwater River
1972	-	-	-	-	-	632	417	454 g
1973	-	-	-	-	-	3,322	551 d	375 d
1974	1,388	-	-	27	1,415	3,954	560	652 d
1975	943	-	-	956	1,899	5,100	1,575 d,e	4 g
1976	118	13	-	281	412	1,920	1,500 d,e	80 g
1977	524	-	310 c	1,167	2,001	4,793	730 d,e	327
1978	350	-	300 c	466	816	4,798	570 d,e	-
1979	227	-	-	1,987	2,214	8,970	1,015 d,e	372
1980	499	-	1,603 c	592	1,091	3,946	1,545 d,e	611
1981	274	-	849 h	1,005	2,128	8,563 f	459 g	550
1982	-	-	1,436 h	-	1,436	8,365 f	-	-
1983	766	-	1,044 h	103	1,913	8,019 f	253	88
1984	2,677	2,600 b,e	8,805 h	-	14,082	11,061	1,368	428
1985	1,584	-	3,775 h	2,081	7,440	5,358	750	-
1986	794	-	-	218 g	1,012	10,857	3,577	146 g
1987 i	2,511	-	-	3,802	-	22,000	-	-

- a Only peak counts presented. Survey rating is fair-good unless indicated otherwise.
 b Surveyed by F.R.E.D.
 c Foot survey.
 d Surveyed by Sport Fish.
 e Boat survey.
 f Population estimate.
 g Poor survey.
 h Weir count.
 i Preliminary estimates (surveys still underway).

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James D. Smith	PO 6053, IAD	99760	479-6939	
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Irene Nichols	Tanana	99777 366 7160		
DON BECK	Box 294 NENANA	99760 832-5495		✓
Bill Caldwell	763 Hl. Ave FAI 99701	452-5181		✓
Sherril Remyan	Rt. 1 Nenana	99760		✓
MARCUS S. BULTZ	Bx 190965, Anchorage	99519 274-7707		✓
James D. Ritt	Bx 26 Nenana	832-5224		✓
Jack Irwin	Box 303 NENANA	852-5288		✓
A.P. McDonald	MIKE 3135 PAPH5	NO		✓
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Ted Suckin	NENANA	99760	832-5638	✓
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Lina Minano	Box 112 Nenana	" 132-5675		✓
Walter Dyer Taylor	1625 Cottonwood ST	456-4846		✓
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Jack Tomlin	"	"		
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Elaine Selas	minto	99758		
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Charlot Sheekster	Clear P.O. Box 40068	99704		
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PERCY DUYCK SR	NIENANA, AK	99760 832-5824		
X BILL FLIRIS	TENANINA, AK	99777 366-7245		
M. A. H. H.	...			
X HENRY R. KEIZLER SR	NIENANA - KANTISHNA RIVER			
X Mary Wilder M.	mtu village	99734		
X Babe Cooper	Marshall	99585 679-6325		
Dave Stevens	Nenana Box 38	99760 832-5431		
Virgil L. Umphenout	878 Lynwood Way North Pole 99705	488-3885		
Bernhard Rupprecht	Front St	99760 832-5697		
Paul George	Nenana			
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An Overview of
Yukon River Salmon Fisheries
Issues

March 15, 1987

Prepared by
Alaska Department of Fish and Game
Division of Commercial Fisheries
Director: Kenneth Parker
1255 W. 8th Street
Juneau, Alaska

I. ISSUE: Potential conservation concerns for Yukon chinook salmon.

Chinook salmon spawning populations are widely distributed throughout the Alaskan and Canadian portions of the Yukon River drainage. Total utilization (subsistence and commercial catch combined) of chinook salmon in the Yukon River has increased during recent years. This increase is due to a combination of both larger subsistence catches and commercial harvests that have remained at high levels during recent years. Unusually large returns during the 1979 - 1981 period set a trend for high harvest levels. Beginning in 1982, run strength declined to intermediate levels but harvests have remained high. In addition, during this period of time total Canadian utilization increased by 72%.

Information obtained from scale pattern analysis and tagging studies indicates that some chinook salmon stocks (from both the middle and upper tributaries of the Yukon River) have undergone increased exploitation in recent years resulting in escapements which will not maintain sustained yields. These high

exploitation rates are the result of excessive chinook salmon harvests during years with runs of only average size. It may become necessary to reduce commercial chinook salmon fishing time below that allowed during recent years and/or further delay the opening of the commercial season to provide for adequate spawning escapements and to provide for subsistence harvests.

II. ISSUE: Reduced commercial harvests of Yukon chum salmon due to stock declines.

There are two distinct runs of chum salmon into the Yukon River including a summer run that enters the river prior to July 15 followed by a later fall run that enters after July 15. The size of the 1987 returns for both stocks were well below average which required a significant reduction in the amount of fishing time in order to achieve minimum escapement goals necessary to sustain runs into the future. The 1987 season was the first time in the history of the summer chum fishery that conservation measures had to be taken. Despite the restrictions, spawning escapements in most rivers were below objective levels. The outlook for the summer chum harvest in 1988 is more optimistic with an anticipated average to above average harvest.

The fall chum salmon return in 1987 was expected to be weak and a conservative management plan was readopted by the Board of Fisheries in anticipation of this poor return. The fall chum

salmon run was closely monitored during the season but there was no indication that the return was of sufficient magnitude to provide for a commercial fishery. The run was considered large enough, however, to provide for minimum spawning escapement objectives in a number of key spawning areas and to provide for needs of the subsistence fishery. Assessments of fall chum salmon escapements indicated an overall increase in abundance over the parent years that produced the 1987 return with escapements approaching or exceeding the lower end of the range of escapement objectives. Although the outlook for 1988 is encouraging with the possibility of a small commercial harvest if the return is at projected levels, the Board decided to extend a conservative management plan that has been in effect since 1986 until more average size returns can be established. Starting in 1989 and beyond a return to more average size runs of fall chums is expected.

III. ISSUE: Illegal subsistence roe sales.

During the December Board of Fisheries meeting, Division of Fish and Wildlife Protection (FWP) staff reported to the Board that they were currently investigating the possible harvest and illegal sale of a large number of chum and coho salmon and salmon roe from Districts 5 and 6 of the Yukon Area during 1987. The chum stocks involved are primarily fall chums which have been depressed during the last several years. No commercial fall chum

harvests were allowed in the U.S. portion of the Yukon during 1967. The majority of the fisherman under investigation are commercial fisherman who may have continued to fish during the commercial fall chum closures.

Large scale unreported harvests have several implications for both fisheries managers and the general public. A large unreported harvest may undermine the understanding of the fishery's dynamics needed for effective management. An accurate index of the number of salmon returning to spawning areas is required to assess the productivity of the run. In addition, the possible illegal removal of these fish from the population would deny legal fisherman the opportunity to utilize the resource by diminishing the size and value of future returns. Information uncovered during the investigation suggests that illegal harvest and sale may have been conducted annually since at least 1983.

Sale of roe from subsistence caught salmon was allowed in A-Y-K fisheries prior to 1977. Emergency regulations were adopted to legalize subsistence roe sales in 1974. Legislative action legalized the sale of subsistence roe in 1975 and 1976; however, the statute sunseted January 1, 1977. In addition to concerns about reported waste, sale of subsistence roe resulted in increased harvest levels of salmon resources. The legislature took no action to reauthorize subsistence roe sales during its

1977 session.

IV. ISSUE: The Department lacks the data collection capability in the upper Yukon River districts to assess inseason run strength.

Concern has been expressed by area legislators and commercial fisherman about the lack of reliable inseason stock assessment programs on the Yukon River and particularly the upper river districts. Major challenges to fisheries management along the river are the immense size of the drainage, the number of stocks, and the lack of adequate assessment at key points where fisheries are concentrated. After the salmon runs have passed Pilot Station at river mile 120, where the department operates a sonar counting project, no quantitative assessment occurs until the runs reach parent spawning streams, with the exception of a test fishwheel stationed on the north bank near Ruby for fall chum salmon monitoring. The Tanana River confluence is 580 miles from Pilot Station, a distance that requires about 23 days for salmon to negotiate. The department stations one seasonal fisheries technician at Galena to monitor salmon catches and collect biological samples from catches and runs and a test fish wheel is operated at Ruby to provide an index of fall chum abundance. Obviously the department's program to assess mainstem run strength above the lower Yukon is scanty at best, and relies primarily upon fisheries harvest statistics to provide

comparisons between years.

The two areas of greatest management concern and conservation risk in the upper Yukon River area at the present time are in the mainstem above the confluence of the Tanana River and within the Tanana River itself. The inability to accurately gauge the strength and timing of the salmon runs as they move into the upper Yukon districts has greatly impeded the ability of the department to optimize harvests and provide adequate escapements.

Several program enhancements could meaningfully address these concerns. A sonar enumeration project to count salmon escapements to the Tanana River would cost approximately \$210,000 the first year, including one-time equipment costs, and roughly \$120,000 during subsequent years to operate the project. Although an improved assessment program on the Tanana River would be a higher priority a similar investment would provide a sonar counting station on the mainstem Yukon above its confluence with the Tanana. Another option which would provide improved run assessment and commercial fishery monitoring capabilities on the Tanana River similar to projects currently operated in Galena and Ruby would cost approximately \$40,000 per year.

Unfortunately, when these projects were considered in the FY 89 budget priorities, they were considered high priorities but could not be included within the Department's budget ceiling.

Hopefully, these programs will be implemented in future budget years.

V. ISSUE: U.S.\Canada negotiations have reached a critical impasse.

During the latter stages of negotiations over the Pacific Salmon Treaty, Canada attempted to include the Yukon River under the transboundary river discussions. The State of Alaska's position, supported by the U.S. government, was that Yukon issues should be addressed in separate negotiations owing to the uniqueness of the fishery and lack of public representation from the Yukon during the negotiation of the Pacific Salmon Treaty. The U.S. position was largely sustained as the treaty, signed in March 1985, contains no specific management regime or harvest allocation requirements for the Yukon River. The treaty does make general reference to the Yukon River by requiring that negotiations begin in 1985 and that coordinated management and research plans be developed as well as an organizational structure to begin dealing with the issues.

Since April 1985, U.S. and Canadian delegations have met during one briefing session and five full negotiation sessions. Sharp differences in the positions held by each country have been identified during the negotiations. Canada continues to argue that these negotiations and any subsequent agreement be

incorporated within the framework and principles of the existing treaty. The U.S. position supports the concept of independent negotiations.

During the 1987 season, in-season chinook salmon abundance indicators including lower river cumulative test net catches, sonar enumeration, districts 4 and 5 cumulative commercial harvests, and reported subsistence catches, indicated a return of above average magnitude. The total Alaskan commercial harvest was only slightly (3%) over the recent five year average. The Canadian commercial harvest was approximately 3% below their recent years average. Spawning escapements were generally above minimum objective levels in the lower Yukon tributaries, and near objective levels in the Tanana River, and below objectives in Canadian spawning tributaries. Emergency commercial closures in Canada were implemented to meet the needs of the Indian food fishery and escapement. Strong protests from the Canadian government were registered with the U.S. State Department and the State of Alaska concerning alleged overharvests by Alaskan fisheries.

In-season evaluation of the 1987 return of fall chum salmon indicated that the return was not of sufficient magnitude to provide for a commercial fishery in Alaska, although it would provide for achievement of spawning area escapement objectives in most major spawning systems and a subsistence harvest similar to

prior years. Postseason spawning escapement information indicates that the 1987 return was increased in abundance from years during which spawning area escapements were below objective. Conservation measures taken during the 1987 were believed to be successful in continuing the rebuilding of fall chum stocks.

While the commercial fishery was closed in the Alaskan Yukon, Canadian commercial fisherman caught a record number of fall chum (25% increase from recent years average). The Alaska Board of Fisheries during their December meeting expressed grave concerns regarding the apparent disregard of the Canadian government for fall chum conservation. The members of the Board wanted the Canadian government to realize that they could not continue to ask Alaskan fisherman to make these sacrifices when the Canadian fisheries use this situation to reallocate harvests at the expense of escapements.

The Canadian negotiating team pressed the U.S. delegation to agree to meet in December. However the U.S. delegates stated that continuing to have two negotiations sessions per year did not appear profitable. Consequently, no meeting was held and the next negotiation session is scheduled for Whitehorse during the week of March 21-25. The expected focus of these negotiations will be the Joint Technical Committee (J.T.C.) reports on harvest management strategies, identification of depressed stocks, and

run rebuilding and enhancement strategies.

Although little progress has been made toward a negotiated settlement a major benefit of the negotiations has been the formation of the J.T.C. composed of fisheries scientists from both nations. The work of the committee is resulting in the exchange of important fishery data and a better understanding of salmon conservation requirements.

STEVE COWPER, GOVERNOR

DEPARTMENT OF FISH AND GAME

OFFICE OF THE COMMISSIONER

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January 13, 1988

JAN 19 1988

The Honorable Jack Coghill
Alaska State Legislature
P. O. Box V
Juneau, AK 99811

Dear Senator Coghill:

Mr. Fred Anderson of our Commercial Fisheries office in Fairbanks advised me of your concern about the Yukon and Tanana Rivers salmon fisheries and, in particular, your expression of interest in possibly helping the Alaska Department of Fish and Game (ADF&G) acquire sonar equipment to better manage those fisheries.

As you know, the Yukon and Tanana Rivers salmon fisheries are among the most complex in the state. Many stock entering the mouth of the Yukon River migrate 1,200 to 1,600 miles or more to their spawning streams and in the process are exposed to the possibility of harvest for 50 days or more. The mixed stock nature of the fishery presents the likelihood of over or underharvesting individual stocks in relation to their actual abundance.

Our most serious problem in managing the Yukon River salmon fishery continues to be our inability to accurately assess run strength on an in-season basis, particularly with fall chum and coho salmon. Reasonably accurate run strength assessment is required to allow commercial and subsistence harvests at optimum levels and yet provide adequate numbers of fish for spawning.

Initial assessment of run size is made using comparative catch data collected at ADF&G test-gillnet sites operated on the south, middle and north mouths of the river in District 1. Comparability of these data, however, can be adversely affected by varying water levels, the presence of debris, the effect of net saturation, and by year to year variability of migration routes in the Delta area. The other component of our test fishing program is a leased fishwheel which we operate on the north bank of the Yukon

River at approximately mile 600. Admittedly, these are rather crude measures of run strength and have been the major source of error in our judgment of relative run size. In addition to the test fishery projects, we also estimate total run size by means of a sonar operated near Pilot Station at river mile 123. Recently (1986 and 1987), the project has produced very promising results for increasing our ability to manage the fishery on the river.

Sonar as a means of estimating escapement was first used on the sockeye salmon rivers on the Kenai Peninsula. Sockeye salmon migrate very close to the shoreline in these rivers and thus counters were designed with short ranges. Today, escapement information from these counters is used exclusively to manage these rivers. The short range of these counters precluded their use in large rivers such as the Yukon and Kuskokwim. The department began experimenting with methods for use in large rivers in 1982. The results have culminated in the successful project at Pilot Station. We are satisfied that the application is producing reliable counts yet some difficulties in dealing with transducer positioning on the unstable banks and bottoms exist. We are confident that this problem will be overcome and that this project will become the single most important data source for decisions affecting in-season management of the Yukon River salmon fishery.

The department has also recently completed evaluation of a method capable of discriminating size of salmon with a new type of sonar called dual beam sonar. Successful enumeration of chinook salmon on the Kenai River using this method has been completed in 1986 and 1987. Although successful on the Kenai River, this method is limited by the size difference between the species being enumerated and by the amount of acoustical noise in the water. Thus successful implementation of this method depends on the individual river and situation. It should be noted that even if size discrimination is unsuccessful, the method still produces estimates of escapement and species allocation can be accomplished with gillnets. This type of system will be tested on the Kuskokwim River near Bethel in 1988.

Current cost estimates for a sonar project on a large river are as follows:

1. \$132.0 to \$188.0 (dual beam system) for sonar gear,
2. \$40.0 for boats, motors, tents, gillnets, etc., and
3. \$25.0 per month field operational costs.

Please bear in mind that these are rough cost projections which are subject to revision based on site location.

The Honorable
Jack Coghill

-3-

January 13, 1988

The coincidental/overlapping run timing of upper Yukon and Tanana Rivers salmon stocks would require acquisition of two sets of equipment in order to enumerate salmon runs in both areas. Given the probability that funding will not be made available to purchase and operate this equipment in both the upper Yukon and Tanana Rivers, our choice would be the Tanana River.

I hope this information has been helpful. Please feel free to contact me if you have additional questions or comment.

Sincerely,



Don W. Collinsworth
Commissioner

YUKON RIVER COMMERCIAL SALMON QUOTAS

Districts 1, 2, and 3: chums(fall), 0 to 110,000

Districts 1 and 2: king salmon, 60,000 to 120,000

District 3: king salmon, 1,800 to 2,200

District 4: king salmon, 2,250 to 2,850
fall chums and cohos combined, 0 to 20,000

Subdistricts 5A, B, and C: king salmon, 2,400 to 2,800
fall chums and cohos combined, 0 to
18,000

Subdistrict 5D: king salmon, 300 to 500
fall chums and cohos combined, 0 to 2,000

Subdistrict 6: king salmon, 600 to 800
fall chums and cohos combined, 0 to 10,250

Totals: kings, 67,350 to 129,150
fall chums and cohos combined, 0 to 160,250

FISHERY ISSUES: ARCTIC-YUKON-KUSKOKWIM REGION

AYK REGIONAL ISSUES

ISSUE: False Pass and high seas interceptions of salmon of AYK and western Alaska origin

Comments: The interception of salmon of western Alaskan origin in both domestic and foreign fisheries has been a longstanding issue for AYK fishermen. With regard to the False Pass fishery, a tagging study was undertaken during 1987 and although the analysis of the data is still in progress, a preliminary report was presented to the Board of Fisheries during their December meeting. Preliminary results reveal the presence of stocks of salmon from systems throughout the North Pacific and Bering Sea, including stocks of Asian origin. A final report on the findings will be available at a later date. No tag recoveries were reported from fall chum on the Yukon River. An unexpectedly large number of tagged chum salmon were recovered from the Kuskokwim Area. Although no funding presently exists, AYK fishermen have requested that funding be provided to continue the tagging studies for an additional year. The Board of Fisheries was scheduled to consider a wide range of proposals during their December meeting dealing with the management of the 1988 False Pass fishery, but they were unable to complete their agenda and have postponed these discussions until their March meeting.

With regard to high seas interception fisheries, the International North Pacific Fisheries Commission is the body responsible for their regulation. While considerable progress has been made to reduce these interceptions over the years, salmon of western Alaskan origin are still being taken in unacceptably large numbers.

YUKON RIVER SALMON

ISSUE: Illegal subsistence roe sales

Comments: During the December Board of Fisheries meeting, the Division of Fish and Wildlife Protection staff reported to the board that they were currently investigating the possible harvest and illegal sale of approximately 82,000 pounds of chum and coho roe and 30,000 chum and coho salmon from Districts 5 and 6 of the Yukon Area during 1987. The chum stocks involved are thought to primarily be fall chums which have been depressed during the last several years. No commercial fall chum harvests were allowed in the U.S. portion of the Yukon during 1987. The majority of the fisherman under investigation are commercial fisherman who may have continued to fish during the

commercial fall chum closures. It is estimated that the sale of 92,000 pounds of roe required the harvest of approximately 160,000 - 170,000 fish. It is not known how many of these fish may be accounted for in subsistence harvest estimates.

If these allegations are substantiated, unreported harvest on this scale can have several implications for fisheries management and the public. The potential size of the unreported harvest may undermine the understanding of the fishery's dynamics needed for effective management. An accurate index of the number of salmon returning to spawning areas is required to assess the productivity of the run. In addition, the possible illegal removal of these fish from the population would deny legal fisherman the opportunity to utilize the resource by diminishing the size and value of future returns. Information uncovered during the investigation suggests that illegal harvest and sale may have been conducted annually since 1983.

This issue may be addressed by the Legislature by the introduction of a bill which would authorize the sale of subsistence-caught roe. Sale of roe from subsistence-caught salmon was allowed in A-Y-K fisheries prior to 1977. Emergency regulations were employed to authorize subsistence roe sales in 1974. Legislative action legalized the sale of subsistence roe in 1975 and 1976; however, the statute sunsetted January 1, 1977. In addition to concerns about reported waste, legal sale of subsistence roe resulted in increased harvest levels of salmon resources. The Legislature took no action to reauthorize subsistence roe sales during its 1977 session.

ISSUE: Reduced commercial harvests of Yukon chum salmon due to stock declines

Comments: There are two distinct runs of chum salmon into the Yukon River, including a summer run that enters the river prior to July 15 followed by a later fall run that enters after July 15. The size of the 1987 returns for both stocks were well below average, which required a significant reduction in the amount of fishing time in order to achieve minimum escapement goals necessary to sustain runs into the future. The 1987 season was the first time in the history of the summer chum fishery that conservation measures had to be taken. Despite the restrictions, spawning escapements in most rivers were below objective levels. The outlook for the summer chum harvest in 1988 is more optimistic; an average to above average harvest is anticipated.

The fall chum salmon return in 1987 was expected to be weak, and a conservative management plan was readopted by the Board of Fisheries in anticipation of this poor return. The fall chum salmon run was closely monitored during the season, but there was no indication that the return was of sufficient magnitude to

provide for a commercial fishery. The run was considered large enough, however, to provide for minimum spawning escapement objectives in a number of key spawning areas and to provide for needs of the subsistence fishery. Assessments of fall chum salmon escapements indicated an overall increase in abundance over the parent years that produced the 1987 return, with escapements approaching or exceeding the lower end of the range of escapement objectives. Although the outlook for 1988 is encouraging, with the possibility of a small commercial harvest if the return is at projected levels, the Board decided not to modify its conservation oriented plan until more average size returns can be established. Starting in 1989 and beyond, a return to more average size runs of fall chums is expected.

ISSUE: Potential conservation concerns for Yukon chinook salmon

Comments: Chinook salmon spawning populations are widely distributed throughout the Alaskan and Canadian portions of the Yukon River drainage. Total utilization (subsistence and commercial catch combined) of chinook salmon in the Yukon River has increased during recent years. This increase is due to an increase in subsistence catches, while commercial catches have remained at high levels. Unusually large returns during the 1979 - 1981 period set a trend for high harvest levels. Beginning in 1982, run strength declined, but harvests have remained high. In addition, during this period of time total Canadian utilization increased by 72%.

Information obtained from scale pattern analysis and tagging studies indicates that some chinook salmon stocks (primarily of Canadian origin) have undergone increased exploitation in recent years, resulting in escapements which will not maintain sustained yields. These high exploitation rates are the result of excessive chinook salmon harvests during years with runs of only average size. It may become necessary to reduce commercial chinook salmon fishing time below that allowed during recent years and/or further increase the delay in opening the season to provide for adequate spawning escapements and to allow for subsistence harvests.

ISSUE: The department lacks the data collection capability in the upper Yukon River districts to assess in-season run strength.

Comments: Concern has been expressed by area legislators and commercial fisherman about the lack of reliable in-season stock assessment programs on the Yukon River and particularly the upper river districts. Major challenges to fisheries management along the river are the immense size of the drainage, the number of stocks, and the lack of adequate assessment at key points where fisheries are concentrated. After

the salmon runs have passed Pilot Station at river mile 120, where the department operates a sonar counting project, no quantitative assessment occurs until the runs reach parent spawning streams, with the exception of a test fishwheel stationed on the north bank near Ruby for fall chum salmon monitoring. The Tanana River confluence is 580 miles from Pilot Station, a distance that requires about 23 days for salmon to negotiate. The department stations one seasonal fisheries technician at Galena to monitor salmon catches and collect biological samples from catches, and runs the test wheel at Ruby for a fall chum abundance index. Obviously the department's program to assess mainstem run strength above the lower Yukon is scanty at best and relies primarily upon fisheries harvest statistics to provide comparisons between years.

The two areas of greatest management concern and conservation risk in the upper Yukon River area at the present time are in the mainstem above the confluence of the Tanana River and within the Tanana River itself. The inability to accurately gauge the strength and timing of the salmon runs as they move into the upper Yukon districts has greatly impeded the ability of the department to optimize harvests and provide adequate escapements.

Several program enhancements could meaningfully address these concerns. A sonar enumeration project to count salmon escapements to the Tanana River would cost approximately \$210.0 the first year, including one-time equipment costs, and roughly \$90.0 during subsequent years to operate the project. A similar investment would provide a sonar counting station on the main stem Yukon above the confluence of the Tanana. Another option which would provide more qualitative assessments of run strength above the Tanana similar to what is presently being done in the Ruby and Galena area (described above) would cost approximately \$40.0 per year.

Unfortunately, when these projects were considered in the FY 89 budget priorities, they were considered high priorities but could not be included within the department's budget ceiling.

FRED 1987 ANNUAL REPORT
TO THE ALASKA STATE LEGISLATURE

Edited by

Johnny S. Holland, Ph.D.

Number 81

Alaska Department of Fish and Game
Division of Fisheries Rehabilitation,
Enhancement and Development

Don W. Collinsworth
Commissioner

Brian J. Allee, Ph.D.
Director

P. O. Box 3-2000
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January 1988

Fishpasses, including the Frazer River pass and those on Afognak Island, contributed sockeye and pink salmon to the commercial fisheries of the area, as well as a limited number of coho and chinook salmon.

Russell Creek Hatchery had a broodstock escapement of 35,000 chum salmon; however, evaluation of the fishery contribution was not funded. Returns to the Russell Creek Hatchery in 1987 were not expected to be great because of construction problems and remodeling efforts.

Kodiak and Alaska Peninsula Releases

Again in 1987, Kitoi Bay Hatchery released more juvenile salmonids than any other state facility. The release of 90 million pink salmon fry, while lower than in 1986, is still enough fish to continue Kitoi Bay's release record. In addition to the pink salmon released, Kitoi Bay released chum and coho salmon and rainbow trout. No fish were released from Russell Creek Hatchery in 1987 because reconstruction and high-water conditions precluded egg takes in 1986.

With five years of returns to the Upper Thumb River of over 20,000 spawners, that project was closed during 1987; no fish were released.

Kodiak and Alaska Peninsula Egg Takes

The hatchery crew at Kitoi Bay Hatchery took over 97.4 million pink salmon eggs and over 6 million chum salmon eggs in 1987. With this egg take, the broodstock development for chum salmon continues to increase. In addition to pink and chum salmon eggs taken for release at the hatchery, over 600,000 coho salmon eggs were taken to continue sport fish stocking projects in the Kodiak area.

ARCTIC-YUKON-KUSKOKWIM

Summary of FRED Projects

The FRED Division maintains an area office in Fairbanks and two fish hatcheries in the Arctic-Yukon-Kuskokwim (AYK) area. Clear Hatchery is located on the Tanana River south of Fairbanks, and Sikusuilaq Hatchery is located on the Noatak River north of Kotzebue (Figure 6). Clear Hatchery will be producing coho salmon, grayling, Arctic char, and rainbow and lake trout for commercial, subsistence, and sport fisheries in the Interior. Chum and chinook salmon programs have been lost to budget cuts. The Clear Air Force Base site for this facility was chosen primarily because the waste-heated water allows a flexible rearing program. Sikusuilaq Hatchery is the northernmost hatchery in the

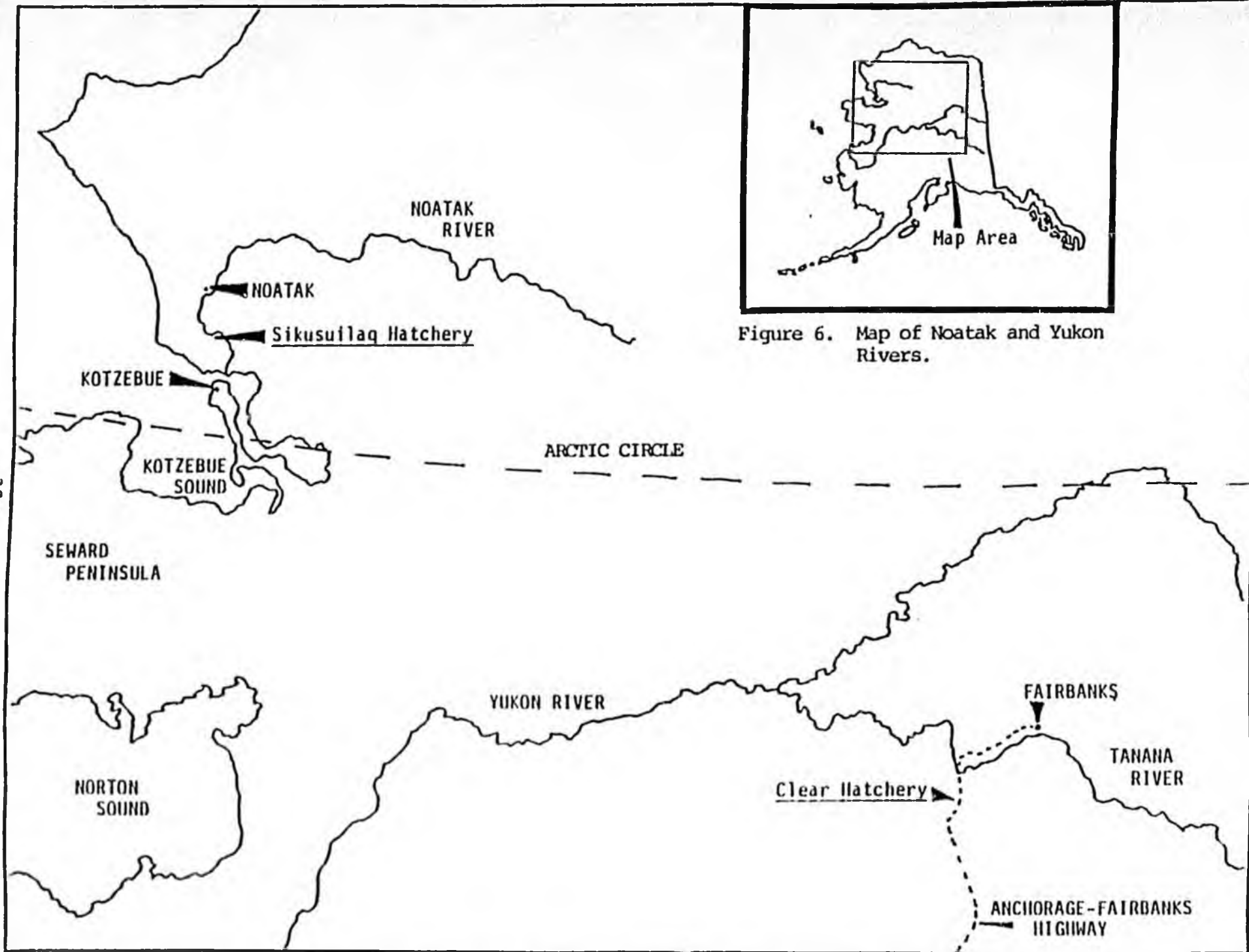


Figure 6. Map of Noatak and Yukon Rivers.

United States. It was developed in 1980 to test the feasibility of enhancement hatcheries in extreme conditions and to contribute chum salmon to the Kotzebue Sound commercial and subsistence fisheries. It was designed to handle 2 million chum salmon eggs, but has since proven to have enough water for approximately 40 million eggs. Additional incubators and outside rearing tanks were added in 1987 to allow egg takes and fry rearing of up to 10 million.

Arctic-Yukon-Kuskokwim Highlights

- Clear Hatchery personnel took lake trout eggs for the first time in 1987.
- Returns of chum salmon to Clear Hatchery indicated a continuing marine survival average of around 1%.
- Approximately 146,000 8-gram chinook salmon and 560,000 coho salmon were released from Clear Hatchery this year. The average size for chinook salmon was twice as large as previous releases in an attempt to increase survival.
- Approximately 5% of the commercially intercepted chum salmon in the Kotzebue Sound fishery were produced by Sikusuilaq Hatchery. The excellent hatchery return was in marked contrast to the record low return of wild stocks.
- More than half the chum salmon eggs taken into Sikusuilaq this year were from hatchery returns.

Arctic-Yukon-Kuskokwim Returns and Fishery Contributions

A very significant return of 8,750 chum salmon returned to the Sikusuilaq Hatchery in 1987; of these, 5,540 were harvested in commercial fisheries, while an additional 1,770 were taken in personal-use fisheries (Table 1). The significance of this return is increased because the natural stocks suffered a record low return to this area. This return and the proven availability of sufficient water and technology was the basis for a decision to increase the capacity of the Sikusuilaq Hatchery. Coho and chinook salmon returns to Clear Hatchery were less than anticipated in 1987. Chum salmon returns indicated a continuing marine survival of about 1%; in line with past returns and expected 1987 returns.

Arctic-Yukon-Kuskokwim Releases

In 1987, Clear Hatchery released 6 species totaling over 4.7 million juveniles. Over 2.5 million of those were grayling fry that were planted in over 50 sites throughout southcentral and interior Alaska. Clear Hatchery personnel also planted 1,060,000 rainbow trout, 248,000 sheefish, 4,150 char, and 300,000 coho

salmon in numerous lakes in the region. For a complete listing of the stocking location, see Appendix B. Releases of chinook and coho salmon were also made at Clear Hatchery. At the Sikusuilaq Hatchery, 1.4 million chum salmon fry were released into the Noatak River.

Arctic-Yukon-Kuskokwim Egg Takes

Over 9.6 million eggs were taken by the two facilities in this area (Table 3). At Clear Hatchery, over 5 million eggs were taken from five species, including the first lake trout eggs. Sikusuilaq Hatchery began its new development phase by taking over 4.1 million chum salmon eggs, doubling its original design capacity.

Table 1. Estimated contribution of fish by FRED hatcheries and projects in 1987.

Hatchery or Project	Species	Commercial Catch	Sport A/ Catch	Brood Stock/ Escapement	Total	Comments
SOUTHEAST REGION						
Bakewell	coho	150	--	100	250	Fishpass near Ketchikan. A/
Beaver Falls	chum	700	--	--	700	Hatchery near Ketchikan.
Chilkat Ponds	coho	1,000	--	250	1,250	Habitat improvement project near Haines. A/
Crystal Lake	chinook	9,100	1,200	6,300	16,600	Hatchery near Petersburg
	coho	4,500	20	2,967	7,487	
	chum	350	--	280	630	
	steelhead	--	--	122	122	
Chuser Creek	chinook	--	--	--		Remote release site near Petersburg. A/
Irish Creek	coho	2,500	--	2,500	5,000	Fishpass near Petersburg. A/
Deer Mountain	chinook	95	200	550	845	Hatchery in Ketchikan.
Fish Creek-Hyder	chum	35,000	--	40,000	75,000	Cooperative spawning channel project with USFS. Catch based on escapement.
Hidden Falls	chinook	400	120	115	635	Hatchery on the east side of Baranof Island.
	chum	456,000	--	87,000	543,000	
Ketchikan Creek	pink	21,000	--	80,000	101,000	Fishpass in Ketchikan.
Klawock	chum	60,000	--	3,706	63,706	Hatchery near Klawock on Prince of Wales. A/
	coho	43,000	170	9,120	52,290	
	steelhead	--	1,000	50	1,050	
McDonald Lake	sockeye	36,000	--	65,000	101,000	A/
Snettisham	chinook	1,220	900	633	2,753	Hatchery 40 miles SE of Juneau.
	coho	200	0	130	330	
	chum	39,100	--	62,500	101,600	
Indian Lake	coho	570	80	570	1,220	
Juneau/DJ	coho	50	--	50	100	Includes Dredge Lake and Salmon Creek A/
Twin Lakes	coho	--	6,000	--	6,000	Land locked sport harvest
Sunny Creek	pink	11,000	--	40,000	51,000	Fishpass on Prince of Wales. A/
Southeast Totals:		721,935	9,690	401,943	1,133,568	
PRINCE WILLIAM SOUND						
Cannery Creek	pink	1,800,000	--	350,000	2,150,000	Hatchery in Unalvik Inlet.
Moba Creek	pink	2,220	--	740	2,960	Fishpass 20 miles NE of Whittier. A/
Eaglik Bay	pink	13,800	--	4,600	18,400	A/
Derickson	pink	15,000	--	5,000	20,000	/
Ft. Rich/Elmendorf						
Whittier	coho	3,000	5,000	--	8,000	Hatcheries located near Anchorage. A/
	chinook	8/	300	--	300	
Cordova	coho	--	6,000	--	6,000	B/
	chinook	100	--	--	100	
Valdez	rainbow	--	41,500	--	41,500	Based upon survival and harvest assumptions.
Clear	grayling	--	19,000	--	19,000	Based upon survival and harvest assumptions.
Gulkana	sockeye	61,000	800	39,200	101,000	Streamside incubation facility near Paxson.
Main Bay	pink	328,000	--	--	328,000	Hatchery SE of Whittier.
	chum	68,000	--	60,000	128,000	
PWS TOTALS:		2,291,120	72,600	459,540	2,823,260	

Continued-

Table 1. Continued

Hatchery or Project	Species	Commercial Catch	Sport Catch	Brood Stock/ Escapement	Total	Comments
COOK INLET						
Big Lake	sockeye	175,000	3,000	90,000	268,000	Hatchery near Wasilla.
	coho	3,840	975	2,160	6,975	Includes adjustment for tag loss.
Landlocked Lakes	coho	..	84,000	..	84,000	A/
Cottonwood Creek	coho	1,470	375	830	2,675	
Little Susitna	coho	1,680	670	700	3,050	Includes adjustment for tag loss.
Crooked Creek	chinook	..	4,500	3,400	7,900	Hatchery located on Crooked Creek.
	coho	40	1,250	2,600	3,890	
Tustumena Lake	sockeye	355,000	5,700	71,000	431,700	Stocking location on Kenai Peninsula.
Leisure Lake	sockeye	21,500	2,200	..	23,700	Stocking location in Kachemak Bay.
Chenik Lake	sockeye	102,000	..	10,000	112,000	Stocking location in Kamishak Bay.
Crooked Creek	steelhead	..	40	185	225	
Ft. Rich/Elmendorf Hatcheries also produced fish in PWS.						
Halibut Cove	chinook	500	1,250	..	1,750	Remote release location in Kachemak Bay.
Homer Spit	chinook	8/	2,000	..	2,000	Remote release location in Kachemak Bay.
Ship Creek	chinook	..	400	800	1,200	
Willow Creek	chinook	170	880	1,130	2,180	
Little Susitna	coho	8,200	3,300	3,400	14,900	Includes adjustment for tag loss.
Cook Inlet Lakes	rainbow	..	288,000	..	288,000	Based upon survival and harvest assumptions.
	chinook	..	26,000	..	26,000	Based upon survival and harvest assumptions.
Resurrection Bay	chinook	..	1,000	350	1,350	
Resurrection Bay	coho	8/	11,600	6,000	17,600	
Clear	grayling	..	14,000	..	14,000	Based upon survival and harvest assumptions.
Trail Lakes Hatchery north of Seward on Kenai Peninsula.						
Hidden Lake	sockeye	104,000	3,000	34,600	141,600	Release location on Kenai Peninsula.
Grant Lake	coho	8/	..	880	880	Catch estimated from escapement.
Caribou Lake	coho	8/	1,200	300	1,500	Release location. A/
Seldovia Lake	coho	8/	1,000	50	1,050	Release location. A/
Six Mile	coho	8/	100	1,900	2,000	Release location. A/
	chinook	..	130	400	530	A/
Cook Inlet lakes	coho	..	32,000	..	32,000	Based upon survival and harvest assumptions.
Tutka	pink	56,000	500	4,000	60,500	Hatchery located in Kachemak Bay.
	chum	2,200	8/	200	2,400	
Halibut Cove	pink	28,500	150	..	28,650	
COOK INLET TOTALS:		860,100	489,220	234,885	1,584,205	

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Table 1. Continued

Hatchery or Project	Species	Commercial Catch	Sport Catch	Brood Stock/ Escapement	Total	Comments
KODIAK/ALASKA PENINSULA						
Kitoi Bay	pink	1,060,000	--	153,000	1,213,000	Hatchery located on Afognak Island.
	chum	3,860	--	6,270	10,130	
Kodiak Lakes	coho	--	4,400	8,800	13,200	A/
	rainbow	--	9,000	--	9,000	
Landlocked lakes Lake Rose Teed	coho	--	44,000	--	44,000	B/
	chinook	B/	100	73	173	
Karluk	sockeye	8,700	--	57,800	66,500	Streamside incubation on Thurb River.
Frazer fishpass	sockeye	8,737	--	48,956	57,693	Fishpass on Kodiak Island.
	chinook	105	--	103	208	
Afognak Fishpasses (combined)	coho	4,552	--	9,500	14,052	A/
	pink	22,402	--	41,300	63,702	A/
	sockeye	476	--	13,729	14,205	A/
Russell Creek	chum	B/	--	35,000	35,000	A/
KODIAK/AK PEN TOTALS:		1,108,832	57,500	374,531	1,540,863	
ARCTIC-YUKON-KUSKOKWIM						
Clear	coho	363	--	645	1,008	Hatchery located south of Fairbanks.
	chum	--	4,500	1,530	6,030	
	chinook	80	--	20	100	
Interior lakes	coho	--	63,000	--	63,000	Based upon survival and harvest assumptions.
	rainbow	--	200,000	--	200,000	Based upon survival and harvest assumptions.
	grayling	--	20,000	--	20,000	Based upon survival and harvest assumptions.
	sheefish	--	20	--	20	Based upon survival and harvest assumptions.
	char	--	3,000	--	3,000	
	chinook	--	5,000	--	5,000	
Sikusillaq	chum	5,540	1,770	1,440	8,750	Hatchery on the Noatak River.
ATK TOTALS:		5,983	297,290	3,635	306,908	
STATE TOTALS:		4,987,970	926,300	1,474,534	7,388,804	
BY SPECIES:						
	chinook		69,624			steelhead 1,397
	coho		393,707			rainbow 538,500
	chum		974,946			sheefish 20
	sockeye		1,308,290			grayling 53,000
	pink		4,037,212			char 3,000
	Salmon Subtotal		6,783,779			Non-salmon Subtotal 595,917

A/ Estimate based upon a combination of historical data, standard survival assumptions, and minimal or no sampling.

B/ Evaluation not funded

Table 2. Number of fish released during 1987 by FRED facilities.

Facility	Brood year, Stock	Species	Released
<u>SOUTHEAST</u>			
Beaver Falls	1986 Hugh Smith	sockeye	250,000
Crystal Lake	1985 Crystal Creek	chinook	684,000
	1986 Harding River	chinook	31,000
	1985 Crystal Creek	coho	362,000
	1986 Crystal Creek	coho	463,000
	1984 Falls Creek	steelhead	8,600
Deer Mountain	1985 Ketchikan Creek	chinook	42,000
	1986 Ketchikan Creek	chinook	302,000
Hidden Falls	1986 Hidden Falls	chum	40,140,000
	1985 H.F./Tahini	chinook	26,000
	1985 Crystal Creek	chinook	46,000
	1985 Tahini River	chinook	25,000
Klawock	1986 Klawock	chum	3,990,000
	1985 Klawock River	coho	926,000
	1986 Klawock River	coho	199,000
	1986 Klawock River	steelhead	91,000
Snettisham	1986 Snettisham	chum	25,460,000
	1984 Snettisham	coho	16,400
	1985 Snettisham	coho	779,000
	1986 Snettisham	coho	104,000
	1985 King Salmon River	chinook	86,000
	1985 Crystal Creek	chinook	961,000
SOUTHEAST REGION TOTAL:			74,992,000
<u>PRINCE WILLIAM SOUND</u>			
Cannery Creek	1986 Cannery Creek	pink	42,600,000
	1986 Cannery Creek	chum	35,000
Gulkana	1986 Gulkana River	sockeye	21,400,000
Main Bay	1986 Main Bay	pink	2,130,000
	1986 Main bay	chum	76,500,000
PRINCE WILLIAM SOUND TOTAL:			142,665,000
<u>COOK INLET</u>			
Big Lake	1986 Meadow Creek	sockeye	11,900,000
	1986 Big Lake	coho	2,688,000
Elmendorf	1986 Crooked Creek	chinook	684,000
	1985 Bear Creek	coho	179,000
	1985 Ship Creek	coho	56,500
	1986 Swanson River	rainbow	181,000
Crooked Creek	1986 Glacier Flats	sockeye	12,500,000
	1986 Bear Creek	sockeye	7,510,000
	1985 Crooked Creek	steelhead	70,000
	1985 Crooked Creek	coho	67,900
Tutka	1986 Tutka Lagoon	pink	24,500,000
	1986 Tutka Creek	chum	50,400
	1986 Westside Creek	chum	395,000

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Table 2. Continued

Facility	Brood year, Stock	Species	Released
Ft. Richardson			
	1985 Little Susitna	coho	584,000
	1985 Caswell Creek	coho	32,000
	1985 18 Mile Creek	coho	108,000
	1986 Eyak Lake	coho	104,000
	1986 Big Lake	rainbow	156,000
	1987 Big Lake	rainbow	407,000
	1986 Swanson River	rainbow	1,039,000
	1987 Swanson River	rainbow	3,700,000
Trail Lakes			
	1986 Crooked Creek	chinook	268,000
	1986 Crooked Creek	coho	1,700,000
	1986 Bear Creek	coho	796,000
	1986 Hidden Lake	sockeye	3,720,000
	1986 Coghill	sockeye	318,000
	1986 Anchor River	steelhead	35,600
COOK INLET TOTAL:			73,748,400
KODIAK & AK. PENINSULA			
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Kitoi Bay			
	1986 Kitoi Bay	pink	90,000,000
	1986 Sturgeon River	chum	529,000
	1986 Big Kitoi	chum	164,000
	1986 Little Kitoi	coho	297,000
	1986 Big Kitoi	rainbow	10,000
KODIAK & AK. PENINSULA TOTAL:			91,000,000
ARCTIC-YUKON-KUSKOKWIM			
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Clear			
	1986 Wood Creek	char	4,150
	1986 Clear Creek	chinook	146,000
	1986 Wood Creek	coho	564,000
	1987 Swanson River	rainbow	1,060,000
	1987 Moose Lake	grayling	1,290,000
	1986 Moose Lake	grayling	1,100,000
	1986 Goodpaster Lake	grayling	106,000
	1987 Goodpaster River	grayling	59,100
	1986 Clear/Koyukuk	sheefish	248,000
Sikusuilag			
	1986 Noatak River	chum	1,440,000
ARCTIC-YUKON-KUSKOKWIM TOTAL:			6,017,250
SPECIES TOTALS			
		Chinook:	3,301,000
		Coho:	10,025,800
		Sockeye:	57,598,000
		Chum:	148,703,400
		Pink:	159,230,000
		Steelhead:	205,200
		Rainbow Trout:	6,552,000
		Grayling:	2,555,100
		Sheefish:	248,000
		Arctic Char:	4,150
TOTAL RELEASE:			388,422,650

Table 3. Estimated number of eggs taken by FRED Division in 1987.

Facility	Broodstock	Species	Eggs Taken
SOUTHEAST			
Beaver Falls	Karta River	sockeye	387,000
	Heckman Lake	sockeye	3,590,000
	Hugh Smith	sockeye	2,870,000
Crystal Lake	Crystal Creek	steelhead	115,000
	Crystal Creek	chinook	2,460,000
	Snettisham		2,760,000
	Medvejie		1,040,000
	Hidden Falls		165,000
	Sheldon Jackson		100,000
	Burnett Inlet		265,000
	Crystal Creek	coho	831,000
Deer Mountain	Ketchikan Creek	chinook	158,000
	Little Port Walter	chinook	164,000
	Reflection Lake	coho	328,000
Hidden Falls	Hidden Falls	chum	73,500,000
	Snettisham		6,850,000
	Hidden Falls	chinook	199,000
	Tahini River	chinook	55,000
Klawock	Crystal Creek	chinook	165,000
Snettisham	Klawock River	steelhead	96,000
	Klawock River	sockeye	1,440,000
	Cable Creek	coho	70,000
	Klawock River	coho	1,061,000
	King Salmon River	chinook	111,000
	Snettisham	chinook	1,440,000
	Snettisham, Chum	chum	47,000,000
	Peterson Creek	steelhead	8,000
	Pavlof River	coho	48,000
	Plotnikof Lake	coho	25,000
	Snettisham	coho	138,000
	SOUTHEAST	TOTAL	147,439,000
PRINCE WILLIAM SOUND			
Cannery Creek	Cannery Creek	pink	108,000,000
		chum	487,000
Gulkana	Gulkana River East Fork	sockeye	33,300,000
		sockeye	310,000
		chinook	13,400
Main Bay	Coghill	sockeye	11,100,000
	PRINCE WILLIAM SOUND	TOTAL	153,210,400
COOK INLET			
Big Lake	Meadow Creek	sockeye	20,400,000
	Big Lake	coho	3,000,000
	Little Susitna	coho	3,000,000
Elmendorf	Crooked Creek	chinook	1,290,000
	Ship Creek	chinook	135,000
	Ship Creek	coho	48,100
	Bear Creek	coho	284,000
Crooked Creek	Tustumena	sockeye	20,000,000
	Crooked Creek	steelhead	130,000

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Table 3. Continued

Facility	Broodstock	Species	Eggs Taken
Ft. Richardson	Deshka River	chinook	218,000
	Montana Creek	chinook	121,000
	Ninilchik River	chinook	292,000
	Willow Creek	chinook	453,000
	Swanson River	rainbow	6,290,000
	Big Lake	rainbow	876,000
	Fleming Spit	coho	208,000
	Anchor River	steelhead	49,000
Tutka	Tutka Lagoon	chum	15,250,000
	Westside Creek	pink	4,500,000
Trail Lakes	Crooked Creek	coho	722,000
	Hidden Lake	sockeye	7,060,000
	Crooked Creek	coho	815,000
	Packers Lake	sockeye	4,000,000
	COOK INLET	TOTAL	89,141,100
KODIAK & AK. PENINSULA			
Kitoi Bay	Kitoi Bay	pink	97,400,000
	Kitoi Bay	chum	6,140,000
	Kitoi Bay	coho	600,000
	KODIAK & AK. PENINSULA	TOTAL	104,140,000
ARCTIC-YUKON-KUSKOKWIM			
Clear	Moose Lake	grayling	2,580,000
	Good Paster River	grayling	220,000
	Wood Creek	coho	652,000
	Swanson River	rainbow	1,810,000
	Wood River	arctic char	167,014
	Paxson Lake	lake trout	89,100
	Broodstock	sheefish	1,390,879
Sikusuilag	Noatak River	chum	4,140,000
	ARCTIC-YUKON-KUSKOKWIM	TOTAL	11,048,993
Egg Totals by Species:			
	Chinook:		11,604,400
	Chum:		153,367,000
	Coho:		11,830,100
	Pink:		209,900,000
	Sockeye:		104,457,000
	Grayling:		2,800,000
	Rainbow:		8,976,000
	Steelhead:		398,000
	Lake Trout:		89,100
	Arctic Char:		167,014
	Sheefish		1,390,879
	STATE TOTAL:		504,979,493

Table 4. A projection of the number of salmon expected to return in 1988 as a result of FRED hatcheries and projects (excluding fishways).

Return site	Chinook	Coho	Numbers by species Sockeye	Chum	Pink	Steelhead
SOUTHEAST						
Crystal Lake	13,450	21,250	—	—	—	75
Ohmer Creek	1,645	—	—	—	—	—
Irish Creek	—	5,000	—	—	—	—
Petersburg	—	250	—	—	—	—
Deer Mountain	1,623	—	—	—	—	—
Hidden Falls	1,550	—	—	478,000	—	—
Klawock	—	77,000	—	382,500	—	3,000
Snettisham	1,855	6,000	—	92,000	—	—
Indian Lake	—	1,650	—	—	—	—
Earl West Cove	590	—	—	—	—	—
Farragut River	1,050	—	—	—	—	—
Brennan Lake	1,046	—	—	—	—	—
Bold Island Lakes	280	—	—	—	—	—
Tunga Inlet	—	11,700	—	—	—	—
Ward Creek	—	—	—	—	—	2,000
Juneau/DJ	—	2,000	—	—	—	—
Chilkat Ponds	—	1,250	—	—	—	—
Marx Creek	—	—	—	30,000	—	—
Badger/Bakewell	—	—	1,850	—	—	—
Huon Smith Lake	—	—	—	—	—	—
McDonald Lake	—	—	—	—	—	—
AREA TOTALS:	23,089	126,100	1,850	1,052,500	0	5,075
PRINCE WILLIAM SOUND						
Cannery Creek	—	—	—	—	1,700,000	—
Cordova	—	2,900	—	—	—	—
Qulross Lake	—	500	—	—	—	—
Gulkana	—	—	118,000	—	—	—
Main Bay	—	—	—	197,000	—	—
Whittier	1,000	2,000	—	—	—	—
Valdez	—	500	—	—	—	—
Surprise Cove	—	200	—	—	—	—
AREA TOTALS:	1,000	5,400	118,000	197,000	1,700,000	0
COOK INLET						
Big Lake	—	10,620	124,400	—	—	—
Cottonwood Drainage	—	34,590	—	—	—	—
Willow Creek	23,890	—	—	—	—	—
Little Susitna	—	39,160	—	—	—	—
Crooked Creek	8,000	2,600	—	—	—	600
Chenik Lake	—	—	100,000	—	—	—
Tustumena	—	—	360,000	—	—	—
Grant Lake	—	2,000	—	—	—	—
Six Mile Creek	2,500	2,000	—	—	—	—
Hidden Lake	—	—	121,500	—	—	—
Tutka	—	—	—	1,300	650,000	—
Halibut Cove	2,600	—	—	—	125,000	—
Homer Spit	3,200	—	—	—	11,800	—
Leisure Lake	—	—	86,900	—	—	—
Seldovia Lake	200	1,200	—	—	—	—
Caribou Lake	—	1,500	—	—	—	—
Resurrection Bay	2,700	15,000	—	—	—	—
Caswell Creek	—	3,177	—	—	—	—
Ingran Creek	—	500	—	—	1,000	—
AREA TOTALS:	43,090	112,347	792,800	1,300	787,800	600

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Table 4. Continued

Numbers by species

Return site	Chinook	Coho	Sockeye	Chum	Pink	Steelhead
KODIAK-AK. PENINSULA						
Karluk	—	—	118,000	—	—	—
Kitoi	173	—	—	10,000	1,693,000	—
Kodiak Lakes	—	5,550	—	—	—	—
Russell Creek	—	—	—	216,000	—	—
AREA TOTALS:	173	5,550	118,000	226,000	1,693,000	0
ARCTIC-YUKON-KUSKOKWIM						
Clear	105	1,000	—	9,640	—	—
Sikisuilag	—	—	—	11,360	—	—
AREA TOTALS:	105	1,000	0	21,000	0	0
STATE TOTALS:	67,457	250,397	1,030,650	1,497,800	4,180,800	5,675
GRAND TOTAL:			7,032,779			

Table 5. Production potential for FRED hatcheries in Fiscal Year 1989.

Species	1988 Egg take objectives a/	Expected adult returns from 1988 eggs b/
Sockeye Salmon	147,132,581	2,870,600
Chum Salmon	207,400,000	4,402,717
Pink Salmon	248,480,031	5,949,219
Chinook Salmon	13,184,796	264,752
Coho Salmon	14,637,606	514,325
Steelhead Trout	474,000	11,418
Rainbow Trout	5,471,908	3,321,204
Grayling	1,841,667	116,000
Sheefish	400,000	50,000
Lake Trout	62,500	25,000
TOTAL	639,085,089	17,525,235

a/ Assumes funding of FRED Division at full request.

b/ These adults will return over several years, beginning in 1990.

Genetics Laboratory

The Genetic Selection Program initiated in 1986 at the Rainbow Trout Broodstock Development Center at Fort Richardson Hatchery continued with the 1987 egg takes. The goal of this program is the production of 2-gram fingerlings for release by mid-July. These production goals have been established as optimal by Sport Fish Division field studies. To reach this goal, fish are being selected for characteristics related to growth and survival. Efforts are also underway to shift spawning time from early May to early March through genetic selection. Earlier spawning will allow a longer period of development and growth for fry to reach the target size by mid-July. Field tests have indicated that these larger fish released earlier will result in better survivals and, consequently, provide more fish to the sport anglers.

Fertility studies were conducted at the Broodstock Development Center in 1987. The purpose of these studies is to determine if early egg and fry mortalities are attributable to either the male or the female parent. This study should also give insight into the question of whether these early mortalities are the result of genetic or environmental factors.

Tissue samples were again collected from sockeye salmon spawning in seven Tustumena Lake tributaries. The purpose of this study is to determine if genetic differences can be detected between these spawning populations. The U.S. Fish and Wildlife Service is concerned that the division's enhancement program may eliminate possible stock differences. Results are not yet available.

Economics

The fish hatcheries and other enhancement activities of the FRED Division and of the PNP hatchery system have been the subject of a variety of economic studies designed to determine the economic consequences of the program. These economic studies have been undertaken to ensure that maximal social and economic benefits are derived from the state's investment in the extensive application of salmon enhancement technology.

Of the collection of public investments available to Alaska, salmon enhancement is one of the very few that improves the level of economic activity in the state by expanding the total output of the economy. Dollars invested in salmon enhancement and rehabilitation improved economic return as well as positive impacts that were produced by increasing the level of economic activity. Preliminary studies undertaken by ADF&G indicate that the FRED program is having significant net benefits and impacts not only in the salmon industry, but throughout the regional economies of Alaska.

Current estimates by officials of ADF&G suggest that the program will ultimately generate net state benefits of \$90 million (over a 25-year period) for the commercial fishery portion of the

program (in 1984 dollars). This results in an overall benefit/cost ratio of 1.4:1. This means that \$1.40 in fish values will be generated for each \$1.00 expended, measuring all benefits and costs in dollars of equal value and discounting them as required to take into account the time at which they occur.

Decision makers are often interested in how fisheries investments, or management policy, may affect economic stability or economic development in various regions of the state. Economic impact models are often used to determine the economic development that would occur from a change in gross sales of fisheries products from such activities as an increase in catch or change in market prices. These economic impact models approximate the local economics by expressing economic relationships among business sectors of the economy. In 1986, this new analytical procedure was applied to the state's fishery enhancement program to aid in the planning and budgeting process. This was a first-of-its-kind project analysis of resident employment resulting from the state's investments in salmon ranching. The model was designed and contracted through a cooperative effort with the Institute of Social and Economic Research (ISER).

The results of the studies project large personal income and employment impacts from the state-owned hatchery program. A recent simulation of the impacts of proposed FRED budgets for the FY 88 revealed that the full-funding request of \$10 million would result in the existence of over 850 resident jobs and \$27 million in resident wages and income. This is 2 to 4 times the level of impacts that result from other equivalent expenditures from the state operating or capital budget.

In 1987, the FRED Division began coordinating a new and greatly enhanced phase of the fishery enhancement impact model. The impact data collection and modeling effort has involved a biological, fishery, and economic analysis of over 100 state enhancement projects (including the recreational fishery component), and PNP Program component. The endeavor includes four (completed) computer-generated databases that are used in the design (ongoing) of two new impact models. This analysis has involved a multiagency data collection effort, and coordination with FRED Division staff and the PNP Program, the Department of Commerce and Economic Development's enhancement loan office, the Sport Fish Division, and ISER (ISER is making some of the model revisions under contract).

The enhancements in the 1987 FRED impact model allow an improved resolution of direct impacts to the commercial fishery and processing sector in the Alaskan economy. The FY 89 budget impacts for FRED Division result in approximately \$35 million in personal resident income to Alaskans and over 1,000 jobs. The analysis of the PNP Program impacts resulting from a good year 1988 are preliminary at this time. The preliminary estimates project approximately \$40 million in personal income and 1,100 resident Alaskan jobs. Evaluation of the additional personal

income impacts of recreational fishery projects are to be completed early in 1988.

In 1987, the FRED economist has also served as economic advisor and conducted staff assignments on economic matters for an ongoing legislative intent assignment (known as the Enhancement Funding Work Group). Assistance was provided to the economic study efforts by other divisions within the department. The Division of Commercial Fisheries studied the full personal income and employment impacts of commercial fisheries in Alaska. Study of the impacts for the 1984 fishing year was carried out through a contract with ISER. This study included all major fisheries. The economist was also involved with the Southeast Recreational Fishing Economic Study (RFP), solicited by the Division of Sport Fish in 1987.

Mariculture

1987 saw the enactment of Senate Bill 294--a compromise bill that allowed for bivalve shellfish mariculture and placed a moratorium on finfish cage culture. FRED staff, working with others in ADF&G as well as with the Department of Natural Resources, the Department of Environmental Conservation, and the Governor's Division of Governmental Coordination, wrote regulations and permit procedures that will set the stage for mariculture of shellfish and sea vegetables.

In the meantime, interest in sea farming is growing. New farms are being started in southeast Alaska, Cook Inlet, Prince William Sound, and Kodiak. Focus at this time is on oysters and mussels, but development work is proceeding at several locations on scallops and giant kelp. An interesting phase of this program development is the formation of local citizens' groups directed at sea farming development for their part of Alaska. FRED Division is working closely with these groups, as well as with the industry's larger organization, "Alaska Mariculture Association."

The joint feasibility study done in cooperation with Japan's OFCF has yielded many scallops, but few of the target species, Weathervane scallops. As the study goes into year number two, goals will be to expand the sampling base and to examine the possibility of species alternative to the Weathervane.

Engineering

Minimal staff, combined with continual problem solving, kept the division's two engineers extremely busy during the past year. In southeast Alaska, the requirement for additional enhancement production viz a viz the U.S./Canada Pacific Salmon Treaty and the associated enhancement facility proposals occupied much of the time of the regional engineer. Other major projects completed include construction of duplex housing at Hidden Falls

Table 17. FRED Division FY88 operating budget (all funding sources)

Function	Budget Δ /	Percent
Management/Administration (headquarters & regional offices)	1956.6	13
Private Nonprofit Hatchery Coordination & Regional Planning	207.3	1
Hatchery Production Statewide (facility operating budgets)	7877.4	54
Biological Projects & Staff (planning , operations , assessments)	608.4	4
Lake and Stream Improvement/Stocking (fishpasses, habitat and stocking projects)	525.1	3
Technical Supervision/Quality Control (biology, fish culture, engineering, maintenance, library, mariculture, economics)	885.4	6
Fish Pathology Services (statewide fish health services)	542.9	3
Genetics Laboratory (statewide genetics services)	84.4	0
Limnology (principal scientist and project leaders)	181.5	1
Lake Fertilization/Stocking (field projects statewide and limnology lab support)	200.5	1
Tagged Fish Recovery Laboratory (CWT) (statewide and US/Canada concerns)	361.7	2
Biometrics/Data Processing	166.7	1
Special Projects (cooperative funding projects)	694.7	4
C.I.P. Costs	265.1	1
TOTAL	14557.7	1

Δ / In thousands



THE SENATE OF CANADA

**THE MARKETING OF FISH
IN CANADA**

**AN INTERIM REPORT ON THE
WEST COAST FISHERIES**

INTERIM REPORT II

Standing Senate Committee on Fisheries

December 1987

CHAPTER FIVE

Issues of Concern, Opportunities and Recommendations

SECURING A VALUABLE RESOURCE

A. The Canada-U.S. Pacific Salmon Treaty

Prosperity in the West Coast fishing industry begins with a secure resource base. The Committee's terms of reference therefore directed it to consider the bilateral Canada-U.S. Pacific Salmon Treaty signed in March 1985 on the management of all five Pacific salmon stocks originating in each country's waters.¹¹¹ The result of almost 15 years of negotiation, the Treaty established a Pacific Salmon Commission to advise each country on matters pertaining to it and to serve as a forum for annual management plans for major intercepting fisheries. Three panels, assigned to particular regional fisheries along the coast, were also created to provide management advice to the Commission. The Treaty calls for each country to manage the stocks originating in its own rivers, to prevent overfishing, to increase production and receive benefits commensurate with this national production,¹¹² except where traditional fishing patterns intervene. In implementing the two principles of conservation and equity, it directs the Pacific Salmon Commission to recognize the desirability of reducing and balancing interceptions.¹¹³

Last year (1986) was the first year in which the salmon fisheries of both countries were managed according to the recommendations of the Pacific Salmon Commission. Preliminary analysis by Canadian officials has revealed that salmon interceptions significantly favoured the United States in 1986, although perhaps less so than if no Treaty restraints had been placed on American fishermen.¹¹⁴

¹¹¹ Special reference is also made to anadromous steelhead trout.

¹¹² *Treaty Between the Government of Canada and the Government of the United States of America Concerning Pacific Salmon*, Ottawa, 28 January 1985, in force 18 March 1985, Article III, para. 1.

¹¹³ *Ibid.*, para. 3.

¹¹⁴ Department of External Affairs, Letter to the Chairman, 30 January 1987.

In view of the imbalance in salmon interceptions between Canada and the United States during the Treaty's first year of implementation, the Committee recommends:

- (1) That the Canadian Section of the Pacific Salmon Commission vigorously pursue negotiations with its United States counterpart to reduce further American interceptions of salmon of Canadian origin so as to ensure that Canada gets its rightful share of the harvest. The Department of Fisheries and Oceans should also undertake a review of the overall impact of the Canada-U.S. Pacific Salmon Treaty at the end of 1987, and each year thereafter. The results of this review should be made available to the general public.

With the signing of the Treaty, new programs were initiated by the Government of Canada, including large-scale mark recapture programs. The Committee wishes to stress the importance of these initiatives in determining whether Canada's share of the salmon harvest is in proportion to the quantity of salmon produced in its coastal waters.

B. Yukon River Salmon Stocks

The Yukon Territory shares with the State of Alaska the Yukon River, the largest watershed in Alaska and Yukon Territory and the fifth largest in North America in terms of area and mean discharge.¹¹ The chinook and fall chum, the major species which migrate along the Canadian section of the Yukon to spawn, travel the longest known route in the world, some 3,680 km, from streams in northern B.C. to the United States territorial waters in the Bering Sea. About 41% of the river's drainage area is within Canadian territory.

A commercial fishery which harvests chum and chinook salmon operates near Dawson City along the Yukon River's main branch and in the lower sections of the Stewart and Pelly Rivers. A native food fishery scattered throughout the Yukon drainage system is not only an intrinsic part of native culture, but also provides sustenance for more than 6,000 native residents.¹² A small non-native subsistence fishery is also permitted in the same area as the commercial fishery. Because of improved road access to remote areas, participation in the sport fishery for Yukon chinook salmon has also increased over the years.

Although the primary industries in the Territory are tourism, mining and government, tremendous interest was expressed in broadening the economic opportunities of the fisheries. Discussions about fishing, processing and marketing commercial products, as well as marketing tourism and sport fishing in the area, however, led to the more fundamental issue of supply.

The signing of the Pacific Salmon Treaty between Canada and the United States in 1985 was said to have been opposed by the Yukon Territorial government and by various interest groups at that time because of the Treaty's failure to address the issue of equitably apportioning Yukon River salmon stocks between the two countries.¹³

¹¹ Department of Fisheries and Oceans, *Pacific Region Salmon Stock Management Plan: Northern Transboundary Rivers*, Discussion Document, Vol. J, 1986, p. 33.

¹² Department of Fisheries and Oceans, *Salmon Resources of the Yukon River* (undated).

¹³ Canada, the Senate, *Proceedings of the Standing Senate Committee on Fisheries*, Issue No. 3, 14 November 1986, p. 48-49.

Currently, Canadian fishermen on the Yukon River obtain a very small catch of fall chum and chinook compared with American catches of the same species (Table 26). Article VIII of the Treaty, which deals with the Yukon River, states that "the parties shall initiate in 1985, and conclude as soon as possible, negotiations" on four major issues: an account of American harvests of Canadian salmon; cooperative management procedures; cooperative research programs, enhancement opportunities and exchanges of biological data; and development of an organizational structure to deal with Yukon River issues.

Since 1985, several rounds of negotiations between Canada and the United States have failed to bring about a settlement on the issue of catch allocations between the two countries. Canada's position has been that management mechanisms for the river should be incorporated into the existing Pacific Salmon Treaty, under which each country is to receive benefits in proportion to the quantity of salmon originating in its waters ("the equity principle"). It is generally accepted that the Canadian portion of the Yukon River produces approximately 50% of the fish. Current Canadian catches are well below this level: it is estimated that 90% of the chinook harvest and 95% of the chum in-river catches are taken by fishermen in the United States, leaving only about 10% of chinook and 5% of chum stocks for Canadian fishermen.¹¹¹

After meeting with the joint Alaskan House and Senate Resources Committee in early February 1987, our Committee concluded that the two countries are far apart in agreeing on an equitable allocation. The Americans propose a separate agreement to handle the Yukon River, and maintain that the equity principle does not apply because of the size and economic importance of the well-established fishing industry in Alaska. Under the present catch allocations, which favour the United States, an expansion of the Canadian fishery could only lead to a reduction of salmon escapement, a situation which the Committee regards as unacceptable.

This Committee believes that Canadian native, subsistence, sport and commercial fishermen are entitled to more of the in-river catch of Yukon River salmon, and believes the issue should be moved up on the political agenda. It recommends:

- (2a) That the Minister of External Affairs express, through the most effective diplomatic channels available to him, Canada's disagreement with the American position on the critical issue of equitably sharing the salmon stocks of the Yukon River.
- (2b) That Canadian negotiators for the Yukon River base the Canadian negotiating position on Article III, paragraph 1(b) of the Pacific Salmon Treaty which states that each party to the Treaty will receive benefits equivalent to the production of salmon originating in its waters.

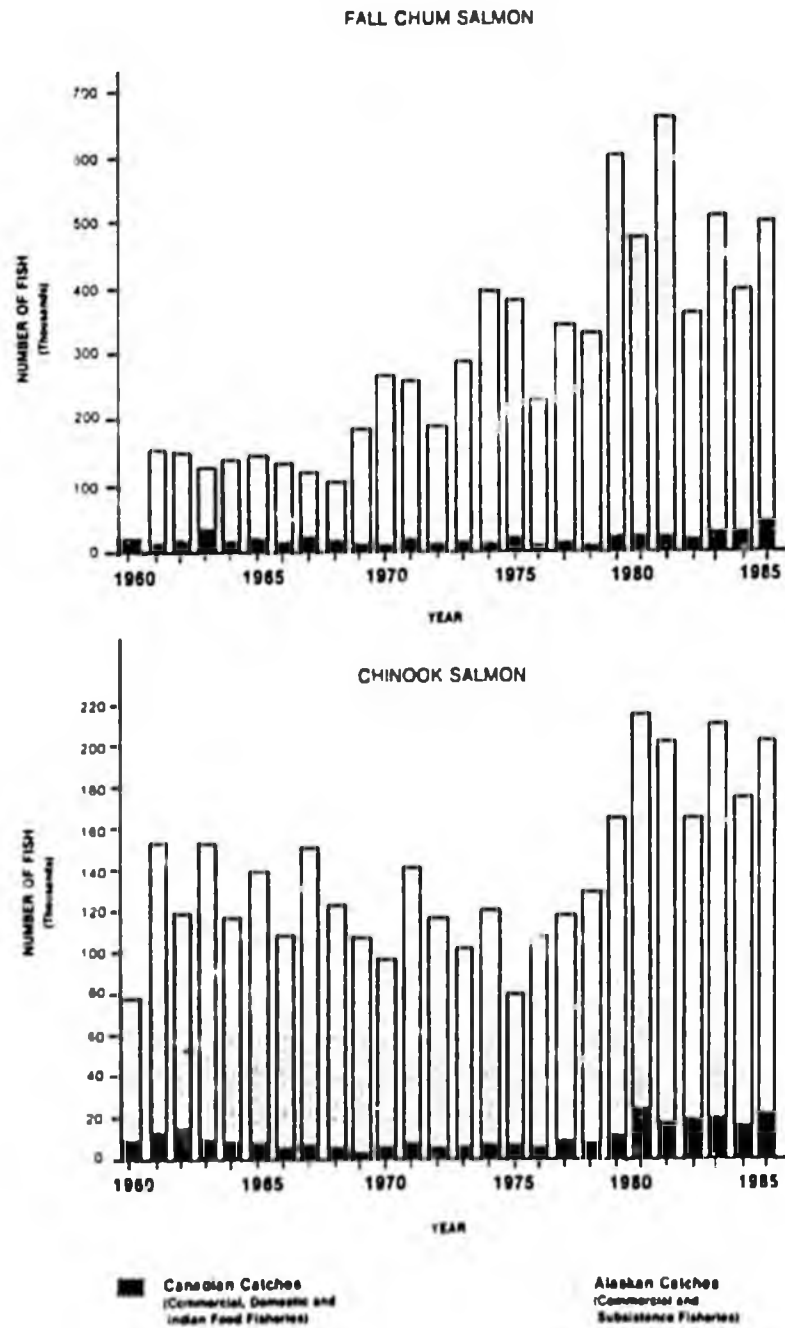
C. The Transboundary River Salmon Stocks of Northern B.C.

All five species of salmon are found to varying degrees in the so-called transboundary rivers of B.C., the systems of which originate in Canada but flow into Alaskan coastal waters (Figure 3). Major transboundary rivers include the Taku, the Stikine and the Alsek, which have approximately 95% of their drainage systems within Canadian territory.¹²¹ Other, smaller rivers include the Unuk, Whiting and Chilkat. A

¹¹¹ Department of External Affairs, Letter to the Chairman, 30 January 1987.

¹²¹ *Pacific Region Salmon Stock Management Plan*, 1986, p. 1, 12, 25.

TABLE 26
CANADIAN AND ALASKAN TOTAL CATCH OF FALL CHUM AND CHINOOK
SALMON ON THE YUKON RIVER, 1960-1985



Source: Department of Fisheries and Oceans, *Salmon Resources of the Yukon River*, undated.

Source: Department of Fisheries and Oceans, *Salmon Resources of the Yukon River*, undated.

Canadian commercial gillnet fishery on the Taku River, directed primarily at sockeye, chum and coho salmon, has been in existence since 1979. The Canadian commercial fishery for Stikine River salmon stocks, which focuses on sockeye salmon, began in 1975, but operated at a low level until 1979 due to the limited market demand and lack of processing and storage facilities in the area. At present, there is no Canadian commercial fishery on the Alsek River. Native food and sport fisheries are present to varying degrees along all these rivers.

Until the advent of commercial fishing on these rivers in the mid to late-1970s, all commercial production accrued to the United States. A Canadian from the transboundary rivers, a member of the Northern Panel of the Pacific Salmon Commission, who testified before the Committee believed that these waterways were not fairly dealt with during the 1985 Pacific Salmon Treaty negotiations and were essentially "traded off"⁽¹⁾ by Canadian negotiators for concessions elsewhere in B.C. Canadian negotiators have encountered great difficulty in getting the United States to accept the equity principle on these waterways. Until recently, Canada allowed the State of Alaska to conduct research and to manage the stocks of these rivers and American journals and reports have referred to these rivers as primary U.S. salmon-producing areas. Moreover, the United States has claimed 50% of all Canadian-produced fish in these rivers because of the freshwater and estuarine rearing habitat which they maintain to allow the fish to grow and return to the rivers to spawn.⁽²⁾

Table 27 compares average catches by Canadian and American gillnet fisheries of Canadian salmon originating from the three major transboundary rivers in northern B.C., and the percentages of the total catch of Canadian stocks received by Canada both before and after the Treaty. On the Stikine River, the Canadian harvest for 1985-86 was set at 35% of the total sockeye allowable catch, or 10,000 fish, whichever was greater, and 2,000 coho salmon. On the Taku River, the Canadian sockeye harvest was set at 15% of the total allowable catch. The Committee was made aware of the fact that there are other transboundary rivers such as the Alsek, the Unuk, the Whiting and Chilkat, for which Canada receives no benefits under the Treaty. These rivers were believed to make significant contributions to the American catch.⁽³⁾ In view of this, the Committee recommends:

- (3a) That the Government of Canada defend that the equity principle, Article III, paragraph 1(b) of the Canada-U.S. Pacific Salmon Treaty, be a priority in future negotiations with the United States on the salmon stocks of the transboundary rivers.

Estimates of total annual production for these rivers were believed to be anywhere between two and five million salmon.⁽⁴⁾ More research should be undertaken, given that escapement and productivity data for most stocks are either inconsistent or limited.⁽⁵⁾ More complete information would undoubtedly better support Canada's case in future negotiations. The Committee therefore recommends:

⁽¹⁾ Canada, the Senate, *Proceedings of the Standing Senate Committee on Fisheries*, Issue No. 3, 14 November 1986, p. 88.

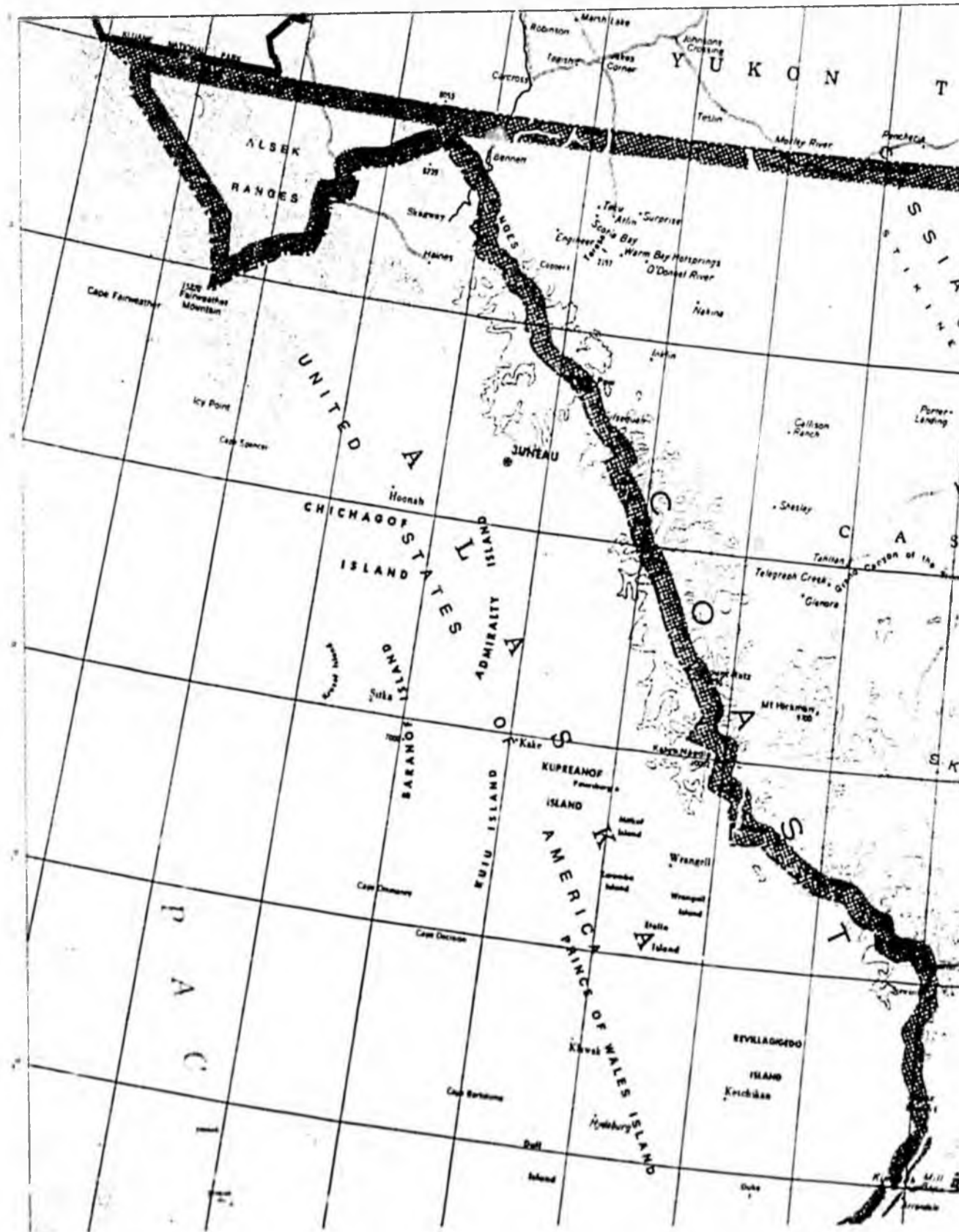
⁽²⁾ *Ibid.*, p. 94.

⁽³⁾ *Ibid.*, p. 95.

⁽⁴⁾ *Ibid.*, p. 89.

⁽⁵⁾ *Pacific Region Salmon Stock Management Plan* (1986), p. 1, 12, 25.

FIGURE 3—NORTHERN BRITISH COLUMBIA



Source: Canada, Department of Energy, Mines and Resources, Surveys and Mapping Branch, Map MCR3 (British Columbia), 3rd edition, 1973

- (3b) That the Department of Fisheries and Oceans provide adequate funding for research to increase its data base for the region's transboundary river salmon stocks.

TABLE 27
COMPARATIVE AVERAGE CATCHES OF CANADIAN SALMON ORIGINATING IN
THE TRANSBOUNDARY RIVERS BY CANADIAN AND AMERICAN GILLNET
FISHERIES, 1981-1985

(Average catches in thousands of pieces)

River	Species	U.S. in-river or terminal catch	Estimated U.S. interception ¹	Canadian in-river catch	Total catch of Canadian salmon	Average percentage to Canada (%)	Pac. Sal. Treaty % to Canada ²
<i>Alsek</i>	Chinook	0.3	0.3	0.4	0.7	57.1	not negotiated
	Sockeye	18.0	16.2	3.0	19.2	15.6	
	Coho	7.1	6.4	0.1	6.5	1.5	
<i>Taku</i>	Chinook	2.1	2.1	0.4	2.5	16.0	incidental
	Sockeye	65.8	55.9	17.4	73.3	23.7	15%
	Coho	32.7	22.9	4.8	27.7	17.3	incidental
	Pink	177.7	151.0	5.7	156.7	3.6	incidental
	Chum	64.6	38.8	2.5	41.3	6.1	incidental
<i>Stikine</i>	Chinook	1.6	1.4	1.8	3.2	57.0	incidental
	Sockeye	160.1	42.4	23.7	66.1	35.9	35%
	Coho	60.3	42.2	6.7	48.9	13.7	2000 pieces
	Pink	324.9	32.5	2.3	34.8	6.6	incidental
	Chum	44.6	8.9	0.7	9.6	7.3	incidental

¹ Rough estimates. Major interceptions, particularly of chinook and coho, occur in Alaskan troll fisheries and are not accounted for in the table (e.g., somewhere between 50% and 70% of the coho catch is taken by the fishery.)

² Percentages do not reflect new spawning escapement guarantees.

Sources: Department of Fisheries and Oceans, brief submitted to the Committee, 14 November 1986, Table 1: Representative of Transboundary Rivers, Northern Panel of Pacific Salmon Commission, Issue No. 3, 14 November 1986, p. 95.

D. Foreign High Seas Interceptions

Also important are the incidental catches of Canadian salmon by foreign fishing vessels on the high seas, outside Canada's 200-mile limit. In the past, both Canada and the United States have attempted, directly and through the International North Pacific Fisheries Commission, to influence the Japanese in particular to moderate their fishing effort. DFO is at present conducting a series of research cruises to the North Pacific to determine whether international high seas squid fisheries represent a serious threat to Canadian salmon. The Committee believes the issue of high seas interceptions is of sufficient importance to justify such actions to improve the Department's data base, and recommends:

- (4) That the Department of Fisheries and Oceans continue to pursue its data-gathering program on foreign interceptions of Canadian salmon on the high seas. Consideration should be given to further strengthening the Department's monitoring capability on the high seas.

Against state

Tanana group files roe lawsuit

Correspondent's report

TANANA—The Tanana Fish and Game Association, representing users of fish and wildlife around the village of Tanana, has filed suit against the state of Alaska over the sale of roe from subsistence-caught salmon on the upper Yukon River.

The suit, filed in Fairbanks Federal Court on Feb. 10, seeks an injunction to prevent the state from bringing criminal charges against some fishermen who have been the subject of a probe by Alaska Fish and Wildlife Protection Division.

The division has alleged the fishermen sold roe illegally from subsistence caught salmon in 1987.

The suit also seeks to overturn a state regulation of 1977 prohibiting subsistence taken roe sales. The association says the regulation violates section 804 of the Alaska National Interest Land Conservation Act. The act mandates subsistence use of fish and wildlife, including "customary trade" as having highest priority.

The suit maintains that roe sales from fish already caught for subsistence use fall under this category of "customary trade" and should be permitted.

The Yukon River is the focus of an allocation controversy involving people who fish for salmon from the Aleutian Islands all the way to the Yukon headwaters in Canada.



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February 25, 1988

Senator John B. Coghill

Dear Senator,

I am writing in regards to the salmon fishery on the upper Yukon River. Our firm has purchased product originating out of the Nenana area in the past and have found the quality consistent with products from other areas.

Market prices for the 1987 season were good and as far as we are able to discern all available inventories have been sold. Market prices for Dark Chums have ranged from \$1.70 to \$2.10 per pound wholesale, \$1.20 to \$1.50 for Pales. Coho prices were at about the same level as Chum and higher valued King prices ranged from \$3.00 upwards. Salmon Caviar from this area is much sought after and ranged from \$5.00 to \$10.00 per pound.

It is our feeling that the loss of this fishery would have a major economic impact to the communities and people involved. We hope a program can be formulated to allow harvesting of salmon in this area to continue along with good conservation practices.

Sincerely,


William P. Clancy

cc: Senator Arlis Sturgelewski
Rep. John Binkley
Rep. Richard Schultz