ALASKA DEPARTMENT OF FISH AND GAME

ANNUAL REPORT FOR 1957

JUNEAU, ALASKA

COVER: BULL STELLER SEA LION ON
LEWIS ISLAND, GULF OF ALASKA

1957
ANNUAL REPORT

Alaska Fish and Game Commission

and

Alaska Department of Fish and Game

Michael A. Stepovich
Governor

Robert C. Kallenberg
Chairman

C. L. Anderson
Director

REPORT NO. 9

JUNEAU, ALASKA

To:

THE GOVERNOR OF ALASKA
MEMBERS OF THE TERRITORIAL LEGISLATURE AND THE
CITIZENS OF ALASKA

Herewith is submitted the Ninth Annual Report of the Alaska Fish and Game Commission, created by the 23rd Territorial Legislature and approved April 1, 1957.

This report covers the activities of the Commission and the Alaska Department of Fish and Game based on the calendar year January 1 to December 31, 1957.

C. L. ANDERSON, Director
ROBERT C. KALLENBERG, Chairman
ARTHUR H. HAYR, Member
EUGENE TORKILSEN, Member
DOUGLAS BABCOCK, Member
NEIL E. GRANT, Member
JAMES HUNTINGTON, Member
NELS E. NELSON, Member

Although the Alaska Fish and Game Commission and the Alaska Department of Fish and Game was created April 1, 1957, for all practical purposes they are a continuation of the former Alaska Fisheries Board and the Alaska Department of Fisheries and accordingly these reports are numbered consecutively.

FOREWORD

The 1957 session of the Legislature enacted Chapter 63, S.L.A. 1957, which repealed Chapter 68, S.L.A. 1949, which created the Alaska Fisheries Board and the Alaska Department of Fisheries. Under the new act, all duties and powers of the Alaska Fisheries Board were relegated to an Alaska Fish and Game Commission, to be composed of seven members, viz., three commercial fishermen, one processor, one hunter, one sport fisherman and one trapper. The four commercial fishery members of the old Board were automatically made members of the new Commission. The functions of the Alaska Department of Fisheries were transferred to the new Alaska Department of Fish and Game, with fur and game activities being added. This change became effective on April 1, 1957.

The Biological Research Division continued research in 1957 on red, king, silver and pink salmon as well as trout, king crab and shrimp. A tagging and recapture technique on the Taku River fish wheel demonstrated its potential as a service for measuring spawning escapement of adult salmon as they enter a muddy, glacial river. The validity of spawning ground surveys was checked again with a weir on the Taku and it was verified that small salmon and jacks are not observed in the usual river bank survey.

A very high survival of red salmon fry planted in a lake cleared of all resident fish was achieved at the Lake Kitoi Research Station. Studies in the troll fisheries indicated a build-up of blood lactate in troll-caught salmon and possible high, delayed mortalities in such fish that escape or are returned to the ocean.

The use af algae to show potential lake productivity was studied with encouraging results. Salmon eggs were incubated and hatched in stagnant cultures of algae, indicating possible future hatchery designs for closed water systems with effective temperature controls.

An extended retention of rotenone toxicity was demonstrated in Princess Bay Lake, under conditions of high acidity and cold temperature. This lake was treated in early spring and did not lose its toxicity until late fall.

Various tagging techniques were tried on king crab to develop a method for releasing large numbers in the studies of growth rates, integration patterns and other life history information.

Exploratory fishing trips for shrimp were made in the Kodiak region with encouraging results.

Scientific papers were presented by members of the research staff at various meetings. The research library continued to catalogue and disseminate pertinent scientific literature to the staff and to the public.

The Division of Predator Investigation and Control continued studies of the beluga, sea lion and harbor seal and also conducted control activities on harbor seals in the Stikine, Taku and Copper River areas. Some wolf control was done in Southeastern Alaska and a wolf investigation was initiated.

The Division of Fur and Game was organized and its program planned. No field work was undertaken.

The Commercial Fisheries Division added one new District Biologist, stationed at Homer on Kenai Peninsula, making a total of five districts

that have resident biologists. Adult red salmon from planted eggs returned again to Frazer and Laura Lakes in the Kodiak district. The first return of silver salmon entered the Ketchikan Hatchery through the use of the newly created fishway. King salmon studies on the Nushagak River were intensified and data of management significance was secured in relation to escapements.

The Sport Fish Division continued its program of lake investigation, lake rehabilitation and trout stocking. The Fire Lake Hatchery near Anchorage was provided with an additional sixteen troughs which brought the total units at this station to its full complement of forty troughs. Four new lakes with a combined surface area of 172 acres were treated with rotenone to kill the scrapfish.

A new prefabricated steel warehouse, 32 feet wide by 40 feet long, was constructed at the Fire Lake Hatchery site. Much needed storage and bad-weather work area will be provided by this building.

The program of the Inspection Division was carried on about the same as in previous years except that the temporary inspectors were required to check for Territorial licenses, not only for sport fishing as they had done in the past, but also for hunting. The 1957 Legislature passed a new license act, Chapter 122, Session Laws of Alaska 1957, which provided for a new scale of licenses for sport fishing and a hunting license as well. Chapter 93, Session Laws of Alaska was repealed by the new Act.

The Engineering Division constructed a fishway and holding tank at the Deer Mountain Hatchery, Ketchikan, and a fishpass weir on a branch of the Taku River. The Bakewell Fishway project was put under contract. Several minor projects were processed.

With funds provided by the 1957 Legislature, the Education and Information Division now has one full-time employee. Conservation films, press releases to newspapers and radio stations and illustrated lectures, along with the Department's annual bulletin, were utilized to inform Alaskans about their fishery resources and the work being done to conserve and utilize them on a sustained yield basis.

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FISH AND GAME COMMISSION

During the calendar year of 1957, two regular meetings of the Alaska Fish and Game Commission were held at the office of the Alaska Department of Fish and Game in Juneau. A summary of each meeting follows:

REGULAR SPRING MEETING, APRIL 15-22, 1957

The spring meeting of the new Commission was called to order on Apirl 15 at 10:00 A.M. by Robert C. Kallenberg as acting chairman. Those present were Mr. Kallenberg, of Dillingham, J. H. Wakefield, of Port Wakefield, and Eugene Torkilsen, of Kenai, all of whom were holdovers from the Alaska Fisheries Board. Nels E. Nelson, of Ketchikan, the other holdover, was absent, being away from the territory on a trip. There being no quorum the meeting was recessed from day to day until April 20, at which time Douglas Babcock of Juneau, who had been appointed the previous day, joined the others, thus establishing a quorum.

Albert Munson, of Kenai, an interim member of the Alaska Fisheries Board, was not confirmed by the 1957 Legislature. Eugene Torkilsen, of Kenai, was appointed in Mr. Munson's place and confirmed by the Legislature before enactment of Chapter 63.

After adopting a set of bylaws, the Commission elected Mr. Kallenberg as Chairman and Mr. Wakefield as vice-Chairman to serve until the spring meeting of 1958. In his introductory remarks the new Chairman suggested that business be confined to only that necessary to get the new Department started and that all major policy decisions, so far as possible, be deferred until the fall meeting when it was expected the full membership of the Commission would be in attendance. This was acceptable, as was a motion that all present employees, including the Director, be continued in office until the fall meeting.

The Director then reviewed the fish and game legislation features of the 1957 session of the Territorial Legislature, mentioning the various bills, memorials, etc. affecting the operations of the Department. In order that the biennial period could be changed to the more appropriate date of July 1, it was necessary for the legislature to pass two general appropriation bills; one to cover the interim period from April 1 to June 30, 1957 and the other for the biennium July 1, 1957-June 30, 1959. Since the latter was the more important, a breakdown only for the biennium is presented here.

FISH AND GAME COMMISSION $12,000.00

This was to cover travel, compensation and miscellaneous expenses of the Commission.

ADMINISTRATION $54,355.00

Salaries of the Director, Administrative Secretary and clerical help, as well as general routine expenses of this division, are covered in this item.

BIOLOGICAL RESEARCH $194,000.00

This is composed of five projects as follows:

1. General—Covers the salaries of the senior biologist (in charge); research librarian and steno-receptionist (½ time); and routine expenses.

2. Taku River Investigation—This is a continuation of the long range studies on the Taku king salmon started in 1952. The other four species are also covered, but not as intensively as the king. The work is carried on by an associate biologist, a junior biologist, and a part time aid.

3. Kitoi Bay Research Station—Studies are being conducted on enumeration, age, growth, and predation on juvenile and adult salmon in Kitoi and adjacent lakes. Techniques are being developed for determining basic red salmon productivity of Alaskan lakes and for maximum utilization of them for production of this species. Some time is being devoted to other species such as dolly varden trout, silver and pink salmon. A biologist is in charge, assisted by a junior biologist.

4. Silver Salmon Studies—Silver salmon are important to the economy of the Territory and efforts will be made to increase the production of this species by increasing the fresh water habitat. The work will be done by a senior biologist.

5. King Crab Investigations—Information basic to the proper utilization of this species is needed for proper management. The work will be in charge of one associate biologist who will conduct studies on the life history, growth, and movements of king crab in the commercial fishery.

COMMERCIAL FISHERIES $193,000.00

This was formerly known as the Watershed Management Division. The senior biologist in charge and a steno-receptionist (½ time) are located at Juneau. In addition, the above funds will provide for 5 district biologists, a fish culturist, and several part time aids. Men will be stationed on a permanent basis at Ketchikan, Wrangell, Homer, Kodiak and Dillingham. The district biologists have three primary functions as follows: (a) to furnish the information needed to formulate the necessary regulations in his district, (b) to catalog the water areas in the district blocked to anadromous fish and their potential for rearing salmon, and (c) to produce runs of salmon in any such blocked areas picked for development.

EDUCATION AND INFORMATION $19,000.00

This will provide for only one full time man and his necessary traveling and other expenses. The main purpose of this division is to acquaint the people of Alaska with the problems connected with the conservation and utilization of our fish and game resources.

ENGINEERING $32,000.00

This takes care of the senior engineer, some part time clerical help, traveling and other necessary expenses. This division carries out that part of the work of the Department that involves the construction of such projects as hatcheries, water systems, migrant trap weirs, fishways, ponds,

etc. It instigates no work of its own, but carries out those items determined by the other divisions to be necessary for fisheries research and management and for which funds are available.

INSPECTION $34,000.00

This work will be carried out, as in the past, by the use of temporary employees during the fishing and hunting seasons. Efforts will be largely devoted to the enforcement of the territorial sport fishing and hunting licenses and for the protection of certain selected areas near stream mouths where the Department is conducting biological research and other programs.

MARINE PREDATOR INVESTIGATION AND CONTROL $73,000.00

The work of this division is designed to increase human utilization of our fishery resources through reduction of losses due to predators. That such losses are substantial enough to work hardship on many Alaskan fishermen is well known, and that some of these losses can be prevented has been demonstrated by the Department's past efforts in this field.

The overall project is composed of five projects:

1. Copper River Seal Control
2. Stikine River Seal Control
3. Sea Lion Investigation
4. Beluga Investigation and Control
5. Predaceous Bird Investigation

SPORT FISHERIES $75,000.00

This appropriation provides for operation of this division for the first half of the biennium. Funds for the second half will come from collections from the sale of sport fishing and hunting licenses as per Chapter 122, S.L.A. 1957. The program is to be carried out by four biologists: a senior biologist located at Anchorage, a biologist at Kodiak, a junior biologist at Fairbanks, and a senior biologist at Juneau. The work is divided into four projects:

1. Lake and Stream Investigation
2. Lake Rehabilitation
3. Fish Propagation (Hatchery Operations)
4. General (office work, etc.)

LAND ANIMAL PREDATORY INVESTIGATION AND CONTROL $25,000.00

This provides for a cooperative program with the Fish and Wildlife Service on the investigation and control of wolves in Southeastern Alaska. The territorial share of the work will be carried out by one biologist and some part time help.

FUR AND GAME $25,000.00

This was really only a token allotment to get the new division started. Beginning on July 1, 1957, receipts from the sale of territorial hunting licenses will be deposited in the revolving fish and game fund. These funds will become available as they accrue for expansion of the Fur and Game Division as authorized by the Commission. It was decided to defer

action in establishing a fur and game program until the fall meeting.

The programs as outlined for the several divisions for the ensuing year were adopted, as was the financial report for the period April 1, 1955-March 31, 1957. After a discussion as to the functions and scope of the advisory committees, it was agreed that all fields of interest should be represented as follows:

1. Sport fisherman—fresh water
2. Sport fisherman—salt water
3. Hunter
4. Registered guide
5. Trapper
6. Public member (Tourism, etc.)
7. Strip fisherman (Commercial)
8. Troller
9. Gillnetter
10. Seiner
11. Shellfish fisherman
12. Long liner
13. Crew or processing plant worker
14. Processor

In accordance with provisions of Chapter 63, S.L.A. 1957, the Commission, as was done by the former Fisheries Board, delegated certain powers to the Director, which were necessary for the proper administration of the Department. The Director then presented, for the Commission's consideration, a new personnel classification and salary scale for the ensuing biennium. After its adoption, the meeting was adjourned.

REGULAR FALL MEETING, NOVEMBER 18-22, 1957

The annual fall meeting of the Alaska Fish and Game Commission was convened by Chairman Kallenberg at 9:35 a.m. at the office of the Department in Juneau.

Since the spring meeting, three new members had been appointed to the Commission by the Governor. Arthur Hayr, of Fairbanks, filled the vacancy in the hunter category and James Huntington, of Huslia, the trapper vacancy. Mr. Neil Grant, of Wrangell, replaced Mr. Wakefield who had resigned. The other four members were present thus completing the full membership of seven.

The Chairman called for the election of a vice-chairman to fill the vacancy created by Mr. Wakefield's resignation. Mr. Hayr was nominated and elected by a unanimous vote.

The minutes of the spring meeting were read and approved, as was the financial statement for the period April 1, 1955-June 30, 1957, and the period July 1, 1957-October 31, 1957.

After a short executive session, the Chairman announced that C. L. Anderson had been appointed by a unanimous vote to serve as Director of the Alaska Department of Fish and Game for a period of five years.

In view of the fact that only four members of the Commission were present at the spring meeting, the Chairman suggested that it might be well to review certain actions taken at that time so as to give the full Commission an opportunity to express their opinions. This was done and all actions reaffirmed with a few minor changes.

The staffs of the several divisions presented detailed reports covering their activities for the past season's operations. This material is covered quite thoroughly in other sections of this annual report. In regard to

the work of the fur and game division, on which no action was taken at the spring meeting, the Director was instructed to make a general survey of the basic management problems concerned with the fur and game resources of the Territory and to take such action as he deems necessary.

In answer to a request of President Patty of the University of Alaska, the Director was instructed to answer favorably by making an offer of $4,000.00 annually for participation in the work of the Cooperative Wildlife Research Unit at the University of Alaska.

Next on the agenda was the formulating of definitions for the various members of the Commission. The following were agreed upon:

Commercial Fisherman—A person who holds a territorial commercial fishing license and engages in commercial fishing during the season.

Fish Processor—A person who engages in the processing, in any manner, of fish or shellfish products.

Sports Fisherman—A person who holds a territorial sport fishing license, engages in sport fishing, but does not engage in commercial fishing.

Hunter—A person who holds a territorial hunting license, engages in hunting, is not a professional hunter, and does not engage in commercial fishing.

Trapper—A person who engages in trapping during the trapping season and does not engage in commercial fishing.

The following resolution, relative to the pollution problem that will arise when the Sitka pulp mill is completed, was introduced and adopted by unanimous vote:

"WHEREAS, the Alaska Lumber and Pulp Company, Inc., plans to construct a pulp mill at Sawmill Creek, Silver Bay, about six miles east of Sitka; and

WHEREAS, this $50,000,000 industry which will employ about 300 men at the mill and from 300 to 500 men in the woods will provide a year-around enterprise which will add to the growth and prosperity of Alaska; and

WHEREAS, a substantial fisheries industry is also involved in the economy of the area; and

WHEREAS, there is every reason to belive that the fisheries and pulp industries in this area can be compatible; and

WHEREAS, only by the maximum sustained utilization of all of Alaska's renewable resources can the Territory's full economic potential be realized; and

WHEREAS, the report by Edward F. Eldridge and Robert O. Sylvester, entitled "A Report on Silver Bay Water Pollution Control Studies near Sitka, Alaska," dated May 1957, shows what precautions must be taken so that the fisheries and pulp industries will be able to live and develop together; and

WHEREAS, this Commission wishes to compliment the Alaska Water Pollution Control Board and its Executive Committee which consists of the Alaska Water Pollution Control Board; the Alaska Lumber and Pulp Company, Inc.; the U.S. Fish and Wildlife Service; and the U.S. Forest Service for their farsighted, fact-finding investigation of the pulp mill pollution problem in Silver Bay; and

WHEREAS, Chapter 117 of the Session Laws of Alaska 1949, known as the Alaska Water Pollution Control Act, in Section 3 states, "It is declared to be the public policy of the Territory of Alaska to maintain reasonable standards of purity of the waters of the Territory consistent with public health and public enjoyment thereof, the propagation and protection of fish and wild life, including birds, mammals and other terrestrial and aquatic life, and the industrial development of the Territory, and to that end require the use of all known available and reasonable methods to prevent and control the pollution of the waters of the Territory of Alaska"; and

WHEREAS, the intent of the Alaska Water Pollution Control Act is clearly to safeguard the fisheries resources of the Territory; this intent being carried out by the Alaska Water Pollution Control Board by the classification of water uses in Silver Bay for the growth and propogation of fish, shellfish and other aquatic life; and

WHEREAS, the logging operations in connection with the pulp mill industry at Silver Bay could have a deleterious effect on the fisheries resources in the area unless properly controlled;

NOW, THEREFORE, BE IT UNANIMOUSLY RESOLVED by the Alaska Fish and Game Commission that the Alaska Water Pollution Control Board make every effort to ensure that the Alaska Lumber and Pulp Company, Inc., pulp mill to be located at Silver Bay, Alaska, cooperates with the Territory to ensure that the fisheries resources of Silver Bay suffer minimum damages from the operation of a pulp mill in that area by providing the necessary facilities to meet the following requirements:

1. Discharge of all mill effluent on the southwest side of Point Bucko in a southwesterly direction at about five feet below low water.

2. A lagoon be provided adjacent to the effluent line to have a total capacity of about 1.5 million gallons, sufficient for about one hour's effluent discharge. The effluent line should be valved so that in case of a spill, or an abnormally high waste concentration, the entire waste can be diverted to the lagoon for the period of abnormal discharge. The lagoon contents should then be pumped back into the effluent line over a period of about 24 hours.

3. That average daily recovery of sulfite waste liquor solids for any month be in excess of 85 per cent of that produced in the pulping process. (By "recovery" is meant the evaporation and burning for heat and chemical recovery.)

4. That the log barker effluent be effectively screened and the screened effluent discharged to the log pond for further removal of suspended solids by settling.

5. That knotter, flat screen and centricleaner rejects be collected and not be discharged with the mill waste.

6. That the average fiber losses in the total mill waste, in terms of suspended combustible solids, not exceed in any one month 70 pounds per ton of final product.

7. That an automatic flow recorder and sampler be installed on the process water sewer.

8. In the design of the Blue Lake dam and power facilities, provision should be made so that the total minimum discharge to Sawmill Creek can be maintained at approximately 300 c.f.s.

9. If foam presents a problem at the point of discharge a log boom should be constructed to contain the foam.

10. That a monthly report be submitted to the Alaska Water Pollution Control Board showing:

a. The average and maximum daily 5-day-20°C biochemical oxygen demand in parts per million.

b. The average and maximum daily suspended combustible solids in p.p.m.

c. The daily flow of waste in gallons.

d. The tons of production.

11. The Alaska Water Pollution Control Board should make periodic water quality and biological studies in the area as a check on mill operation and to evaluate the assumptions made from the accumulated scientific data. This should be done a minimum of once during the period of high runoff in the summer and once during the period of low runoff in late winter; and

BE IT FURTHER RESOLVED that the Alaska Water Pollution Control Board make every effort to ensure that proper logging practices are carried out in connection with this pulp mill industry so that there is a minimum change in the fresh water environment in the area and that no impediments are created to fish migration either upstream or downstream; and

BE IT FURTHER RESOLVED that this Resolution be submitted to the Honorable Mike Stepovich, Governor of Alaska; the Alaska Water Pollution Control Board; the Alaska Lumber and Pulp Company, Inc; the United States Fish and Wildlife Service; the United States Forest Service; and the Alaska Resource Development Board."

Adopted by the Alaska Fish and Game Commission November 22, 1957.

As a general policy statement the Director was instructed to make every effort to insure access and to have set aside areas on lakes and streams so that the public can enjoy the benefits of their heritage—the waters of the Territory of Alaska.

In line with the thoughts of the Commission the lake rehabilitation policy was rephrased to read as follows:

"The lake rehabilitation program includes the process of eradi-

cating an undesirable fish population from a lake, thereby placing the lake in the exclusive production of desirable fish. It means making full utilization of the potential fish production of a lake by the elimination of scrap fish that compete for food and the elimination of predaceous fish that preclude the successful establishment of desirable fish. The lake rehabilitation program includes the eradication of all the fish in a lake and the subsequent restocking with desirable fish. The program could be compared to land farming; the farmer clears his land, plants seed and produces a crop. The purpose of lake rehabilitation is to provide the maximum production of desirable species of fish in a lake.

LAKE REHABILITATION IS TO BE USED AS AN EFFECTIVE TOOL INSURING THE MAXIMUM FISH PRODUCTION BENEFITS TO THE PEOPLE OF ALASKA."

A resolution pertaining to the control of certain predators on salmon, halibut and other commercially important species was introduced and carried by a unanimous vote. This reads as follows:

"BE IT RESOLVED THAT THE ALASKA FISH AND GAME COMMISSION endorses the intent of Senate Bill 2719 insofar as it relates to control of predatory animals in particular areas where their predation or depredations have been determined to be genuinely harmful to human interests. For the reasons that the time, place and extent of predator killing is exceedingly difficult to regulate under a bounty system, and that past experience has demonstrated that this method of predation control is ineffectual and wasteful, and that, in addition, predatory animals are themselves a potentially harvestable resource which might be utilized for the benefit of mankind, this Commission suggests consideration of subsidies to processors or their agents as an alternative to direct bounty payments."

The following procedure for the activating of advisory committees was adopted:

1. In communities where Commissioners are well acquainted they will select the members of the committee and name a chairman.
2. In communities where there are no Commissioners, but where the Department has a staff member, he will work through the Director and come up with a tentative list of committee members and chairman. These names will be subject to consideration by the Commission.
3. In communities where there are neither Commissioners nor staff members, but from which requests are received for formation of advisory committees, the Director will endeavor to get a tentative list of names for consideration by the Commission.

The problem of the Japanese high seas salmon fishery on stocks of Alaskan fish was them presented and the implications discussed by Chairman Kallenberg and Director Anderson, who are members of the advisory committee to the American section of the International North Pacific Fisheries Commission. Whereupon the following resolution was introduced and adopted by unanimous vote.

"WHEREAS, the International North Pacific Fisheries Commission was created by a convention between Canada, Japan and the United States, which came into force on June 12, 1953, and under terms of this treaty the three nations agreed to establish a commission, which could recommend conservation measures for regulation of species of fish in the North Pacific Ocean, that are of joint interest to the three nations; and

WHEREAS, the said convention also recognized that the stocks of salmon spawned in the rivers of North America and the stocks of halibut and herring adjacent to the coasts of North America qualified for abstention and accordingly Japan agreed to abstain from fishing these stocks, and Canada agreed to abstain from fishing salmon in the Eastern Bering Sea; and

WHEREAS, at the time the Convention was negotiated it was expected that the stocks of salmon of North America and Asian origin might intermingle somewhere in the Mid-Pacific area, therefore a line running north and south through 175°W longitude was established on a provisional or temporary basis to separate the stocks; and

WHEREAS, the International North Pacific Fisheries Commission inaugurated in 1955 a comprehensive coordinated research program to be participated in by scientists of the three countries to solve the problems of the treaty and which has been continued and expanded in 1956 and 1957, with participation by specialists from the three countries in the fields of salmon distribution on the high seas, racial studies, scale analyses, parasitology, tagging and other related sciences; and

WHEREAS, results of these extensive studies have demonstrated that (1) there is a broad band of intermingling of stocks of salmon of North American and Asian origin in the Mid-Pacific on both sides of the provisional line, (2) stocks of red salmon spawned in Bristol Bay streams occur in considerable numbers at least as far west as 170° E longitude, approximately 500 miles west of the provisional line, (3) a large proportion of these red salmon between 175° W and 170° E longitude are immature and would, therefore, gain greatly in weight if allowed to remain in the ocean to feed until mature, (4) during the 1957 fishing season Japanese vessels caught between 5,000,000 and 10,000,000 red salmon in the above area, most of which, if not all, were destined for Bristol Bay streams, thereby depriving American fishermen of earning a livelihood; and

WHEREAS, American and Canadian fishermen have already been prohibited from catching salmon on the high seas by means of nets, are restricted to rather narrow limits along the coast and, furthermore, they are closely regulated by means of fishing seasons, mesh size, closed areas and other measures; and

WHEREAS, in view of the above facts the United States section of the International North Pacific Fisheries Commission recommended to the respective parties, at its recent meeting in Vancouver, B.C., on November 4-8, 1957, the cessation of all salmon fishing in the zone of intermingling; and

WHEREAS, this proposal of the United States Section was not accepted by the two other national sections, thereby permitting this intermingling zone to be as heavily exploited in 1958 as in 1957 to the

great detriment, perhaps annihilation, of the runs of red salmon destined for the streams of Bristol Bay; and

WHEREAS, should the Japanese be allowed to destroy the salmon fishery of Bristol Bay, which is the only source of income for the residents, the present stable resident population of the area, so essential to the national security of the United States, would be forced to move, thus creating a large uninhabited section of the country vulnerable to invasion by an unfriendly power; and

WHEREAS, the added burden of the Japanese fishing effort on the Bristol Bay runs makes it impossible for the United States Government to fulfill its treaty obligation of maintaining the fishery on a maximum sustained yield basis;

NOW, THEREFORE, BE IT RESOLVED by the Alaska Fish and Game Commission of the Territory of Alaska that the Government of the United States do everything within its power to alleviate this situation."

The Director was authorized to spend up to $1,000.00 of funds of the sport fish division for the purchase of boats to be placed on lakes in Southeastern Alaska.

Proposed changes in the commercial fishing regulations for the 1958 season were discussed with Juneau officials of the Fish and Wildlife Service and with the staff of the Commercial Fisheries Division of the Department. Several fishermen appeared before the Commission to present their views and numerous letters on the subject were read, after which the Commission instructed the Director to prepare a brief incorporating the Commission's recommendations for the coming season.

After deciding to hold the annual spring meeting at Fairbanks on or about April 7, 1958, the meeting was adjourned.

The above brief reads as follows:

December 3, 1957

Hon. Ross L. Leffler
Assistant Secretary of the Interior
U.S. Fish and Wildlife Service
Washington 25. D.C.

Dear Mr. Leffler:

The Alaska Fish and Game Commission herewith submits for your consideration its recommendations concerning the 1958 regulations of the commercial fisheries of Alaska.

These recommendations of the Commission are the result of careful study and incorporate the best and latest available biological information from your Service, our own Department, and other agencies. In addition the views of commercial fishermen, operators, and the experience and knowledge of the members of the Alaska Fish and Game Commission have been drawn upon.

A joint conference was held by the Commission with members of your staff; namely John F. Gharrett, Acting Regional Director, Bureau of

Commercial Fisheries; C. Howard Baltzo, Assistant Regional Director for Management, Bureau of Commercial Fisheries; and H. Clay Scudder, Eastern Area Supervisor, Bureau of Commercial Fisheries, to discuss the Service's proposed regulations. Their cooperation in meeting with the Commission is appeciated. The cooperative spirit between the Service and the Alaska Department of Fish and Game is increasing each year.

We wish to commend the Fish and Wildlife Service for the new research programs designed to help answer some of the management problems of the commercial fisheries. It is our belief that such research programs will aid in correcting management practices necessary to bring the fisheries back to a high level of abundance.

The Commission would be gratified if the "Laws and Regulations for Protection of the Commercial Fisheries of Alaska" could be issued earlier. An earlier issuance of these regulations would help fishermen and other interested parties in formulating their fishing plans and readying gear for the coming fishing season.

Some simplification of the regulations is also in order, both in terminology and make-up. Some of the so-called minor fisheries could be incorporated in separate sections, for instance, trolling.

The Commission repeats its many-times stated policy that wherever more effective types of gear are legally fished, the less effective types should also be allowed. In the past there have been instances of removing less effective year from various areas while more effective types were allowed to remain.

PART 101 — DEFINITIONS

The Commission reaffirms its recommendation of the past several years that definitions of all legal types of gear be incorporated in the regulations, together with a clear statement as to what time in the process of setting each gear it is considered to be legally fishing and when it is considered to have ceased fishing.

PART 102 — GENERAL PROVISIONS

The Commission reiterates its stand that fish traps be abolished in all fishing areas of Alaska. This is in line with the policies established in British Columbia and the Pacific Coast States. The people of Alaska have asked overwhelmingly for this step by referendum vote and numerous memorials. If fish traps are not eliminated an opening should be required in the lead during closed fishing periods. Perhaps a law similar to that required for the four crown traps still remaining in British Columbia would be suitable.

The Commission is in accord with the proposal to prohibit snagging of salmon in and near population centers. Not only is this a wasteful practice, causing a large loss by maiming, but is is unsportsmanlike.

The proposal to prohibit nets from setting more than two-thirds the distance across a channel at any time is in order.

PART 104 — BRISTOL BAY

The Commission is in agreement with the Service on the marking of boats for identification with the permanent Fish and Wildlife Service number.

The boundary changes on the outer Nushagak limits are in order. Markers should be provided in the river, whether they be halibut buoys, spar buoys, scows, boats, or other apparatus. The difficulty of sighting the present markers, especially under adverse conditions, has caused many unintentional violations.

The Commission agrees the greatly increased fishing effort for king salmon on the Nushagak River calls for some measures of reduction in intensity. However, there does not seem to be any great need for alarm that the king salmon stocks are depleted or near depletion. The average catch per boat has decreased from 629 fish in 1953 to 328 in 1957; however, the number of boats has increased from 40 to 220 in this same period. It is to be expected that there would be competition between gear when 220 units fish in a restricted area. During the early 1900's the fishery sustained, for a period of 20 years, a catch equal to and greater than the 1957 catch, and the decline after this can probably be attributed to economic conditions rather than depletion. Spawning ground surveys made this year on the Nushagak and Mulchatna Rivers and their tributaries revealed fair numbers of kings throughout these systems. The density of the fish on the spawning grounds was similar to that in other Alaskan king salmon rivers which the Department has studied, and the total spawning area in terms of miles greatly exceeded that in the other rivers. As this was the Department's first survey of the Nushagak area no comparison of the 1957 escapement can be made with former years.

It is recommended that the king salmon nets be limited to 28 meshes in depth to insure some escapement every day and that fishing time be reduced to 4½ days per week.

PART 108 — KODIAK AREA

The Commission is in accord with a long, continuous fishing season with shorter weekly fishing periods, and thus would favor fishing between August 3 and September 20, even if only two days per week were allowed up to September 5 when the fishing week could be extended during the silver salmon season.

The Commission repeats its recommendation made in 1956 that a 75 fathom lead be legal for purse seiners in Kodiak. In some localities, fishing with a longer lead than currently allowed would be desirable.

It is recommended that a six inch mesh cod end be used in king crab trawls rather than the present twelve inch mesh. The twelve inch mesh is not serving the purpose for which it is intended, letting small crabs escape and, in addition, it tends to mangle large crabs. It also places a hardship on the fishermen who drag and also fish pots, as they need two nets—one with a twelve inch mesh cod end for crabs and the other with a six inch mesh cod end to drag for bait for their pots.

PART 109 — COOK INLET AREA

The king crab season should be regulated by field announcement, as a set closed season from January 1 to May 31 ignores the fact that crabs may often be prime during portions of this period. In fact, as the fishery in Katchemak Bay is entirely conducted by pots, no closures for protection of soft shell crabs are necessary in this Bay. Pots do not often catch soft shell crabs and those that are caught can be released without harm.

PART 112 — COPPER RIVER AREA

It is recommended the salmon season should open May 1.

PART 114 — YAKUTAT AREA

The Commission agrees with the proposal to locate upper markers on the Dohn, East, Akwe and Lost Rivers. It is the Commission's understanding from discussion with the Service that these restrictions will impose no hardships on the fishermen in this area by forcing them out of the river into the surf.

PART 115-124 — SOUTHEASTERN ALASKA AREA

The Commission is opposed to any relaxation in the pink salmon rehabilitation program inaugurated by the Service in 1954 in view of the fact there is reasonable doubt that 1958 will be a banner pink year. The gear that has fished the past four years has been hard put to make a living from their catches. Introduction of drum seines and a twenty percent increase in traps will bring about much the same situation, even if there is a larger run. If the predicted large run does not materialize, it will be disastrous to the fleet. The amount of gear fishing the past few years is adequate to harvest any increase in runs.

A long continuous fishing season with short weekly fishing periods is favored by the Commission so that catch and escapement will be ensured for all segments of the pink runs. Normally with a short intense season differential escapements of the various segments (early, middle and late) of the runs are secured depending upon the timing of the season.

Some pink salmon spawning areas are in poor shape. The mainland area of the Southern District is one example, especially in the odd year cycle. Although there was an upswing in the escapement in 1956 in this area over the preceding few years, it is still relatively low compared to the past 20 years. This area (mainland of the Southern District) should be closely observed to ensure escapement in 1958 and especially in 1959.

The following fishing dates are suggested for all of Southeastern Alaska: Monday, June 16 to Thursday, October 23. The weekly fishing period should be of short enough duration to allow for escapement each week, say from 12:00 noon on Monday to 12:00 noon on Thursday. During the long season, it will probably be necessary to have several sustained closures by field announcement to allow additional escapements on weak runs, for instance, the early pink run previously mentioned to the mainland area of the Southern District.

The proposed extension of the Prince of Wales Island gill net area for sockeye salmon is in order. Additional space is needed to make it worthwhile to fish this area.

The Commission opposes at this time any removal of the restriction on the taking of king salmon under six pounds.

The Commission agrees that Fish Creek should be added to the list of streams near Juneau in which fishing is allowed only with hand rod, hook and line. Consideration should also be given to adding Montana and Peterson Creeks to this list.

The Commission is in favor of closing Ketchikan Creek to fishing for salmon. There has been a great wastage in the past caused by catching salmon and then releasing them dead or dying. The Alaska Department of Fish and Game has a hatchery on this stream and brood stocks of king and silver salmon returning are affected by this wasteful fishery.

The Commission believes the Portland Canal gill net area should be enlarged to conform to that allowed the Canadians in this area. Before and after the seine season, the outer limit should be from Cape Fox Island to Ford Rock and thence to the International Boundary.

The southern area, in which a quota of 10,000 tons of herring is proposed, should be divided into two areas at a line drawn from Ernest Point to Narrow Point through Tlevak Narrows and thence south to the International Boundary. A catch of not to exceed 5,000 tons should be set for the section south of this line. The remainder of the 10,000 tons to be taken north of the line.

The above recommendations and suggestions are offered in a spirit of cooperation. We hope they will help to assure a future sustained maximum fisheries utilization in Alaska.

Respectfully submitted by,

C. L. ANDERSON, Director for the Alaska Fish and Game Commission:

ROBERT C. KALLENBERG, Dillingham, Chairman

ARTHUR H. HAYR, Fairbanks, Vice Chairman

NELS E. NELSON, Ketchikan

EUGENE TORKILSEN, Kenai

DOUGLAS BABCOCK, Juneau

JAMES HUNTINGTON, Huslia

NEIL E. GRANT, Wrangell

ADMINISTRATION

The Division of Administration handles all general routine business of the Department such as accounting, requisitions, vouchers, personnel records, general files and clerical work. The activities of the Director are likewise covered in this division.

In addition to his routine duties the Director represented the Territory at several important meetings during the past year. Two conferences of the American Section of the International North Pacific Fisheries Commission were held during 1957 at Seattle, Washington, one on April 9-10 and the other on September 12-13. A full meeting of the Commission was held on October 28-November 8 at Vancouver, B.C. The Alaskan representative on the Commission was Mr. J. H. Clawson of Anchorage. The Alaskan advisors to the American section of the Commission for the past year were John W. Smith, fisherman, Metlakatla; Robert C. Kallenberg, fisherman and member of the Alaska Fish and Game Commission, Dillingham; and C. L. Anderson, Director of the Alaska Department of Fish and Game, Juneau.

The Merchant Marine and Fisheries Committee of the U.S. House of Representatives conducted a hearing in Juneau on the subjects of fisheries, transportation, etc. The Director appeared before this committee to present the position of the Alaska Fish and Game Commission.

Due to a conflict of dates the Director was unable to attend the annual fall meeting of the Pacific Marine Fisheries Commission held at Portland, Oregon on November 18-20; however, he was represented by Robert R. Parker, Senior Biologist of the Department.

During the 1957 session of the Territorial Legislature, the Director was called upon for information and assistance in legislative matters pertaining to fish and game subjects and was asked to explain the proposed departmental budget to the House Ways and Means Committee and to the Senate Finance Committee. Opportunity is taken here to thank members of the legislature for their confidence in the Department and for their support in the general appropriation bill.

During 1957 inspection and survey trips were made by the Director to the various parts of the territory, especially where fish and game projects of the Department were being carried forward. Meetings were held with fish and game representatives to explain the work of the Commission and the Department and to assist in the establishment of advisory committees to the Commission. Other duties were the preparation of the minutes of the Commission meetings, the writing of a brief to the Fish and Wildlife Service on the proposed 1958 commercial fishing regulations and the preparation of material for the Department's 1957 Annual Report, together with the compiling of information and data requested by various governmental and private agencies.

BIOLOGICAL RESEARCH

PERSONNEL

With the growth of the Department and the desire for more academic advancement among members of the staff, the roster of research personnel experienced a considerable change during 1957. Clarence Weberg transferred to the Commercial Fisheries division as District Biologist at Homer and Paul Garceau transferred to the Predator Control section, operating in Southeast Alaska. Both of these men were engaged in the Taku River studies. Doug Blanchard joined the staff in the spring as assistant and Gary Finger in December to take charge of the Taku research.

Robert Vincent left the Kitoi Research station after his third winter in residence to do graduate work at Cornell University. He was replaced by John Winther in June, who was assisted during the summer by John Dearborn from Michigan State University. Reed Stevens left the king crab project in Kodiak to take a position in Marine Biology in Florida. Roy Rickey took charge of the king crab work and will have an assistant when a replacement for Stevens is found. Robert Parker, on educational leave to attend the University of British Columbia, completed his Master's degree in fisheries, his thesis being on growth rates of trout as a function of size. After working on red salmon and king salmon troll studies in the summer, Parker continued on leave to work on his Doctorate at U.B.C. Ahron Gibor joined the staff in July to work on studies of the productivity of salmon lakes. Dan Gittings continued as Science Librarian and William Smoker in charge of the Research Division.

Biographical Sketches

Ahron Gibor was born in Jaffa, Palestine, in September 1925 and received his early education and did his undergraduate work in that country, majoring in agricultural science. He became an American citizen and entered the University of California, Berkeley, where he completed a Master's degree in Biochemistery in 1952. A Doctor of Philosophy degree was obtained from Stanford University in 1955, with a major in Biochemical Science. His Master's thesis was entitled "Phosphorus Loss from Chick Embryo Heart Tissues Cultured in Vitro" and his Doctorate thesis "Growth and Nutrition of Brine Organisms". He conducted research in Israel for a year at the Weissman Institute, returning to Berkeley in January 1957 where he worked on blood chemistry research at the University of California laboratory of criminology. His special interest has been productivity of marine ponds and, since joining the Alaska Department of Fish and Game in July 1957, he has been doing research on basic productivity in salmon lakes and on incubation requirements of salmon eggs.

Gary Finger was born in Seattle, Washington, in June 1925 and received his early education in Everett, Washington, completing basic courses at Everett Junior College. In 1948 he entered the University of Washington, receiving a B.S. regree in 1950, majoring in Experimental Psychology, and a Master's degree in Fisheries in 1957. His Master's thesis was entitled "The Role of Light Adaptation on Negative Phototaxis in Silver Salmon." He served three years in the Navy during World War II, which includede duty in the South Pacific. His research experience in salmon behavior will be of considerable benefit to Alaskan studies in this field.

John Winther was born in July 1935, in Portland, Oregon, received his early education in Edmonds, Washington, and obtained a Bachelor of Science degree in Fisheries at the University of Washington in 1957. He worked for three summers on Alaska red salmon studies in the Bristol Bay area for the U.S. Fish and Wildlife Service and on trout production research, while at the University, for the Washington State Department of Game.

Douglas Blanchard was born in Skagway, Alaska, in March 1922, where he received his early education and then attended the University of Washington for a short time, majoring in Forestry. At present residing in Douglas, Alaska, he brings to the Department of Fish and Game considerable experience in Alaska field work, particularly with boats, both on rivers and on salt water. He spent three years on duty with the U.S. Army during World War II in heavy weapons and in the Military Police. With over ten years as Customs Officer on the Taku River previous to joining the Department of Fish and Game research staff, he is of major assistance to the salmon research on that river.

Science Conference

Five biologists from the Alaska Department of Fish and Game participated in the Eighth Alaska Science Conference held in Anchorage September 10-13. William Smoker presided at the Fisheries section and the following papers were presented by departmental personnel:

"The Role of Interspecific Competition and Predation in Limiting Lacustrine Production of Red Salmon" by Robert R. Parker;

"Taku River Salmon Carcass Counts as a Means of Spawning Enumeration" by Clarence A. Weberg;

"Notes on the Birds of Kitoi Bay, Afognak Island, Alaska" by John Dearborn;

"Marine Mammals in Relation to Commercial Fisheries in Alaska" by James W. Brooks.

Details of the papers will be published in the 1957 Transactions of the Alaska Division of the American Association for the Advancement of Science. At a winter meeting of the local chapter in Juneau, a paper entitled "The Uses of Environmental Controls in Salmon Production" was presented by William A. Smoker.

LIBRARY SECTION

To keep abreast of the ever-increasing flood of publications, the research library was initiated in 1950, with the basic collection contributed by the Director and Members of the staff. This nucleus has grown. In 1951 there were 3,800 publications and by the end of 1957 nearly 10,000. Books are less current than journals and make up a far smaller percentage of the library's holdings. In 1957 eighty-five books were acquisitioned and processed. Periodicals and journals received on subscription or exchange now number 220. The major current objectives of the library are: (1) to make a functional subject catalogue out of the chaotic nature of the literature as it comes to the library. This is a difficult problem facing any science library concerned with processing recent literature; (2) to develop the collections of literature in game management and related fields, since this phase has been emphasized in the recent expansion of

the Department to fur and game; (3) to distribute regular accession lists to field personnel in order to acquaint them with what is available in the library and with the current literature in their particular field.

TAKU RIVER INVESTIGATIONS

The Taku River program continued in 1957 and, by way of new information, it was demonstrated that the fish wheel at Canyon Island could recapture a significant number of tagged fish released down river. Thus, a possible method may be provided for calculating the spawning escapement of adults as they leave the fishery and enter the river. The program started in 1951 with emphasis on king salmon and was expanded in 1952 to include preliminary studies on the other four species of Pacific salmon. Details of the background and description of the program have been discussed in the 1955 and 1956 Annual Reports. The purpose is to (1) study king salmon and others in a typical, natural Alaskan stream, (2) ascertain the role of management practice and stream improvement in the production of salmon, and (3) determine the feasibility of the fish wheel as a sampling device in turbid waters to measure adult escapement.

History

To date it has been indicated that the king salmon troll and gill net fisheries capture largely four and five year-old fish, with the troll also taking three year-old males. Gill net gear tends to remove more of the larger females (four and five year-olds) than the variable males (two to six years of age). This results in unequal sex ratios on the spawning grounds (one female to almost six males in 1957), which constitutes a considerable waste of male fish. The catch per unit of effort of the fish wheel has been correlated significantly with the catch per unit of effort of the gill net fishery, showing that relative abundance of spawning escapement can be measured by the fish wheel. However, whether or not the fish wheel can indicate actual abundance requires additional study.

A troll fishery occurs on both Taku king and silver salmon and the catches of Taku kings has been estimated for the years 1951 to 1955 (1956 Annual Report), ranging from three to nine thousand fish. Increased restrictions on the 1956 and 1957 troll fishery have reduced by one-half the available time for fishing at the peak of the run (about the first of June) and, with the entire month of May closed to the trollers in the Taku area, probably half of the total run of Taku king salmon is permitted to escape troll fishing as indicated in Table 1, which lists the gill net catch and catch per unit of effort. 1957 gill net catches were characterized by somewhat lower over-all catches, with the exception of the chum harvest of 82,700 fish, which was over double the usual catch and constituted the best on record for this species in the Taku. For the pinks, red, and silver salmon, the lowered catch per boat-week, indicated that the smaller total seasonal harvest was due not only to the shortened fishing time but also to the stocks being less abundant. Since the catch per unit of effort of Taku kings remained high, the low total catch of this species was probably due to the shortened fishing season and indicates a more favorable spawning escapement.

Troll, Gill Net and Fish Wheel Catches

Table 1. TAKU RIVER

Catch in numbers of fish at the fish-wheel and in the gill net fishery. Catch per gill net boat-week in parentheses*.

YEAR		KINGS		REDS		PINKS		SILVERS		CHUMS	
1951	Gill Net Catch	9,792	(6.1)	63,687	(39)	75,027	(39)	27,540	(17)	7,582	(5)
	Fish Wheel Catch	426	June* 12-18								
1952	Gill Net	12,941	(7.5)	45,233	(32)	39,293	(26)	29,865	(22)	23,945	(14)
	Fish Wheel	590	June 5-11	1,776	July 24-30	13,253	July 17-23	1,943	Aug. 28-3	2,087	Sept. 25-1
1953	Gill Net	16,766	(8.8)	51,570	(40)	6,914	(7)	20,502	(24)	18,504	(16)
	Fish Wheel	214	June 12-18	1,075	July 24-30	2,095	July 17-23	796	Aug. 28-3	1,785	Sept. 25-1
1954	Gill Net	14,348	(8.6)	54,260	(33)	24,282	(16)	42,545	(25)	63,018	(29)
	Fish Wheel	281	July 3-9	1,840	June 19-25	21,613	July 24-30	981	Sept. 25-1	2,676	Sept. 25-1
1955	Gill Net	10,686	(7.0)	28,765	(22)	16,129	(14)	40,470	(21)	15,352	(8)
	Fish Wheel	71	June 12-18	470	Aug. 31-6	1,516	July 10-16	446	Aug. 7-13	521	Sept. 25-1
1956	Gill Net	11,253	(8.4)	36,601	(28)	11,592	(12)	27,767	(23)	38,785	(23)
	Fish Wheel	327	June 29-4	1,208	June 19-25	6,782	July 24-30	260**		24**	
1957	Gill Net	8,482	(8.4)	27,226	(21)	6,633	(7)	27,491	(20)	82,726	(40)
	Fish Wheel	91	June 19-27	670	July 17-23	1,664	July 10-16	44***		31***	

*Peak weekly catch per standardized 24 hour fishing day.
**Wheel closed August 24.
***Wheel closed August 29.

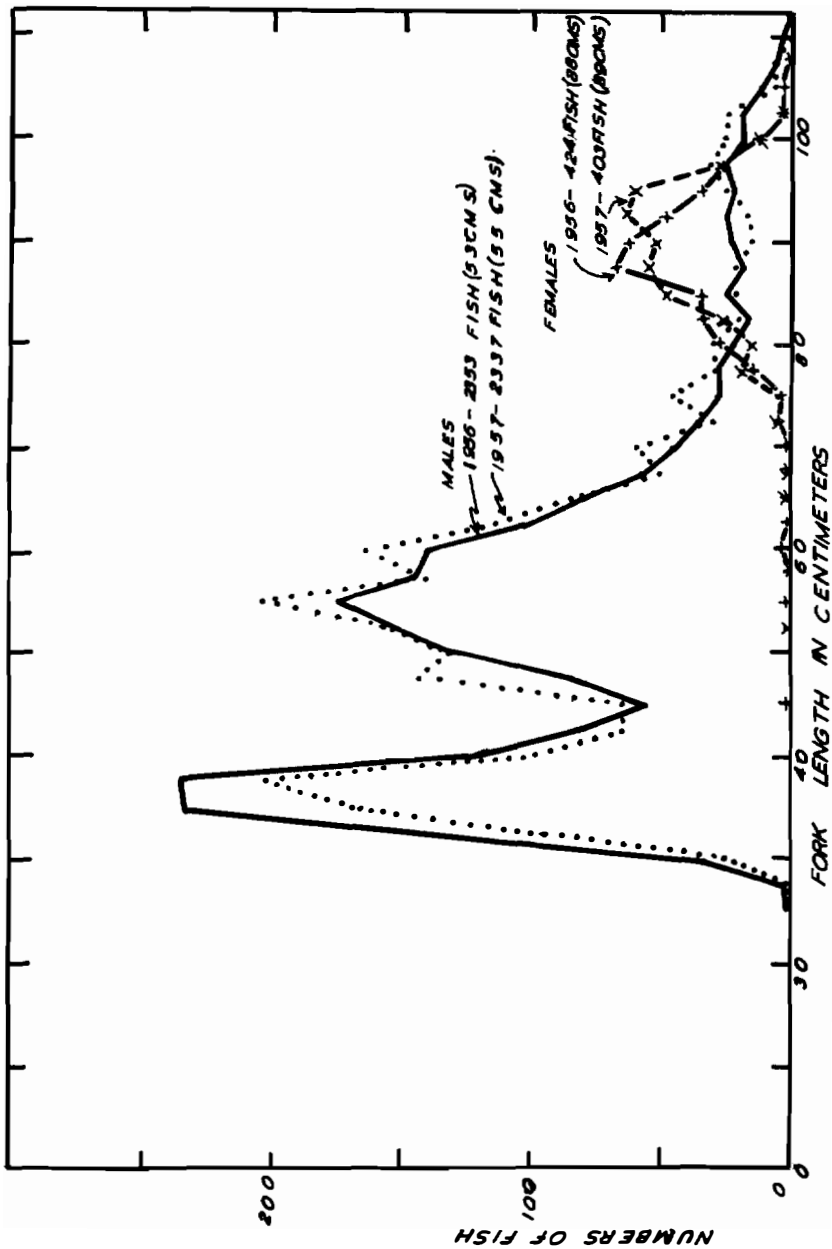


Figure 1. Length distribution of Taku king salmon carcasses recovered on Nakina spawning ground weir.

Table 1 also lists for the fish wheel sampling device total catches and occurrence of the peaks of the runs.

Where the sampling has been adequate, as in the red salmon, the fish wheel catches have reflected the abundance of the species in the gill net fishery.

On a trial basis, fish tagged at the fish wheel were released a distance of one mile downstream. The results were inconclusive but demonstrated that, with improvement in techniques, significant numbers of recaptures were possible. With such information in the future, the percentage of fish taken in the wheel at various water levels may be calculated and the total number of fish passing upstream ascertained.

Spawning Ground Studies

The Nakina River spawning ground studies for Taku king salmon was continued and the carcass collecting weir installed in 1956 was placed in position in 1957 again previous to the spawning period. Table 2 shows that the 1957 counts were quite similar to 1956 and that the extent to which small salmon, particularly jacks, are not seen in standard riverbank surveys was about the same in 1957 as in 1956. In 1956 about 65 per cent of the large adults actually present were observed from the bank and 63 per cent in 1957, which is a very close verification. Figure 1, in addition to demonstrating a close agreement between 1956 and 1957 in length of chinooks on the spawning ground, also emphasizes the very large number of small precocious male "jack" salmon, which are not harvested in either the commercial or recreational fisheries and constitute a waste in that respect.

Table 2.
Comparison of Nakina River-bank counts of Taku king salmon with total count of carcasses at weir.

Year	Count of Salmon from River-banks	Actual Count of Carcasses at Weir			
		Male			
		Jack	Adult	Female	Total
1956	550 fish	1,925	428	424	2,777
1957	543	1,870	457	403	2,730

Silver Salmon Creek Falls Improvement

In 1956 it was observed that a falls on Silver Salmon Creek, which flows into the Nakina just below the carcass weir, was serving as an obstruction to sockeye salmon at the existing stream flow. This caused large numbers of this species to fall back downstream and to collect in the Nakina above the weir with a natural Nakina run. Many of these died unspawned and, in 1956, 807 female and 490 male carcasses collected at the weir. Improvements were made at the falls, as described in the Engineering section of this report, in early 1957 previous to the sockeye run. The water flow was greater in 1957 with more water spilling over the falls and with a greater depth in the pools. Only 121 females and 90 males were collected unspawned on the Nakina weir indicating that the block conditions were not so severe with the higher water flow.

Kitoi Bay Research station on Afognak Island is located on salt water with many nearby lakes for salmon and trout studies.

KITOI BAY RESEARCH STATION

The program of this station, located on Afognak Island near Kodiak, continued in progressing toward the goals described in previous Annual Reports. The principal problem is that of developing techniques for introducing red salmon into lakes that are not being utilized at the present.

Of great interest was the first count of smolts from Ruth and Midarm Lakes in the spring of 1957. As discussed in the 1956 Annual Report, these lakes were planted with red salmon fry from Kitoi Lake under a study program financed in part through a research contract with the U.S. Fish and Wildlife Service, authorized by the Saltonstall-Kennedy Act.

Predator-Competitor Studies

Ruth Lake, from which all resident fish had been removed, produced yearly migrants amounting to 35 per cent of the fry planted, while Midarm Lake whose resident fish had been left untouched had a downstream migrant count of only 1.4 per cent (Table 3). This unprecedented smolt production of Ruth Lake from a hatchery fry release needs further analysis to evaluate its full significance: there were hold-over fingerlings in both the planted lakes, Midarm and Ruth, which will migrate as two year olds and the picture will not be complete until the fish return as adults. Another significant comparison is with the natural production of yearly smolts in the parent or donor system, Lake Kitoi, where only approximately two per cent of the estimated fry from natural spawning migrated as yearling smolts.

Weir with inclined screen by-passes all red salmon fingerlings leaving Ruth Lake to trap for counting and subsequent release downstream.

Because the 1956 run of adults donor fish into Lake Kitoi was small, the females being about one-fourth as numerous as in 1954 and 1955, only a small number of eggs was taken into the hatchery and by the spring of 1957 only 66,000 fry were available for planting. In order to provide a reasonable semblance of a natural overlapping of brood years, the entire lot was released into Ruth Lake. The fry were planted by airlift from the hatchery in five-gallon cans in lots of 6,000 fry per can, with about 10 minutes time lapsing between removal from the hatchery trough and placement in the lake. The fry were planted in mid-June, which was a month earlier than the 1956 plant and reflects the more mild winter and spring of 1957. The fry were observed schooling and feeding in the lake shallows in late August.

After two years since treatment with toxicant to remove resident fish, Ruth Lake continued to show a high periphyton index in 1957. Either any increase in basic productivity, due to the fertilizing effect of the scrap fish carcasses, did not diminish greatly by the second year or the possibility is emphasized that Ruth Lake is naturally a more productive lake than Kitoi. The periphyton study was continued merely on a technique-testing basis and the opportunity to compare Ruth Lake with Kitoi was coincidental. The suspension of many small glass microscope slides used in 1956 was modified to the use of large, six by six inch glass plates (Figure 2). The attached algae on the plates, which were suspended five feet below the lake surface for 30 days, were scraped off and measured volumetrically. The comparison of 1957 algae growth in neighboring lakes is presented in Figure 3.

Figure 2. Glass plates suspended under surface may show lake productivity by measuring growth of attached algae.

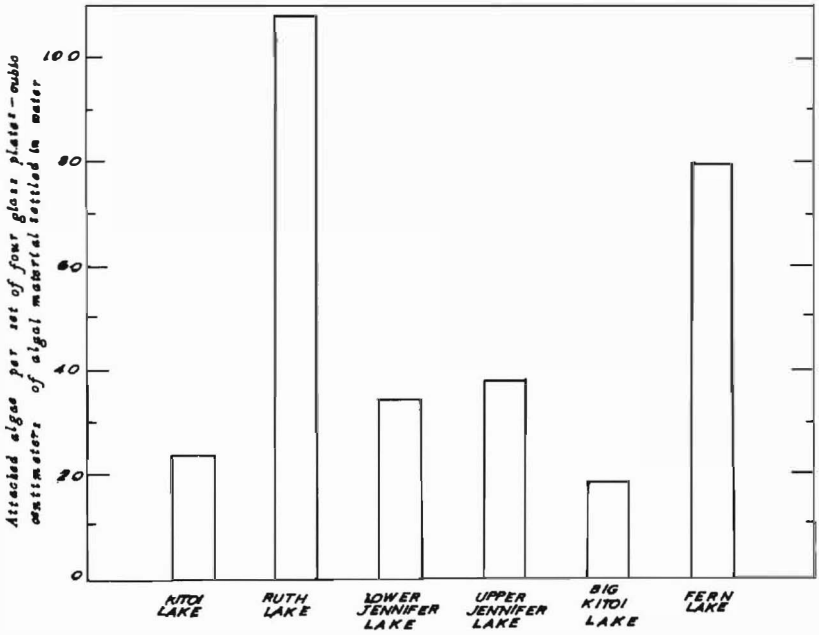


Figure 3. Sixty day growth of attached algae in Kitoi Region lakes, summer 1957.

The intertidal reach of Ruth Lake outlet presents hazards to salmon smolts entering salt water. Here they are exposed to sea gulls, crows and foxes.

Floating ponds used to test basic productivity of salmon lakes.

Table 3. Red salmon smolt migration from Lake Kitoi, 1955-1957.

Year	Number of Migrants (average fork length)			
	One Lake-Growing Season		Two Lake-Growing Seasons	Total
	May Migration	June Migration	June Migration	
1955	None recorded	17,000 (73mm)	12,000 (81mm)	29,000 (76mm)
1956	41,000 (39mm)	9,000 (61mm)	1,000 (72mm)	51,000 (44mm)
1957	1,200 (55mm)	33,000 (63mm)	2,800 (73mm)	37,000 (64mm)

Table 4. 1957 Counts of Sockeye Smolts Recruited from 1955 Brood

Lake	Surface Acres	Recruitment from 1955 Brood	Seaward Yearling Migrants	Peak Day of Downstream Migration	Outlet Temperature Peak of Migration	Average Fork Length	Average Weight (grams)	Approx. Fish per Acre	Migrant Yearlings as percent of Recruitment
Kitoi	90	2,000,000 eggs	20,000 fish (approx.)	June 4	61°F.	62mm	2.0	1.0 lbs.	1.0%
Midarm	15	80,000 fry	1,142	June 7	62°F.	72mm	2.7	0.5 lbs.	1.4%
Ruth	47	90,000 fry	31,407	June 7	64°F.	100mm	10.6	15.5 lbs.	34.9%

Smolt Migration

The 1957 red salmon smolt migration from Lake Kitoi, as indicated in Table 3, was more like the first migration counted in 1955 and did not repeat the pattern of 1956 when large numbers of very small fish migrated in May, which was a month earlier, from under the ice.

It is of interest that in 1957 the peaks of the smolt migrations, not only from the planted lakes, Ruth and Midarm, but also from the parent lake, Kitoi, all occurred in early June. Since the latter lake lagged behind by several weeks in the spring warm-up of water (Table 4), the question arises as to whether or not accumulated hours of daylight or perhaps population pressures provide the stimulus for the smolt migration, rather than accumulated temperatures. This will be studied more thoroughly in the future.

The 1957 silver fingerling smolt migration was similar to the previous two years, with the fish appearing to be in excellent condition. The age analysis is yet to be done but apparently most of them had spent more than one growing season in the lake. The fry-of-the-year were few (Table 5), and this is of interest because of the comparatively large parent silver escapement in 1956 (Table 6).

Table 5. Silver Salmon smolt migration from Lake Kitoi 1955-1957. Number of Migrants

Year	Fingerlings	Fry	Total
1955	3,500	1,000	4,500
1956	3,450	1,350	4,800
1957	3,900	200	4,100

Adult Studies

The adult salmon at Kitoi were delayed, due to the negligible flow from the outlet resulting from the low rainfall. The small early-July segment of the run was counted into the lake on schedule but the August runs of sockeye and the silvers were held by low flows off the creek mouth. The salmon schooled and moved in and out with the tide. Finally, in late August, stored water from Lake Kitoi was released for short daily periods at high tide and the adults attracted up to the weir were counted, measured, and placed in the lake. By this time the sockeye salmon had their spawning colors and many of the males were ripe.

Also in late August, 25 females and 25 males were held in a 40-foot deep net in the lake, to test whether or not they could be ripened in this manner. Most of these fish were spawned successfully by hand for the hatchery in early October. A few of the females were missed because they apparently released their eggs in the holding net (after becoming gravid but before there was a chance to examine them), while other fish escaped in October through a tear in the net. Because of the small run

Table 6. Number of Adult Fish Arriving at the Kitoi Weir. 1954-1957.

	RED				SILVER				DOLLY VARDEN			
	1954	1955	1956	1957	1954	1955	1956	1957	1954	1955	1956	1957
Males	864	806	158	125	——	189	——	166	——	——	——	——
Females	1,150	1,202	269	251	——	88	——	145	——	——	——	——
Not Sexed	——	——	19	——	289	——	338	——	80	589	410	61
Jacks	215	95	349	103	——	15	29	29	——	——	——	——
Total	2,229	2,103	795	479	289	292	367	340	80	589	410	61
Egg Take		500,000	130,000	60,000				35,000				

of adult red salmon, only 60,000 eggs were taken for the hatchery from the 1957 brood. This was supplemented in December by 50,000 eyed eggs from the Ketchikan hatchery in order to provide a significant fry release into Ruth Lake in 1958.

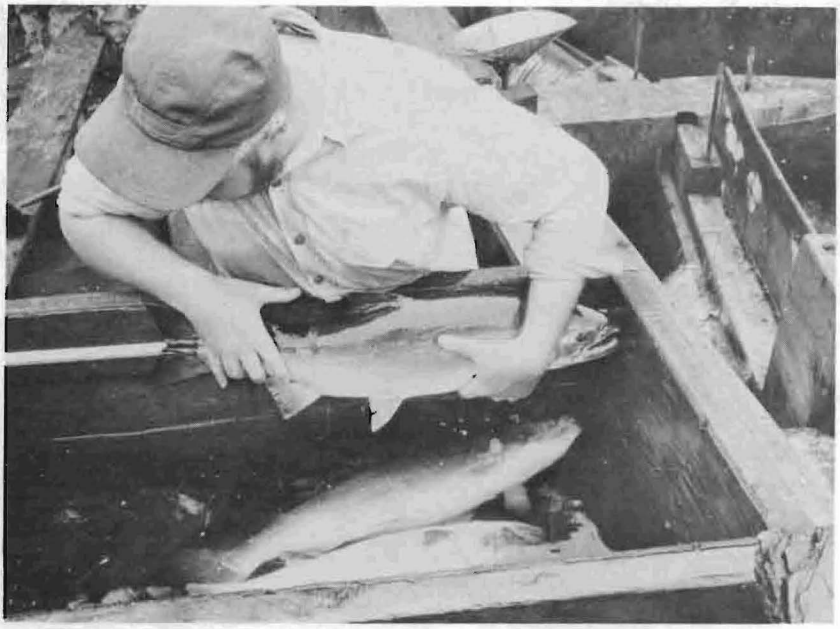
Fish buyer cleaning king salmon caught by gill netter, Taku Inlet.

Marine Survival

In 1957 for the first time at Kitoi most of the returns from a single red salmon smolt migration could be examined through scale studies. Smolts counted downstream in the spring of 1955 returned as jacks in the fall of 1956 and as adults in 1957: Table 7 shows that, while the 81mm smolts with two lake-growing seasons were in a ratio of 1 to 1.4, with the 73mm smolts having one lake-growing season, when the males came back as jacks they were in the ratio of only 1 to 3.9 and when the adult males and females came back they were in the ratio of only 1 to 1.8. This would indicate that the smaller yearling smolts had a better ocean survival rate than the larger two-year old smolts.

Jack Salmon

As demonstrated in Table 6, the large number of jack red salmon counted into Lake Kitoi in 1956 did not forecast a large run of adults in 1957. Some indication as to the early differences between jacks and adults has come to light in Kitoi red salmon scale studies.



At Lake Kitoi outlet weir, anesthetized adult salmon are measured and scale samples taken to determine age and growth of the fish.

Table 8 shows that, among the one-lake season smolts in 1955, the average growth amounted to about 10.2 circuli, whereas, of the fish returning from this group, the jacks in 1956 had had an average growth of 11.7 circuli and the fully grown males and females in 1957 showed 7.1 and 8.4 lake-growth circuli, respectively. This might indicate that the jacks came from young males that had good growth in the lake. It further raises the question of whether or not in salmon lake management, if understocking occurs and the fry enjoy unusually good feeding condition, a high proportion of the males will mature precociously, return a year early as jacks, and thus be lost to the fishery and result in a waste of lake productivity. This problem will be studied in the future.

Table 7. Comparison between proportions of one-lake season red salmon smolts to two-lake season smolts found in 1955 downstream migration and their return as adults.

		One Lake Season (73mm)	Two Lake Seasons (81mm)	Total
Fingerling smolts	1955	59%	41%	100%
Jacks	1956	79%	21%	100%
Adults	1957	64%	36%	100%
Total returns		71%	29%	100%

Table 8. Fresh water Circuli Counts of samples of one lake-season smolts and adults from the 1953 brood of Lake Kitoi red salmon.

Number of Circuli	Smolts 1955	Jacks 1956	Males 1957	Females 1957
0				
1				
2				
3				
4				2
5			8	7
6			15	19
7	6	1	12	15
8	12	0	11	20
9	51	1	7	2
10	52	3	13	6
11	45	6	2	8
12	27	4	2	9
13	10	4	2	1
14		2	0	5
15		2	1	1
Average	10.2	11.7	7.9	8.4

SILVER SALMON INVESTIGATIONS

The success of the introduction of red salmon fry into a lake cleared of resident scrap fish in the Kitoi studies encouraged a similar test in the Southeast Alaska region, with emphasis on silver salmon. Princess Bay Lake near Ketchikan was selected and treated with rotenone May 18, 1957, in cooperation with the Commercial Fisheries management section.

Princess Bay Lake

The lake has a surface area of 22 acres with a volume of 734 acre feet. It has a cascading rapids in the outlet stream, rendering it virtually impassable to naturally migratory fish such as salmon. On May 17, 1957, the lake surface was 51°F. and the water was slightly acid with a pH of 6.1, total dissolved solids 23 parts per million, and had a slight bog color. The removal of resident fish was apparently complete. Around the perimeter of the lake from the shoreline to a depth of six feet (i.e. 0.6 acre examined), the fish-kill tally was as listed in Table 9. Only a few fish were observed floating on the lake surface away from the shore.

Princess Bay Lake remained toxic, particularly in the lower depths, until late October or early November when the fall overturn occurred.

In the fall of 1957 eggs from silver salmon at Ward's Cove and red salmon at Kah Shakes Lake were taken into the Ketchikan Hatchery for hatching and release, in the spring of 1958, into Princess Bay Lake. The two species will be released together into the lake, in order to determine

Table 9. May 17, 1957 fish-kill tally along shore of Princess Bay Lake following application of Rotenone.

Species	Average Length	Number Counted
Stickleback	2 inches	512
Cottids	3 inches	171
Dolly Varden	5 inches	43
Cutthroat	5 inches	85
Silvers*	4 inches	44

*Probably from Ketchikan Hatchery fry release in 1955.

Shallow ponds are studied for possible rearing of salmon fry.

the extent to which silver fingerlings may be competitors or predators on red salmon fingerlings, and also whether or not a lake supporting two different species of salmon may show a greater total production than if it is occupied by only one.

Streamflows and Southeast Silver Abundance

As indicated in the 1956 Annual Report, the published commercial catch data available to 1954 showed a significant correlation between adult silvers landed commercially and the annual runoff experienced by those fish as juveniles in their natal streams two years previously. In 1957, three more years of catch data permitted the addition of three more points to the graph and, as shown in Figure 4, the catches were con-

siderably lower than expected from the annual streamflow relationship. It may be due to an actual decline in abundance of silver stocks during 1955 to 1957 that is not related to streamflow, such as a less-than-optimum spawning escapement. Perhaps for those years the annual runoff of Fish Creek, which is used as an index stream, was not a valid representation of the runoff in Southeastern Alaska streams generally. A third possibility might be the occurrence of short periods of excessively low flows or sharp floods that are not reflected in the annual streamflow. The reasons for this decline will be investigated further.

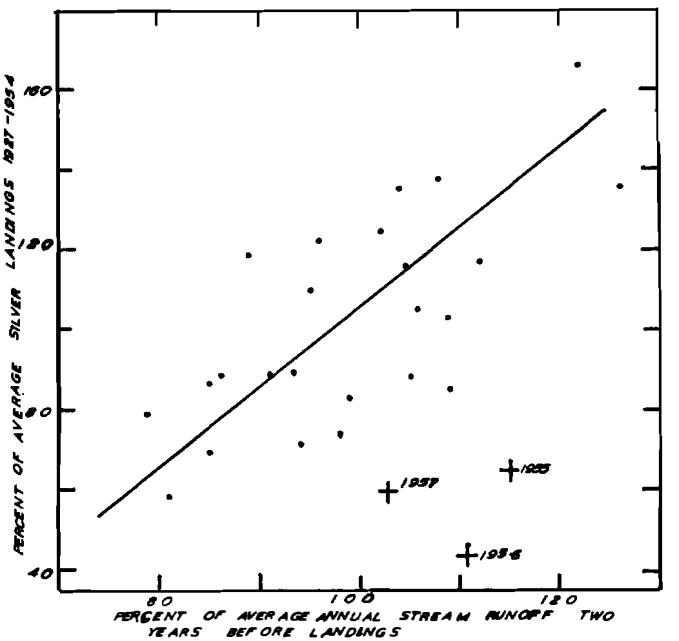


Figure 4. Comparison of Southeastern Alaska silver salmon landings in 1955, 1956, and 1957, and previous landings in correlation with Fish Creek annual streamflows.

KING CRAB INVESTIGATIONS

The king crab studies at Kodiak continued although the project operated the last six months under a handicap, in that a full time biologist was not available. The work during this period was supervised by the local Commercial Fisheries Biologist, who has had a long experience with the king crab fishery.

During the year, a detailed tabulation was completed of the previous commercial catches of king crab so that trends in numbers and sizes, as well as catch per unit of effort of crabs landed in the various fishing areas, may be computed.

A study was started June 28, 1957, under a contract with the U.S. Department of the Interior through the Fish and Wildlife Service, with

funds authorized by the Saltonstall-Kennedy Act, entitled "Investigation of the Growth Rates of King Crab in the Kodiak Area". Growth will be studied by releasing tagged crabs of all sizes in Chiniak Bay and recording the growth of the recaptures in the following months, changes with time in the size frequency distribution of crabs captured in the fishery, and by measurements in individual crabs held in a live tank as they pass through moulting stages. In the first six months of this study several types of tags were studied. It was decided to use a small identification plastic disc with a single plastic "thread" for attachment through the isthmus, located under the posterior edge of the carapace, rather than the previously-used plastic thread with printed identification enclosed in a sleeve. In November, 1957, an efficient method of obtaining crabs for tagging and release was developed. A fishing boat was chartered to obtain crabs by pot fishing. A load of several hundred king crabs was brought in the boat's live tank to the dock in Kodiak, where they were tagged with an assembly line procedure and then returned in the live tank and released in the area of capture. The crabs remained in excellent condition and this technique allowed the work to proceed in an efficient manner, away from the bad weather conditions of the open sea.

In the four-year period since the Department has started king crab studies, over 3,300 tagged crabs have been released. These have consisted of undersized males and all sizes of females. Recoveries are still occurring; ten per cent have been recaptured and returned to the Department, and are available for analysis as to growth and migration.

GENERAL RESEARCH SECTION

During 1957 results from several special studies were obtained. A number of lakes are being used by the Department in research studies and it is desirable to compare them by physical measurements, since these will have an influence on their basic productivity. There are a number of measurements used to describe lakes, such as surface acres, average depth and volume of water, but such properties as irregulartiy of the shoreline and extent of shoal areas are not usually expressed. From available survey data, indices for these factors were derived for some of the study lakes. Shoreline irregularity was expressed as the length of the actual shoreline of a lake, divided by the shoreline of that lake if its surface area was contained in a perfect circle and hence had no irregularities. The shoal area index was expressed by dividing the average depth by the median depth. The average depth is obtained by dividing the total volume by the surface area and the median depth is that depth for which the surface area over greater depths is equal to the surface area over lesser depths. In lakes with steep sides the median depth is greater than the average depth and for lakes with large shallow areas the median depth is less than the average depth. The physical properties of the study lakes are compared in Figures 5 and 6 from a study by Dr. Smoker.

Lake Shore and Shoal Indices

It is of interest that Ruth Lake has the highest indices for both shoreline irregularity and for proportion of shoal areas. These may indicate high basic productivity and provide part of the explanation as to the success of fry introduction into this lake.

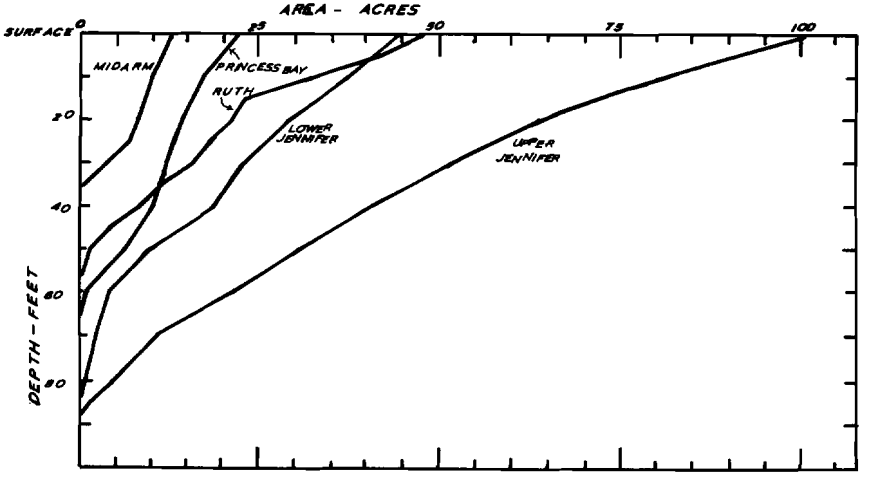


Figure 5. Comparison of areas and depths of experimental lakes used in salmon introduction studies.

Troll Chinook Fatigue

During August of 1957 a preliminary study was conducted by Robert Parker of the Research Division, in cooperation with Dr. Edgar C. Black of the University of British Columbia, on the effects of the severe exercising king salmon undergo in the troll fishery on blood levels of lactic acid. Sixty-six chinook salmon were taken by trolling about 15 miles off Cape Fairweather, Alaska. Blood samples were taken to determine the sequence of blood levels of lactic acid during post-exercise recovery in a live box. The blood level of lactic acid increased during the first 3.5 hours of post-exercise rest, followed generally by a gradual decline. Indications are that complete recovery was not achieved prior to eight hours of rest. A third of the fish died with no apparent severe injuries. The maximum mortality rate was during the period of maximum blood levels of lactic acid. It was concluded that, while a chinook salmon may survive in a live tank, it is not adequately prepared to meet further stress in its natural environment in less than eight hours.

It has long been a dream of salmon and trout agencies to develop a method of egg incubation in a non-flowing or closed water system, thus freeing the hatchery from the exacting and often expensive demands of a flowing water system. In 1957 Dr. Gibor of the Research Division demonstrated that salmon eggs could be hatched in perfectly still water, by using algae to provide oxygen for the eggs and to remove the waste products released by them. The eggs were placed in an aquarium with green plants under continuous illumination. Of several plants tried, a unicellular green algae suspension gave the best results. The possibility of using the principles of this procedure for large scale hatchery processes is at present under investigation.

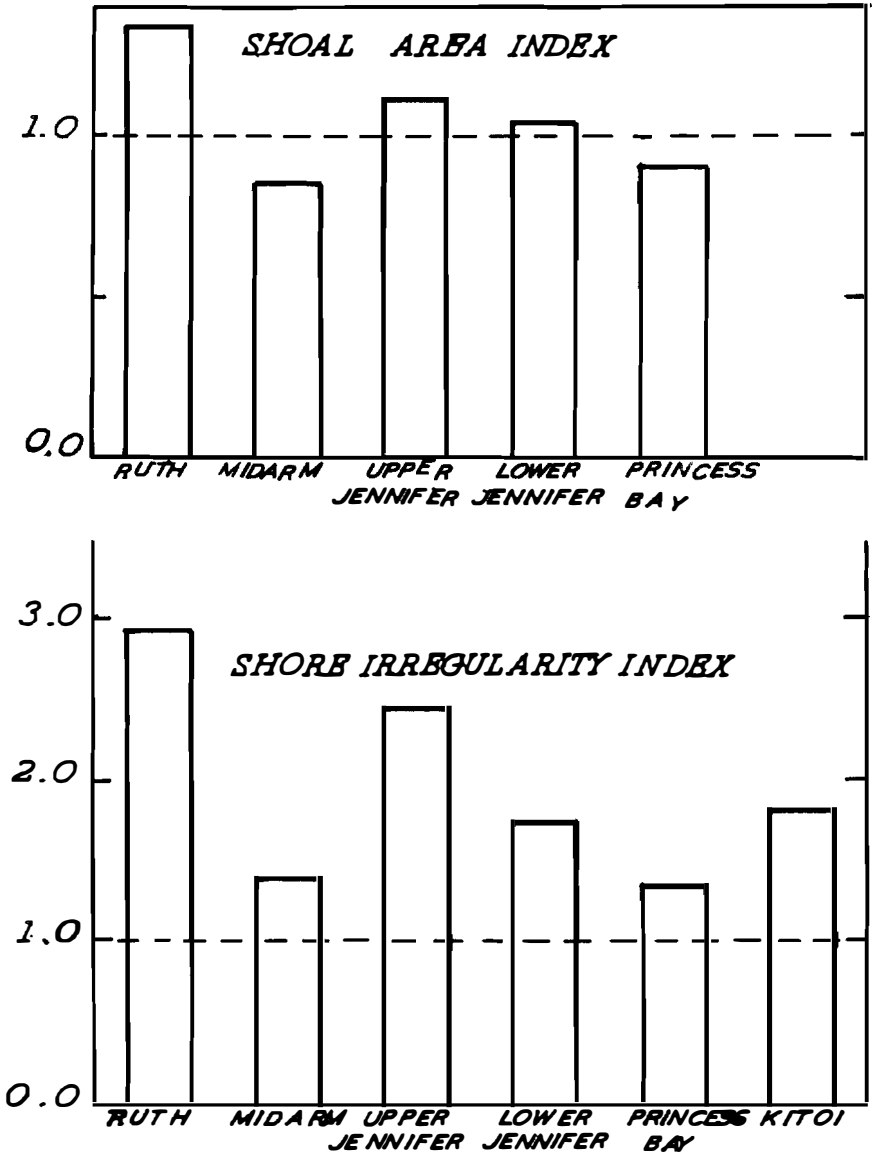


Figure 6. Comparison of shoal areas and shoreline irregularities of experimental lakes used in salmon introduction studies.

ENGINEERING DIVISION

Technical and professional engineering services were provided for the several divisions of the Department. These included a great variety of diverse subjects ranging from evaluation of ideas and data through designs, plans and specifications to ordinary field surveys.

Land surveys for public access areas were made for Knik Lake (Knik Arm), Lost Lake (Richardson Highway), Lower Fire Lake (Anchorage) and Meier Lake (Palmer). Construction planning surveys were made for Birch Lake outlet control structure, Fire Lake Hatchery water supply and Frazer Lake Falls fishway. Lake topographical soundings and maps were made for several lakes on which development is contemplated or under study.

Bids on contract construction of the Little Kitoi Lake fishway and of the Deer Mountain Fish Hatchery concrete fish troughs were rejected, as all bids received were deemed too high. Wood troughs were substituted at the hatchery and were built at a cost of $690.00 each for the two-compartment five by sixteen foot troughs. A concrete fish ladder and holding tank (Figures 1 and 2) at Deer Mountain Fish Hatchery was completed under a $7,500.00 contract by a Ketchikan contractor. This ladder provides for elevating upstream migrants seven feet from Ketchikan Creek into a concrete holding tank adjacent to the hatchery building. A $120,000.00 contract was awarded to a Ketchikan contractor for construction of a fishladder and incidental structures at 38-foot high Bakewell Falls, 50 miles easterly of Ketchikan, the project to be completed by late summer, 1958.

Figure 1. Deer Mountain Hatchery fishway. The cover grating has been removed. Ketchikan Creek is in the background.

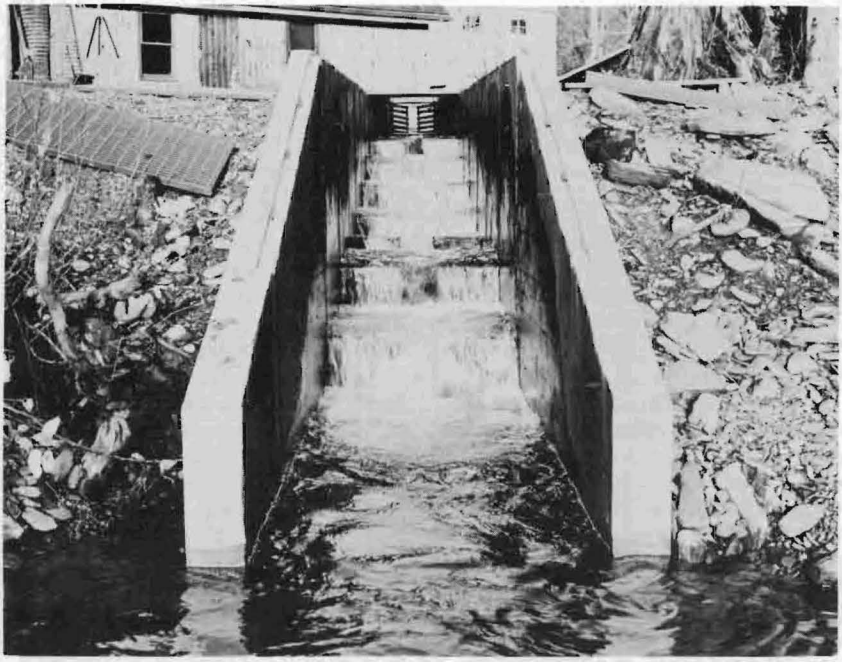


Figure 2. Deer Mountain Hatchery fishway.

Figure 3. Weir constructed by Department on tributary of Taku River.

Departmental personnel constructed a stone-ballasted log deck dam (Figures 3 and 4) to maintain tail water pool levels on a tributary of the Taku River. The falls had been a low water block to upstream migrating red salmon. This project, constructed entirely of indigenous logs and stone, enables migrants to negotiate the falls at all conditions of river flow.

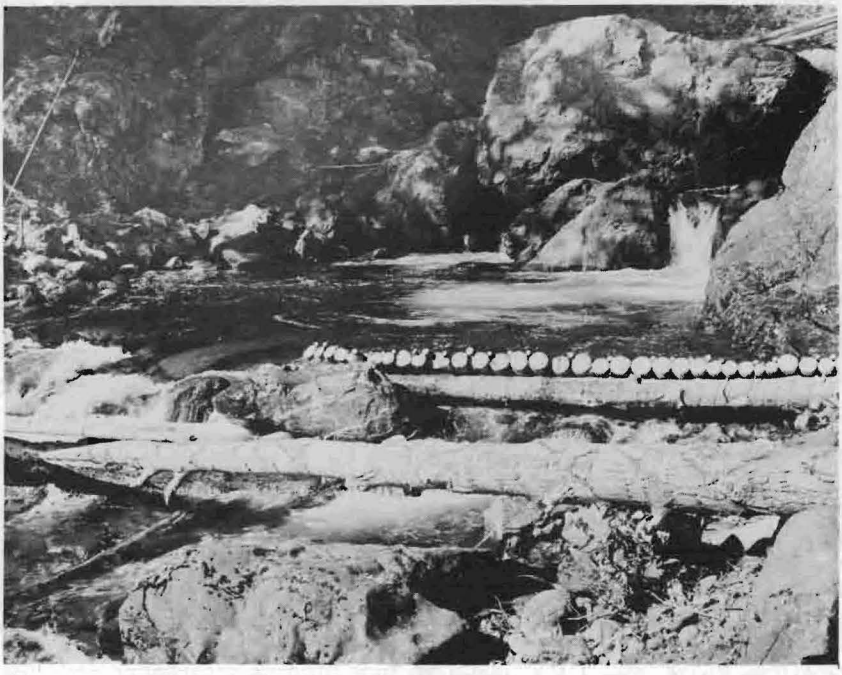


Figure 4. Weir on tributary of Taku River. This construction raised the water level in the pool so salmon could negotiate the falls (right background) at all water stages.

Full scale prototypes of experimental, lightweight, sectional, steep fishpass models of aluminum alloy plate were fabricated and delivered to the Kitoi Bay Research Station at a cost of $375.00 per foot of lift. A typical installation will be made for field checks in 1958, including fish behavior studies.

INSPECTION

As in past years, the Department assisted the U.S. Fish and Wildlife Service in the enforcement of the Federal regulations for Alaska's fish. In addition, during 1957, the inspectors assisted with the enforcement of the Federal game regulations.

The 1957 Territorial Legislature passed a new Sport Fishing and Hunting License Act, Chapter 122, Session Laws of Alaska 1957. This Act repealed the former Sport Fishing License Act, Chapter 93, Session Laws of Alaska 1951, which required a Territorial license for sport fishing but did not require a Territorial license for hunting. The 1957 Act set up a new scale of license fees for sport fishing and for hunting as well.

The new Act stipulated that all the sport fishing and hunting license fees were to be deposited in the revolving Fish and Game Fund. Chapter 63, Session Laws of Alaska 1957, which establishes the Fish and Game Fund, among other things, states that no funds accruing to the Territory from sport fishing and hunting license fees can be diverted to any purpose other than the protection, propagation, investigation, and restoration of the sport fish and game resources and the expenses of the administration of the sport fish and game division of the Department. Disbursements from the fund are made by the Territorial Treasurer upon authorization of the Alaska Fish and Game Commission.

The new Teritorial Sport Fishing and Hunting License Act required the services of the temporary inspectors for a longer season than was formerly the case when there was only one license—sport fishing. The inspectors, in addition to checking sport fishermen for licenses, must check hunters during the hunting season, particularly in the fall of the year.

The inspectors have, as their primary responsibility, the duty of protecting the fish and wildlife. Their efforts in public relations and in diligently patrolling their areas are pointed toward this objective. The presence of the inspector in the area being patrolled acted as a strong deterrent to fish and game violations, thus insuring compliance with the regulations. Inspectors were stationed at Afognak Island, the Upper Copper River drainage and interior Alaska, and the Anchorage-Palmer-Kenai Peninsula areas. One man was stationed in each of the three mentioned locations. In addition, all of the field biologists of the Department were deputized and did enforcement work from time to time.

Clarence W. Selig, the Afognak Island inspector, confined his efforts largely to Pauls Bay and Perenosa Bay during the salmon fishing season. He was also of assistance to the biologists working on the Laura Lake system.

Charles W. DeBoer patrolled the Upper Copper River drainage and interior Alaska. The area was worked from the highways using a panel truck for both transportation and living quarters. Lakes and streams were checked by hiking in from the highways. Salmon protection during the spawning migration and checks of sport fish anglers and nimrods kept the inspector on the jump.

Bruce Graham worked the Anchorage-Palmer-Kenai Peninsula area. In this area one finds the heaviest concentration of fishermen and hunters in Alaska. The patrol was conducted from the highways and on foot.

During the season, 16 violators of the Territorial Sport Fishing and Hunting License Acts were apprehended. The cases were processed through the U.S. Commissioner's Courts; all violators pleaded guilty. The fines assessed ranged from ten to twenty-five dollars.

EDUCATION AND INFORMATION

The division now has one full time employee. Two 25-minute sound films in color were produced by this Division during the year. They were as follows:

1. Construction of a fishpass by the Engineering Division on a tributary of the Taku River.

2. Predator Investigations on a sea lion rookery in the Gulf of Alaska.

This brings the Department-produced films to eight.

The Department's film "Quest for Better Fishing" was shown rather extensively in the Kodiak, Homer and Dillingham areas. Forty-five showings of the film were made in Southeastern Alaska in schools, various clubs and community gatherings to audiences totalling nearly 7,000 persons.

Films from the Department's film library were circulated about the Territory.

News releases were issued to radio stations, newspapers, etc. to keep the public informed about the work the Department is doing to augment and conserve this important resource.

The 1956 Bulletin was compiled and issued.

Mail inquiries, which were mainly from Stateside concerning fishery opportunities in Alaska, were answered.

Vessels of king crab fleet at Alitak Bay, Kodiak Island.

PREDATOR INVESTIGATION AND CONTROL

by

James W. Brooks

This division is charged with the investigation and control of predation that appears detrimental to human interests. The major predator species concerned are harbor seals, sea lions, belugas, gulls, and dolly varden trout, while the important prey species involved are salmon, halibut, black cod, and herring. In addition, the scope of activities during 1957 was broadened to include study of wolves in relation to deer, as well as some actual wolf control in Southeastern Alaska.

ACKNOWLEDGEMENTS

The Department of Fish and Game is pleased to acknowledge the continued cooperation and assistance extended by the Cordova Seal Committee, the Alaska Packers Association, and the numerous commercial fishermen who have replied to our sea lion questionnaires or otherwise rendered valuable aid.

POLICY

The general policy of the Department with respect to predation remains unchanged: Control of the predation by any species will be conducted only subsequent to establishment of the need for the control, and the methods employed will be those that are most efficient and, at the same time, the least destructive of animal life having natural or other values. Under no circumstances will control be carried to the point where any species is threatened with extinction.

PERSONNEL

The division staff, with changes noted below, includes the following men:

Permanent basis employees.

James W. Brooks, Biologist
Archie S. Mossman, Assoc. Biologist
Paul Garceau, Junior Biologist
Harold Z. Hansen, Deputy Seal Hunter

Temporary basis employees.

Clifford Kilkenny (Wrangell)
Stanley Miller (Wrangell)
Doyle Cisney (Petersburg)
Clancy Henkins (Juneau)
Calvin E. Aiken (Cordova)
Gary Daetz (Cordova)
Charles H. Mohr (Cordova)
Mathew Pytel (Cordova)
Charles S. Wells (Cordova)
Denton R. Moore (Kokhanok Bay)
Alex Tallekpalek (Kvichak Bay)
Charles F. Wilson (Kvichak Bay)

Mr. Clifford Kilkenny, employed for several years as a seal hunter in the Stikine River gill net fishery, died on July 20 (See obituary p. 124). Mr. Stanley Miller was hired to carry on control work through the remainder of the season.

There were two changes in the Division's permanent staff. Dr. Archie Mossman, whose research dealt with bird and trout predation on salmon, resigned in August to accept a university teaching position. Mr. Paul Garceau, employed in the Division of Biological Research, transferred to the Division of Predator Investigation and Control in October, and was assigned to the newly initiated wolf project.

HARBOR SEAL CONTROL

Gill net salmon fisheries are subject to depredations by harbor seals which damage or destroy captured fish. The control of seals in the fisheries of the Stikine, Taku, and Copper River areas again constituted a small but prominent part of the Department's fishery improvement program. As in former years, rifle hunters were employed in the Stikine and Taku areas, while depth bombing with dynamite was continued in the Copper River district. A description of the latter technique may be found in the Annual Report for 1954.

The kill of seals in 1957 is listed below by locality.

Stikine River	396
Taku River	60
Copper River	4,250

Stikine River

At the time of Mr. Kilkenny's death (July 20) he had killed 298 seals on the Stikine River. Seal depredations were then of an insignificant nature, and it was thought unnecessary to replace him for the remainder of the season. This conclusion proved erroneous, for in the absence of harassment by a hunter, seals rapidly moved back into the fishery causing serious trouble. At the request of numerous fishermen and Mr. Charles Meacham, the Department's District Biologist, another hunter (Mr. Stanley Miller) was hired to control seals from September 1st to 30th. This influx of seals into the unprotected fishery confirms that the destruction of seals, in itself, does not adequately safeguard a gill net fishery: the scaring and harassment connected with shooting is perhaps of equal importance.

Taku River

Following the 1956 season, it was felt that in the Taku vicinity seals had been locally reduced to the point where the fishermen could readily protect themselves, and that no seal control by a Departmental hunter would be necessary in 1957. However, the king salmon season had hardly gotten well started in the spring of 1957 when it became apparent that some control would be required. Mr. Clancy Henkins was therefore hired to shoot seals for a brief period during the spring.

The experiences of 1957 in the Stikine and Taku Rivers support the view arrived at previously that the destruction of seals in Southeastern

Alaska by our hunters and by bounty hunters has little residual benefit. We are contending with a large widespread seal population which through readjustments shortly obscures the results of removing small numbers of animals from any one locality. Nevertheless, seal depredations in Southeastern Alaska, being restricted in time and place, are rather easily kept under control by our present localized programs.

Figure 1. Seal hunter with scope-sighted rifle collects seals in an area where salmon are being caught with gill nets.

Copper River

Protecting the Copper River gill net fishery presents a more difficult problem because the fishing effort is dispersed widely. Shooting and harassment are impractical, and recourse to large scale destruction of seals proved necessary. Here, definite inroads have been made in the seal population in an area large enough to make peripheral influx appear relatively slow. Because seal depredations have been so costly to this fishery, continuing pressure on the seals, sufficient to prevent population recovery, seems imperative. Such action will not only assure protection to the fishery, but will avoid expensive repetition of the large scale control operations which have been conducted in recent years.

HARBOR SEAL INVESTIGATIONS

Incidental to seal control operations, much information is gathered on the seal's life history and its relationship to various fish species. Such

information is considered highly important to an eventual understanding of the true role of the seal in the animal communities in which it exists. Judging the animal's worth by reference only to its contacts with commercial fisheries may lead to wrong conclusions. For example, food found in seals' stomachs shows that they feed on a variety of fish species. Some of these fish, as sculpins, flatfish and cod are known to be predators on young salmon, particularly around stream mouths during the seaward salmon migration.

Thus far, it seems that the more information one obtains, the more complicated the seal problem becomes. It is anticipated that a full time biologist will be assigned to seal investigations in the future, in an attempt to hurry conclusive results.

WOLF CONTROL AND INVESTIGATION

In cooperation with the Fish and Wildlife Service, the Department this year inaugurated a program of wolf control and investigation. Paul Garceau was permanently assigned to this work and Doyle Cisney was hired as a temporary employee.

Figure 2. Biologist Paul Garceau with a large timber wolf collected in the Ketchikan area, December, 1957.

Wolf control began in November, after bears entered hibernation, in localities adjacent to Ketchikan and Wrangell according to a priority system established by the Fish and Wildlife Service. Areas which could support good accessible herds of deer, but which appear to be prevented

from achieving satisfactory deer production because of wolf predation, were given most attention. Wolf control was also practiced in one or two areas where there was some evidence of rabid wolves near human habitation.

Mild weather and lack of snow allowed deer to forage away from the beaches and created a situation that rendered effective wolf control extremely difficult. However, many more wolves are believed to have been killed than were actually recovered for, without tracking snow, they could not be followed away from lethal stations.

In connection with the investigation phase of the project, carcasses or parts of carcasses recovered were saved for biological study. Some information was gained on the distribution and abundance of wolves and the relationship of this to deer abundance. It is planned that research of this type will be accelerated during 1958.

Figure 3. Photograph made during an aerial census of 450 sea lions on rock west of Crawfish Inlet, Baranof Island.

SEA LION INVESTIGATIONS

Population Estimate

The investigation of sea lions in Alaska has now progressed beyond the survey stage. All of the important rookeries and hauling out sites are believed to have been located, either by Department of Fish and Game or by Fish and Wildlife Service biologists. The Fisheries Research Institute has also made extensive surveys, mostly in central and western areas, though their information has not yet been made public. It is reason-

able to conclude on the basis of available data that the total sea lion population in Alaska is in excess of 100,000 animals. In relation to the enormous area occupied, this number of animals might appear to be small. Nevertheless, the degree of crowding on all rookeries examined indicates that sea lions are near their possible peak abundance, unless new rookery sites are pioneered in the future.

Other phases of the investigation include efforts to learn the seasonal pattern of movements, the reproductive success, the year round food habits, the extent of depredations in commercial fisheries, and means of controlling such depredations. To date, more than 100 sea lion pups have been tagged with cattle ear tags being placed on their flippers. It is hoped that future recoveries of these marked animals will yield information on movements. A more ambitious tagging program is planned for the future.

Tagging

Figure 4. Cattle ear tag in place on a sea lion pup's flipper, Lewis Island, Gulf of Alaska, June 1957.

From sea lion stomachs examined, it is known that the animals eat a wide variety of fish; squid are also an important food, at least during the winter season in Southeastern Alaska. Herring were found more frequently and in greater quantity than any other food on a year around basis. Halibut, flounders, cod, rock fish, greenling, sculpins, salmon and even chitons were also eaten. As collecting continues, an even wider range

Food Habits

of food items will undoubtedly be revealed. It appears doubtful that significant quantities of commercial species of fish, with the possible exception of salmon, are taken while free swimming. It is perfectly certain, however, that important quantities of black cod, halibut and salmon are taken from fishing gear, mainly trolling lines and long lines. The animals are equally a nuisance around salmon traps and purse seining operations in certain localities.

Figure 5. Biologist measuring a sea lion specimen collected on Lewis Island, Gulf of Alaska, June 1957.

Depredations

With regard to depredations in the commercial fisheries, questionnaires returned from fishermen provide some information. Recognizing the likelihood that fishermen experiencing sea lion trouble are more apt to have the incentive to return questionnaires, the results are nevertheless of interest. The returns from the halibut fishery represent 253 boat days of fishing with an average reported loss per boat day of 11 fish, or about 440 pounds if they were of average size. This quantity would have a value to the fishermen of about $88.00. Reports from salmon trollers, mostly in the outside waters of Southeastern Alaska, represent 564 boat days of fishing. The reported loss was three fish per boat day which together would have a value of at least $6.00. We do not have information on the total fishing effort and, in any event, it is doubtful that one would be justified in projecting the above losses to cover the entire fleet during the whole of the season. Typical of the remarks added to the questionnaires by fishermen are the following:

"Could be bombed", "Thin down as soon as possible", "Send the Coast Guard out to destroy them", "Recommend bounty on sea lions", Use dynamite, guns, poisen, A bombs".

Figure 6. Weighing a 50-pound sea lion pup, Lewis Island, Gulf of Alaska, June 1957.

At this point, the sea lion problem is far from being resolved, though much more is known about it than ever before. The reproductive rate of the animals is considerably lower than was believed prior to the initiation of this investigation. The sea lion's food habits are not particularly detrimental except when the animals are in contact with an active fishery. The percentage of the total sea lion population that commits depredations is extremely small, for the great bulk of the animals are occupied with reproductive activities on rookeries during much of the fishing season. With the background of facts reviewed above, the Department will continue to give serious attention to the sea lion problem, particularly with respect to the development of economically practical ways of controlling depredations.

BELUGA INVESTIGATION

As related in earlier Annual Reports (see particularly that for 1955), our investigations have revealed that in Bristol Bay belugas prey heavily on salmon. This predation is considered to have its most harmful effects when it involves Kvichak River downstream migrating red salmon of year classes that are already numerically small. Therefore, an effort was

Figure 7. Sea lions on Chiswell Island rookery, July 1957.

made in 1957 to keep belugas out of the Kvichak River, where most predation occurs, and so protect the anticipated small seaward migration of salmon.

The method employed to repel belugas was simply to chase them out of the lower reaches of the river with a fast outboard-driven skiff whenever they were sighted. Dr. Archie S. Mossman, who conducted this work in 1957, expressed the view that because of the extremely small seaward salmon migration and the harassment of the belugas he was able to effect, relatively few young salmon were lost.

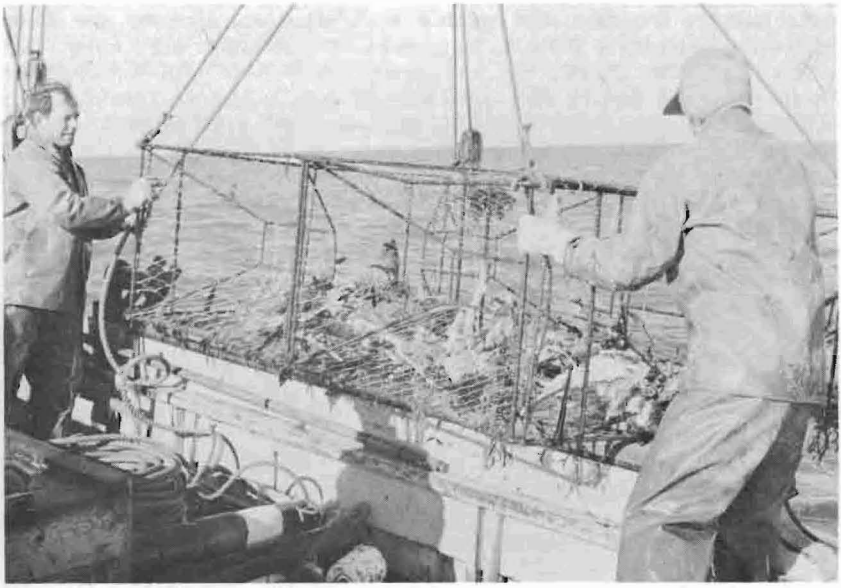
This method of controlling predation has severe limitations because, during bad weather or the hours of darkness, it is difficult and often impossible to detect and frighten the belugas. Another repelling technique has been considered and that is transmitting through the water sounds that may induce fright in the animals. The sounds emitted by the belugas themselves, when in panic or agony, offer some hope in this connection. Dr. Mossman succeeded in recording on tape some beluga sounds, though the animals were in an undisturbed state at the time. When additional recordings of sounds produced under different circumstances are obtained, experiments will be conducted to measure the response of the belugas to them when they are transmitted.

PREDACEOUS BIRD INVESTIGATIONS

The investigation of bird predation on salmon during 1957 was limited to field observations in the Kvichak River. Dr. Archie S. Mossman, who conducted this research, concluded that no serious predation occurred because of the very small seaward salmon migration. The gulls did not congregate to prey on fish, as was the case in former years when migrations involved much larger numbers of salmon.

Field work in 1957 allows no further comment with respect to glaucous-winged gull predation on spawning salmon or on salmon eggs. It is believed, however, that such predation was locally severe this year because of low rainfall and the consequent shallowness of many streams.

Methods of frightening terns and gulls were tried out briefly but with relatively small success. Further experiments with scaring devices in areas where predation on salmon is concentrated will be pursued in coming seasons.



Lifting king crab pot during February fishing, Alitak Bay, Kodiak Island.

COMMERCIAL FISHERIES DIVISION

The work of the Commercial Fisheries Division has been directed towards two main objectives:

1. Acquainting the District Biologists with their district. In the event of statehood, these are the men who will be the management biologists and we will rely on them for a great deal of the information necessary to form intelligent regulations.

2. Experimenting with methods of enlarging our salmon populations by other means than management of the existing runs.

In order to accomplish (1) above, the District Biologists are acquainting themselves with the people, fisheries, and spawning watersheds in their districts by, (1) taking part in community activities, (2) working in the various fisheries aboard the boats during actual fishing operations, (3) encouraging the fishermen to drop in and talk, ask questions, and give their views and experiences, (4) spending time on the salmon spawning areas during all seasons of the year, thus becoming acquainted with the streams used, numbers of fish, timing, and stream conditions during the various seasons, (5) conducting meetings with various interested groups, such as schools, fishermen and clubs, and giving talks accompanied by slides and moving pictures on various educational phases of conservation work and, (6) conducting research on specific problems relating to the salmon in the various districts.

The work of establishing new salmon populations, other than existing runs, has so far been directed at utilizing areas for salmon production that are blocked by barrier falls. These areas differ from salmon producing areas only in the fact that salmon are denied entrance by the falls; their water chemistry, plankton content and temperatures are similar. The watersheds in the districts are cataloged. Watersheds with suitable sites for fishways are selected and experimental work initiated. Test plantings in several watersheds have indicated that successful runs of red and silver salmon can be started by introducing eggs or fry so that the adult fish will return to the new spawning and rearing area by means of the fishway.

Another phase of this work has been habitat improvement. Experiments have shown that by removing the predator and competitor fish by means of chemical treatment, the survival of introduced salmon can be increased as much as thirty times. Habitat improvement is being tried by the Commercial Fisheries Division in selected watersheds in the various districts. This tool of management opens up the possibilities of utilizing blocked bodies of waters, at least as rearing areas, in which salmon eggs or fry can be introduced and from which young migrants are allowed to proceed to sea to mature and then to enter the various commercial and sport fisheries. It may also be possible to use this tool on watersheds with existing major runs which have reduced salmon populations; however, further research is necessary to learn all the ramifications of its use before attempting any large project of this nature.

The following reports on the progress of the Commercial Fisheries Division represent the combined efforts of the staff:

Walter Kirkness, Senior Biologist
Stanley D. Swanson, District Biologist, Ketchikan
Roy A. Rickey, District Biologist, Kodiak
Clarence A. Weberg, District Biologist, Homer
Charles H. Meacham, District Biologist, Wrangell
A. Dean Paddock, District Biologist, Dillingham
Lee Larsen, Fish Culturist, Ketchikan

KETCHIKAN DISTRICT

The main emphasis in the Ketchikan district during the past several years has been directed at experiments to increase salmon production by making use of watersheds now blocked to salmon by falls. This has proceeded in two phases: (1) introducing salmon eggs or fry into natural bodies of water blocked by falls to test their rearing capabilities and, (2) improving the habitat by removing the undesirable fish before introducing salmon. The Deer Mountain Hatchery has greatly facilitated this program by providing a source of fish for these experiments. This hatchery was erected in 1954 by the Ketchikan King Salmon Derby Committee, sponsored by the Ketchikan Chamber of Commerce, for the use of the Alaska Department of Fish and Game. It is located in the city of Ketchikan at the edge of the city park. The fish rearing capacity of the hatchery was substantially increased during 1957 by the installation of two deep wooden rearing troughs. Another facility added to the hatchery was the fishway* designed to allow the returning brood stock fish to swim up into the holding pens in the rearing ponds. Seventy-two fish ascended this ladder into the hatchery holding pen during 1957. Of these, 65 were returning adult silvers from the hatchery's first plant in 1955.

Natural Lake Plant—
Red Salmon

Old Franks and Bakewell Lakes have been planted in the past with eyed and green red salmon eggs to test the rearing capabilities of the lakes. The Old Franks system was planted in 1952 and 1953 with 60,000 and 35,000 red salmon eggs, respectively. Returning adult red salmon were seen jumping at the falls in this system in 1956 and 1957. No actual count of the returning fish could be made but 25 jumps were observed in a period of ten minutes in August 1957.

The Bakewell Lake system, which has been described in past Annual Reports, will have a fishway constructed in 1958. During 1957 this system received a release from the hatchery of 323,100 red salmon fry and in addition 525,000 red salmon eggs. The eggs were taken from Buschman Creek, Hugh Smith Lake near Bakewell Lake, and planted the same day in a tributary stream of Bakewell Lake with the same temperature characteristics as that of Buschman Creek.

Since the first plants of red salmon in the Bakewell Lake system were made in 1954, the first year of returns for this plant is expected in 1958 when four year-old adults should come back to the base of the falls. At this time the fishway should be completed or near completion.

*Picture and description in the Engineering section.

The green egg plants were made into the Bakewell Lake tributary by the use of cylinders (Figure 1). Trenches were dug in the gravel parallel to the current in suitable areas of the stream bed. The cylinders were placed in the upstream end of the trench, one immediately below the other. Several rocks, six to eight inches in diameter, were placed in the bottom of the upstream cylinder and 9,000 to 10,000 eggs were poured over these rocks. The eggs settled into the spaces between the rocks. Then gravel was added to a level slightly higher than the stream bed. The cylinder was then lifted free of the trench and placed downstream from, but next to, the second cylinder. The cylinders were then filled and rotated until the full length of the trench was utilized.

Figure 1. Planting eyed red salmon eggs in Bakewell Lake tributary by cylinder method.

Brood Stock Experiments

Experiments have been conducted at the hatchery to establish a small run of brood stock silver salmon which will return to the hatchery on Ketchikan Creek. This brood stock, if successfully established, will be used as a nucleus for planting rehabilitated and barren areas. The young salmon are reared in the hatchery dirt ponds and allowed to migrate out at will.

In the spring of 1955, 53,000 fry of the 1954 brood were introduced into one of the dirt ponds. They migrated as fingerlings into Ketchikan Creek in January 1956. An adipose fin had been removed from 2,200 of this group for identification. In 1956, 12,500 young silvers of the 1955 brood were put into the pond. These 12,500 were all marked by removal of the adipose and left ventral fins.

During the fall of 1957, 65 adult silver salmon from the 1955 plant returned to the hatchery via the fishway which had been installed that summer. Figure 2 shows two of these fish which had been marked by removal of the adipose fin. The first silver came into the holding pen on October 13 and the last on December 18. The greatest number of fish on any one day was November 22 when 12 fish ascended the fishway.

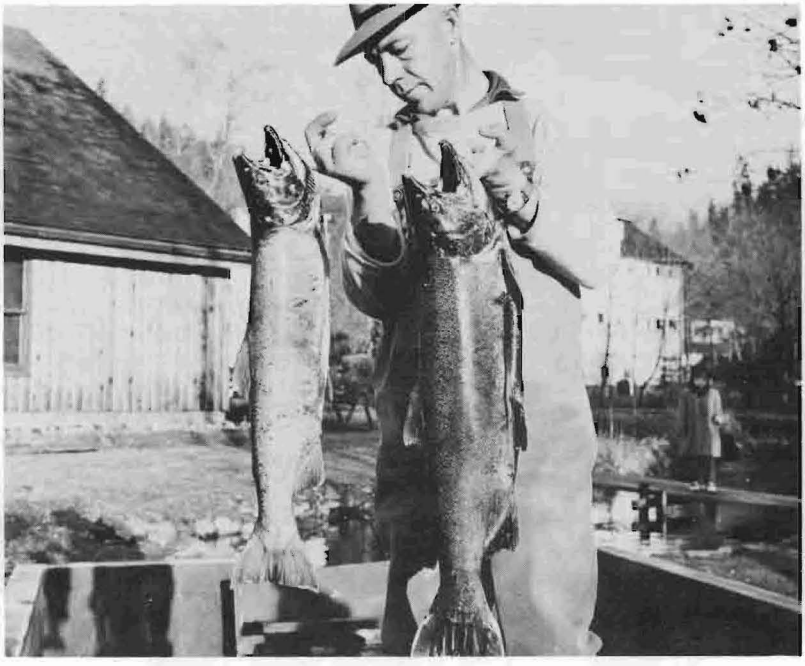


Figure 2. Two silver salmon which returned to Ketchikan Hatchery marked as fingerlings by removal of adipose fin.

In addition to the 65 silvers of the 1954 brood, two jack silver salmon of the 1955 brood returned. These both had the adipose and left ventral fins missing, as they were originally marked. Four other jack salmon entered the trap but escaped before they could be identified.

Lake Rehabilitation

Preliminary results from planting red salmon in lakes from which all other fish have been removed by chemical application show a very high survival to migratory size. An experiment to use this tool with silver salmon was inaugurated in cooperation with the Biological Research Division in the Ketchikan district in 1957. Princess Bay Lake on Revillagigedo Island was treated with rotenone in May of 1957. This lake is situated about 40 miles from Ketchikan in southeastern Behm Canal. It has a surface area of 22 acres, an average depth of 33 feet and a maximum depth of 65 feet. Although the surface waters down to about 12 feet were non-toxic after one month, the deeper water remained toxic until the end of November. Tests with

live fish at this time demonstrated that the toxicity had completely dissapated.

Fry plants of silver and red salmon will be made in the spring of 1958. This experiment will be one of a series to find if more pounds of desirable fish can be raised by mixing the species or by keeping them separate.

During 1957 silver and red salmon eggs were taken from several sources to provide eggs and fry for the continuation of the above experiments. All of the necessary red salmon eggs—775,000 in number—were taken from the Hugh Smith Lake system. Of these, 250,000 were taken to the hatchery for rearing, while 525,000 were planted into the Bakewell Lake system on the days taken, as previously described.

Salmon Egg Taking

Silver salmon eggs were taken from the returning adults to the hatchery, Kah Shakes Lake and Ward Creek. In the latter instance, the egg-take was in the form of a salvage operation, as a number of fish were dying below the Ward Creek Dam due to low flows.

A different type of trapping weir than normally used was constructed at Kah Shakes Creek. Normally, picket-type weirs are rendered inoperative by high flows in this district during the fall. Instead of the conventional picket-type weir, a log and plank dam was placed across the stream. The dam had an orifice through which the fish could gain entry to proceed upstream, into the trap which was placed directly above the dam. During normal flows all the water flowed through the orifice; at high flows water also poured over the face of the dam in a thin even spill.

As the largest single amount of water came through the orifice, even at the highest flows, the fish were always attracted to this opening. Figure 3 depicts the weir and trap under construction.

Figure 3. Kah Shakes trapping weir under construction.

Surveys of the pink salmon spawning grounds in the Ketchikan District were made by skiff, plane and on foot. The escapement was lower than the parent year (1955) for most streams in the Ketchikan area. Two large pink salmon streams in this area, the Wilson and Keta Rivers, received the lowest escapement recorded in the past nine years.

Pink Salmon Escapement

KODIAK DISTRICT

Evaluation of the red salmon egg plants in Laura and Frazer Lakes was continued in 1957. Both of these systems, which were formerly barren of salmon due to falls in their outlets have been planted with red salmon eyed and green eggs. Laura Lake is now accessible to salmon by fishways installed in 1952. Frazer Lake is still blocked. The progress of work on these systems has been reported upon each year in the Annual Reports since 1951.

The seaward migration of red salmon smolts from Laura Lake in June followed the same general pattern as reported in previous years. A modified inclined screen or Wolf Trap was used to capture the migrants. The trap was operating only during a sampling period from six to ten p.m. At all other times the trap was closed and the lead lifted to permit unobstructed passage of the smolts downstream. Sampling in other years has shown that the bulk of the smolts from Laura Lake pass out of the lake and downstream in large schools between six and eleven p.m.

Laura Lake

Table 1. Age composition of downstream migrants—Laura Lake—1957.

Age at Migration	Red Salmon Number Sampled	Per cent of total	Silver Salmon Number sampled
1	226	69.7	
2	66	20.4	
3	32	9.9	
Totals	324	100.0	202

Table 2. Age composition of adult red salmon returning to Laura Lake—1957.

Age of Salmon	Number of Salmon	Percent of Sample
3_2	64	27.8
4_2	71	30.9
4_3	5	2.2
5_2	64	27.8
5_3	19	8.3
6_3	7	3.0
Totals	230	100.0

The dominant age class of the downstream migrants has not changed since the first migrants were sampled in 1953 (Table 1). The majority of the smolts, 69.7%, leave the lake after spending one winter in fresh water.

Silver salmon are now well established in Laura Lake. The numbers of silver salmon smolts indicated in Table 1 as compared with the numbers of red salmon migrants is slightly misleading as, although silvers are more easily trapped, they apparently migrate downstream at random 24 hours a day.

The smolt trapping was curtailed early at Laura Lake, due to more urgent need for the available personnel in other areas.

Table 2 lists the age composition of the returning adult red salmon run in 1957. A total of 230 were counted into Laura Lake (Figure 4). The age of the salmon is designated by two numbers as 3_2. The first number, 3, represents the total age of the fish; in this case the fish was in its third year. The sub-number, 2, represents the age the fish left fresh water—in this case, the second year. Three age classes were predominant in the returning adults, 4_2, 5_2, and 3_2, thus reflecting the predominant age of down-stream migrants—fish in their second year or having spent one winter in fresh water. It is interesting to note that 69 of the returning fish spent one year in the sea, 90 spent two years and 71 spent three years.

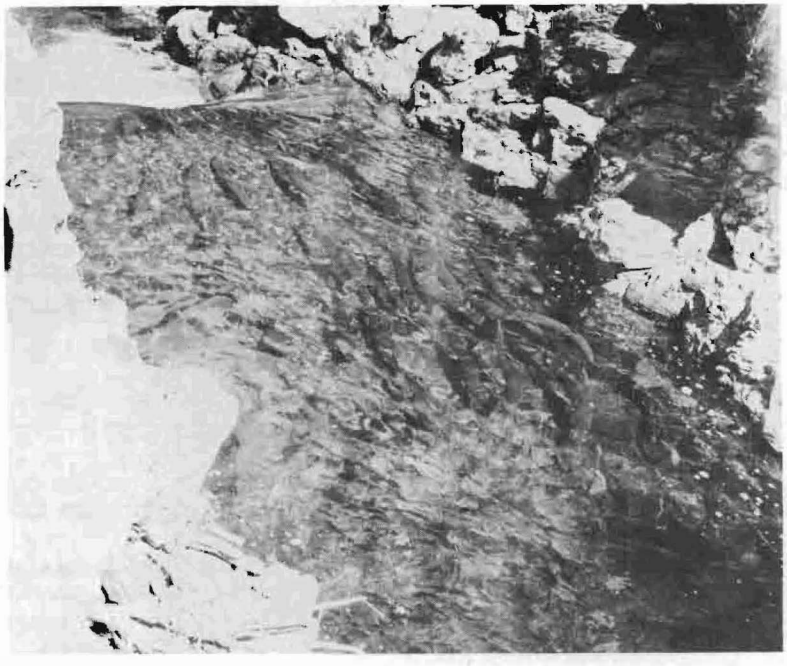


Figure 4. Returning red salmon in third pool of Laura Creek ladder.

An unusually large run of jack salmon (3_2) returned in 1957. It is the largest percentage of jacks that has been observed in this intro-

duced run. In many areas a proportionately large run of jacks is interpreted as evidence of unusually good survival of that particular year class. In this case it is the fish resulting from the eggs stocked in Gretchen Creek in 1954. If the premise is sound, the adults returning to the spawning grounds in 1958 as 5_2s should show a marked increase over the same age groups of other years.

The return of adult red salmon to Frazer Lake occurred during the month of June in 1957. They were trapped in the river below Frazer Falls (the barrier to anadromous fishes) where scale samples and length measurements were taken (Figure 5). The salmon were carried one at a time in a five-gallon bucket of water around the falls and returned to the stream to continue their journey to the spawning streams tributary to Frazer Lake.

Frazer Lake

Figure 5. Weir and trap below Frazer Lake.

Table 3 indicates the results of age determination from scales of the fish sampled. The 5_2s and 5_3s resulted from the egg plants of 1952 in the tributary streams of Frazer Lake as described in the 1952 Annual Report (pp 60-61).

Table 3. Age composition of red salmon adults returning to Frazer Lake—1957.

Age of Salmon	Number of Salmon	Percent of Total
4_2	26	16.25
5_2	84	52.50
5_3	48	30.00
6_3	2	1.25
Totals	160	100.00

Foot surveys of the spawning streams flowing into Frazer Lake revealed the salmon on the spawning grounds in the same area as the eggs were planted five years previously.

The sex ratio of spawners was approximately one female to one male.

The return of mature red salmon to this system is very encouraging in that it points up the fact that Frazer Lake is indeed capable of rearing red salmon fingerlings, and the tributary streams offer adequate spawning grounds in quantity and quality. This drainage is capable of producing large numbers of red salmon annually to the fishery.

Salmon Catch

The 1957 salmon fishing season in the Kodiak area held little more for the fishermen than did 1956, which was considered a failure. Even so, there were 34 more units of gear fishing the Kodiak area, reaching an all time high of 534 units (including the 22 traps) compared to 500 units in 1956. This increase was probably due to an anticipated run of pink salmon to approach the numbers caught from the parent year of 1955 when over 11,000,000 salmon were harvested, more than 10,000,000 of which were pinks.

Table 4 shows the 1957 catch by gear in the Kodiak District for the species of salmon.

Table 4. Kodiak salmon catch by species—1957.

Type of Gear	Per Cent	Red Salmon	King Salmon	Pink Salmon	Chum Salmon	Coho Salmon	Totals	Per Cent
22 Traps	4.1	75,675	147	798,044	178,044	12,568	1,064,478	17.4
400 Purse Seine	74.9	76,376	607	3,557,868	840,714	20,073	4,495,638	73.5
15 Beach Seine	2.8	12,783	246	243,708	94,654	1,671	353,062	5.8
97 Set Nets	18.2	69,293	23	90,991	39,004	716	200,027	3.3
534 Totals	100.0	234,127	1,023	4,690,611	1,152,416	35,028	6,113,205	100.0

The total catch of salmon in the Kodiak District for the past five years is reflected in Table 5. The catch composition by species remained fairly constant throughout the period.

Table 5. Total catch of all species of salmon in Kodiak district.

Year	Number
1953	5,799,254
1954	9,851,499
1955	11,478,121
1956	4,370,514
1957	6,113,205

Shrimp Exploration

Several short exploratory trips were made in the Kodiak area with local fishermen. (Figures 6 & 7). Most of the fishing was done with a small shrimp trawl patterned after a conventional otter trawl, as used for bottom fish or king crabs. The trawl was operated in depths ranging from 25 to 125 fathoms. The most promising results were from smooth mud bottoms in approximately 100 fathoms of water. Up to 500 pounds of shrimp were taken in 20-minute trawls. The catch consisted mostly of sidestripes (Pandalopsis dispar) and pinks (Pandalus borealis). Some specimens of the sidestripes were eight to nine inches long, measuring from the end of the rostrum to the end of telson. The heads-on weight of the sidestripes averaged 50 per pound, while a selected group of maximum size weighed 20 per pound. The pinks average 60-70 per pound.

Five other species were taken but not in as large numbers as the pinks and sidestripes.

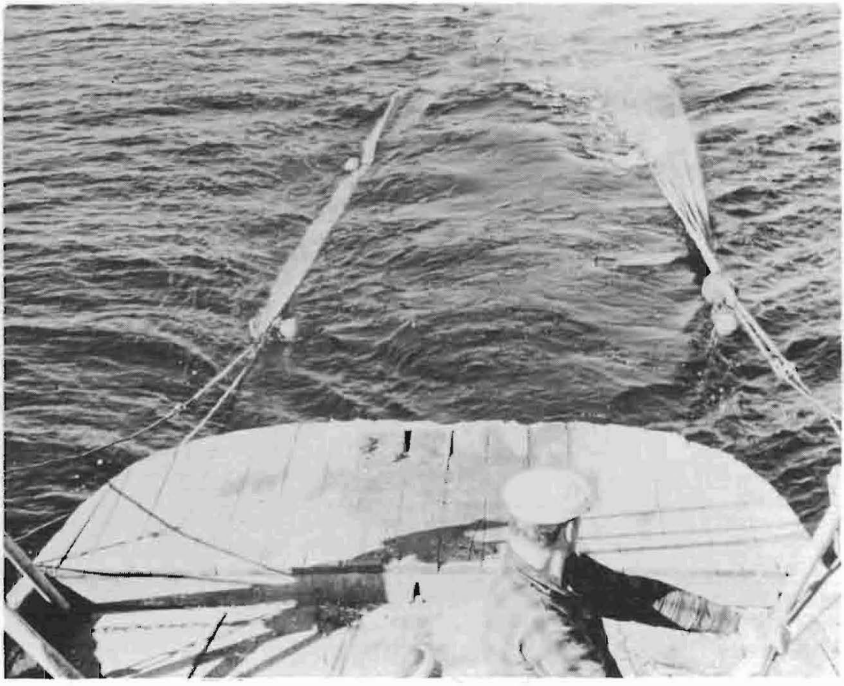


Figure 6. Shrimp trawl being hauled into stern of boat.

While results were most encouraging, further exploration is needed before it can be determined if a commercial operation is warranted. Several individuals and fish processing concerns have indicated an interest in packing shrimp in this area.

Figure 7. Catch of shrimp after 20 minute tow.

Exploration studies with a commercial size trawl is contemplated by this Department for early 1958. A reliable quantative determination of the shrimp beds in the Kodiak district is expected to be available to prospective operators after exploratory work by this and other agencies in 1958.

The five less common species of shrimp were:

Spot	(Pandalus platyceros)
Humpback	(Pandalus hypsinotus)
Coon-stripe	(Pandalus danae)
Pink	(Pandalus jordani)
Pink	(Pandalus goniurus)

WRANGELL-PETERSBURG DISTRICT

In Southeastern Alaska many potential salmon waters lie idle. Surveys are being made in Wrangell-Petersburg district to seek out those waters which are biologically and economically sound for the establishment of salmon runs followed by stream improvement work.

The Stikine River is the largest single producer of salmon within the district. Catch statistics of past years are poor; however, it is evident from these records that the Stikine River gill net fishery is declining.

Table 6 gives the 1957 gill net catch by weeks. Previous statistics back to 1933 were published in the 1956 Annual Report.

Table 6. Stikine River gill net catch statistics for 1957 by weeks*.

Week Ending	Boat Landings	Kings	Reds	Coho	Pinks	Chum
May 4	8	28				
11	34	296				
18	55	791				
25	74	776				
June 1	75	1,417				
8	85	1,291	30			13
15	75	1,104	2			
22	98	1,062	4,763		95	28
29	78	436	6,780		30	172
July 6	107	444	2,737	9	74	1,371
13	95	211	2,855	12	398	1,752
20	72	92	2,003	45	871	4,163
27	58	18	1,103	77	1,104	4,622
Aug. 3	72	74	438	287	563	3,193
10	73	6	158	435	454	2,287
17	80	18	107	1,548	262	2,074
24	114	59	59	3,673	89	1,459
31	147	55	22	8,291	28	1,290
Sept. 7	112	28	5	6,403	8	730
14	123	46		9,227	6	536
21	118	73	1	8,753	59	198
28	54	84	20	1,196	1	43
Oct. 5	1			11		
Total	1,808	8,409	21,083	39,967	4,042	23,931

*Data by courtesy of the U.S. Fish and Wildlife Service.

Stikine River Exploration

Less than one-fourth of the 20,000 miles in the Stikine River watershed is believed to be contributing to salmon production. Aerial surveys show one half of the entire Stikine River drainage to be blocked to spawning salmon by velocity blocks extending for 30 miles in the Grand Canyon of the Stikine. As is shown in Figure 8, all but one of the nine major tributaries entering the Stikine below the Grand Canyon is either totally or partially blocked to salmon migration.

The Tanzilla River has an extensive total block to salmon migration in a very unstable canyon at its confluence with the Stikine.

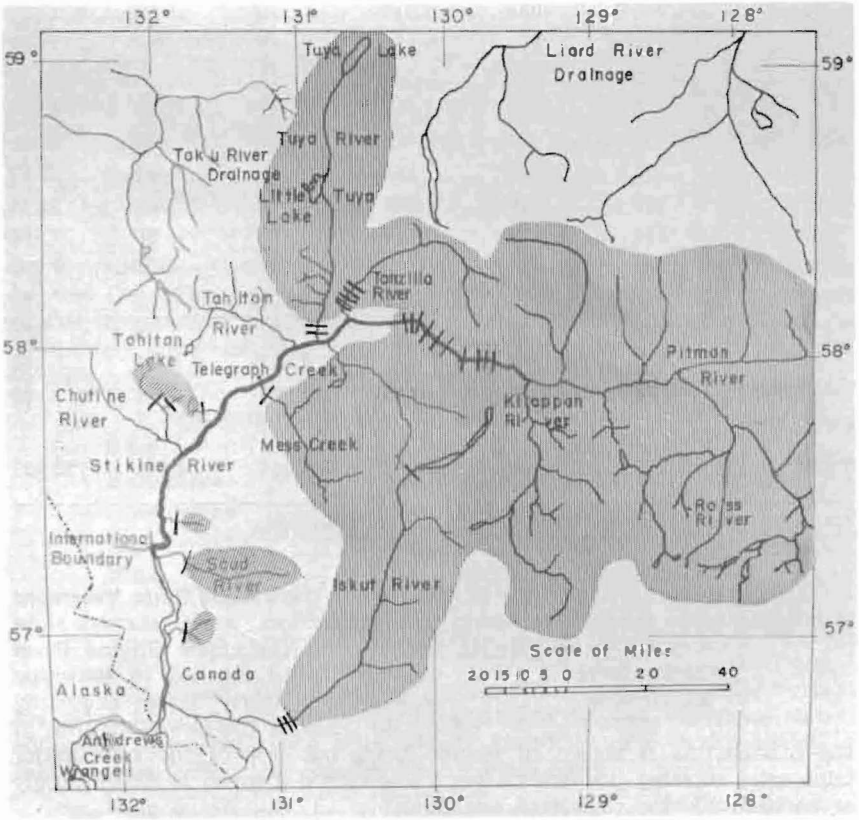


Figure 8. Map of the Stikine watershed. Shaded areas are blocked to salmon by either falls or great velocity of water.

The Tuya River salmon-producing potential for all species is tremendous—perhaps greater than the present production of the Stikine. Unfortunately, two total blocks exist 2½ miles from the Tuya's confluence with the Stikine. Stream improvement work of this magnitude is presently beyond the financial means of the Department. Figure 9 shows the Tuya River ten miles below the lake. It is about 150 feet wide and 1½ feet deep in this location, with excellent spawning gravel.

Figure 9. Tuya River ten miles below lake.

The Kalastline River is blocked by falls a short distance above its confluence with the Stikine. Above this obstruction the Kalastline flows for four miles through a precipitous canyon.

Our exploratory work shows the Tahltan drainage to be by far the largest single red salmon producer to the Stikine—perhaps as much as 90%. The Tahltan also has an excellent run of king salmon, although escapement counts made in 1957 were considerably below 1956 figures. Coho are reported to utilize the drainage to some extent. Figures 10 and 11 illustrate Tahltan Lake and the red salmon beach spawning.

Surveys in 1957, as in 1956, reveal a great red salmon loss in the Tahltan run, due to a partial block which exists in the main river about 20 miles below Tahltan Lake. (Figure 12). Not only does this obstruction prevent a large portion of the red salmon run from reaching its spawning grounds but so delays that portion of the run, which successfully sur-

Major Tributaries

Figure 10. Tahltan Lake, Stikine River tributary.

Figure 11. Red salmon spawning on the beach of Tahltan Lake.

mounts the obstruction, that the high water period is past when they do ascend it. Beaver activity in the small outlet streams of Tahltan Lake is so heavy that high water is required for migrating salmon to gain access to the lake. A dry water year would be disastrous to the Tahltan red salmon run. Figures 13 and 14 illustrate the Tahltan Lake outlet before and after beaver dam removal.

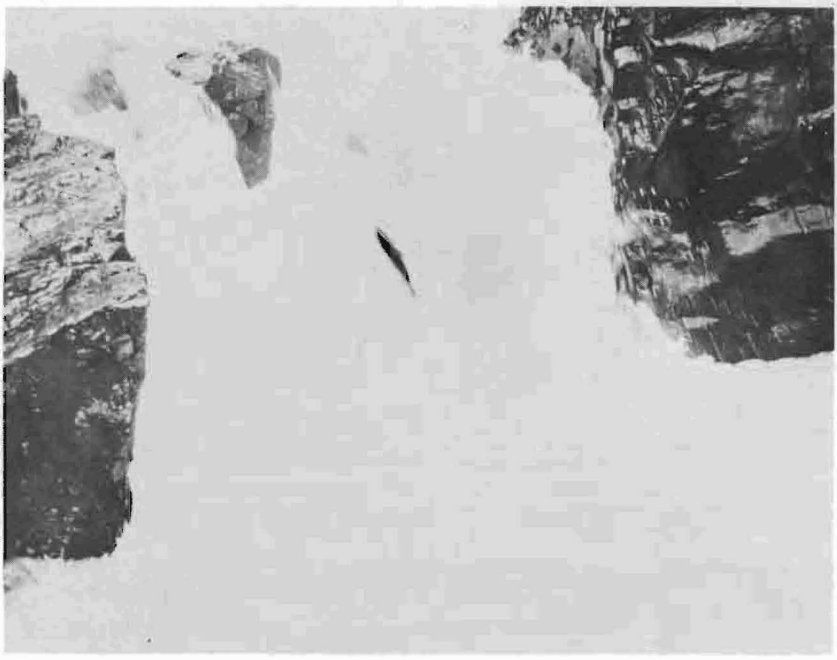


Figure 12. Partial block in Tahltan River with red salmon jumping.

Mess Creek flows through an unstable steepwalled canyon for seven miles before joining the Stikine River. At the head of this canyon is a straight walled "v" shaped chute, 200 feet long, which culminates in a 20-foot falls forming a total block to salmon.

Ground exploration work has not begun on the Chutine River, locally referred to as the "Clearwater". This, the only unblocked major tributary to the Stikine River, is reported to have runs of both king and coho salmon. Despite the colloquial name of "Cleawater", this river is glacial from spring runoff to early September. For this reason, it is believed king salmon spawning would be confined to the few clear water tributaries; late run coho should find the river clear.

The Scud River is a wild glacial river. Aerial reconnaissance reveals blocks to salmon migration about 25 miles above its confluence with the Stikine. Extensive gravel bars formed by the constant shifting of the river channel exist over a wide area. It is probable that late run coho use the lower stretches of the Scud after fall freeze-up has rendered glaciers inactive and the stream has cleared.

Figure 13. Outflow from Tahltan Lake while beaver dam was in.

Figure 14. Outflow from Tahltan Lake after removal of beaver dam.

The Porcupine River has the same physical characteristics as the Scud River. Aerial reconnaissance reveals no blocks to exist for a distance of ten miles; it is reported by mining prospectors to possess falls above this point. Undoubtedly late run coho also use the Porcupine after fall freeze-up has rendered glaciers inactive.

Aerial reconnaissance of the Iskut River, largest tributary to the Stikine, reveals blocks 40 miles and 100 miles above its confluence with the Stikine. Coho are known to spawn in the lower tributaries, particularly in the Craig River. The four large and several small lakes at the headwaters of the Iskut River collectively possess the largest red salmon producing potential of the Stikine drainage.

Practically every small tributary to the Stikine River below the Grand Canyon has been examined for its salmon producing qualities. Almost without exception, as with the major tributaries, these small streams are blocked to salmon migration, many within the first one-half mile. Most of these smaller streams also are glacial, grading from wild rock-rolling chutes to mild flowing, milky colored creeks. After the fall freeze-up the glacial streams clear and undoubtedly many accommodate small runs of coho. In the aggregate, it is believed their contribution to the coho run is considerable.

Minor Tributaries

An examination was made of the following small tributaries: Kunishma, Susie, Dodjatin*, Winter*, Brewery, Tsikhini*, Shakes*, Yehiniko, Arrival, Snipper, Helveker, Kirk, Dokdaon, Kasha, Cinema, Vekops, Butterfly, Donnaker, Jonquette, Oksa, Deeker, Patmore, Christina*, Flood, Anuk, Sterling, Andismith*, Darsmith, Fowler, Choquette, Glacier Mountain, Tasakili*, Katete*, Shuktusa*, North Arm*, Andrews* and Government*.

Of these 37 tributaries, the 12 denoted by an asterisk are presently known to support runs of salmon. Shakes, Christina, Sterling, Tasakili, Andrews, and Government Creeks require further study to determine if their salmon producing potential will justify stream improvement work.

Exploratory coastal surveys were carried out to acquaint the District Biologist with the area, catalogue all salmon producing and non-producing waters within the district, locate barriers to salmon migration, and locate a source of brood stock for introduction into barren waters.

Coastal Exploration

In excess of 50 streams and lakes were examined. As a result of these initial examinations, several areas were found to possess salmon producing potential great enough to justify further work in the near future.

Virginia Lake, 670 acres in size, lies but 0.7 of a mile from salt water. Fish passage to Virginia Lake is seriously hampered by cascades at tidewater. A race of small red salmon locally referred to as "bullet sockeyes" is known to surmount the cascade and to spawn in Virginia Lake. Due to their small size, these salmon are of little commercial value. Removal of the cascade and introduction of

Mainland

marketable size red and coho salmon and steelhead trout would add to the economy and sportfishery of the area.

Harding River in Bradfield Canal supports a large run of chum, a fair run of pink and a small run of king salmon. Five miles above tidewater, salmon migration is blocked by a series of four cascades terminating in a six foot falls. One mile above the falls lies 170-acre Fall Lake. If the barrier were removed, undoubtedly the present salmon runs would extend their spawning area and runs of red and coho salmon could be established in Fall Lake.

Eagle River in Bradfield Canal supports a good run of chum and pink salmon and a small run of king salmon. Between four and five miles above tide line there exist two blocks to salmon migration. Above these obstructions lie Eagle Lake and Reflection Lake, both of which are clear-water lakes with clear-water tributaries. Realization of the latent potential of the Eagle River system lies in extension of the king salmon spawning area and establishment of red and coho runs.

Islands

Geographically located in an area of excellent red and coho salmon producing lakes, 950-acre Neck Island Lake, Prince of Wales Island, is a good potential salmon producer. Salmon are presently blocked from Neck Island Lake by a series of four falls. Removal of these falls and establishment of red and coho salmon runs would add to the economy of the district.

Blocked to salmon for years by a man-made log dam, 173 acre Harvey Lake, Woewodski Island, is slated for rehabilitation by eradication of all present fish and introduction of red and coho salmon.

Shrimp Industry

Due to the installation of two shrimp-picking machines, there has been a marked increase in the Wrangell shrimp industry. Machine picked shrimp are canned by heat process rather than fresh frozen. This innovation to the Alaskan shrimp industry has allowed fishermen to harvest this crustacean without the restriction of daily market quotas. Although there is no indication of over-harvesting at present, facts should be obtained to arrive at a maximum sustained yield.

Future Plans

It is planned during 1958 to remove the partial block to salmon migration existing on the Tahltan River, the Stikine's largest producer of red salmon. Exploration of the Stikine River water shed will continue.

Chemical treatment of Harvey Lake, Woewodski Island, preparatory to the introduction of red and coho salmon, is planned for 1958.

Several streams within this district, reported to the Department to possess blocks to salmon migration, will be checked. As many additional streams and lakes will be surveyed as time allows.

BRISTOL BAY DISTRICT

Contact was maintained throughout the season with all phases of the Nushagak king and red fisheries. The Nushagak king salmon season was characterized by an increase in the number of units which were registered. In spite of this increase in effort, the catch per boat showed a gain over the two previous years, according to official figures. Further discussion of this fishery will be found in a following portion of this report.

Commercial Fisheries

The red salmon of the Nushagak, however, proved particularly disappointing, with a total take which barely topped a half-million fish. Escapement in the spawning areas of the region was of approximately equal proportions, with the result that many areas showed extensive reduction in spawners below the numbers which usually utilize the grounds.

The Togiak fishing area was visited near the conclusion of the season. Salmon from this fishery are at present transported via refrigerator barge to processing facilities on the Naknek River. All of the participating fishermen are residents of Togiak or lower Kuskokwim River villages. Though the run into the Togiak River is of a smaller magnitude than that of the four major Bristol Bay fishing areas, its contribution is significant. A run of silver salmon also enters this river, with its peak occurring several weeks after that of the reds. A portion of this run is sometimes harvested and salt-cured by local processors. Figure 15 illustrates Togiak gill net boats pitching fish to a cannery scow.

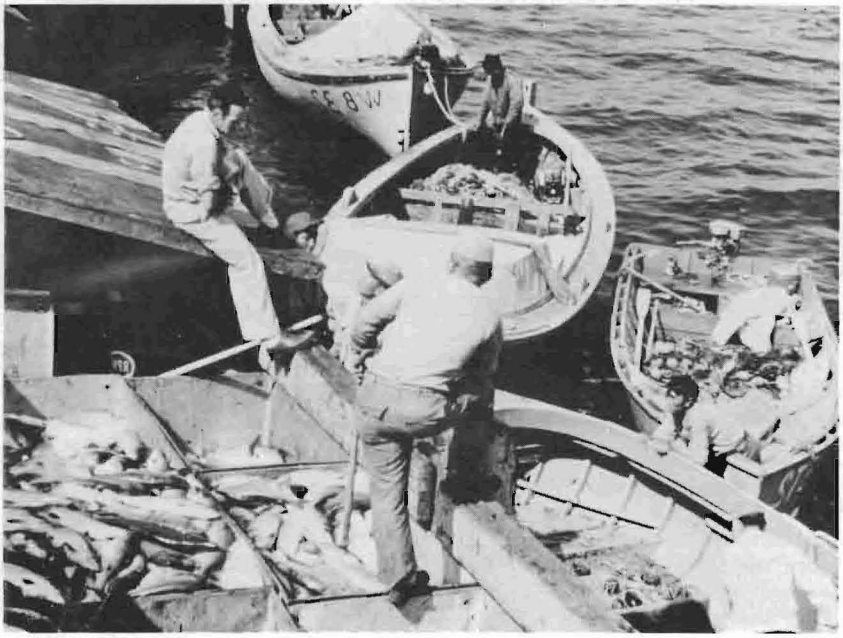


Figure 15. Togiak River gill netter pitching up fish to cannery scow.

Another objective of the Commercial Fisheries Division is to increase the ultimate yield of salmon by bringing into production areas which are not contributing at the present time. Once located, such an area must be investigated to ascertain whether or not it may be practical to introduce a run of fish.

Blocked Areas

During surveys of salmon escapement in previous years, a blocked area on the Copper River, a tributary of Lake Iliamna, has come to the attention of the Department. The 12 miles of river below the waterfall, which now blocks all migration, is one of the major spawning areas contributing to the Kvichak red salmon run. An investigation of the portion of the river above this falls and a close examination of the obstruction itself has seemed in order. A preliminary survey of the physical features of the area was made in September, combined with sampling of the indigenous fish species by use of gill nets of varied mesh sizes.

The Copper River has its source in the Aleutian Range, where the tributaries arise which feed 1,250-acre Meadow Lake, the uppermost of the series of lakes which characterize the course of this river above the falls. Below Meadow Lake the river drops rapidly into an unnamed, more irregularly-shaped body of water of nearly equal size about three-quarters of a mile downstream. Both are relatively deep, steep-sided lakes and appear to possess limited productivity characteristics. The nearby hills press closely upon the shores of Meadow Lake and, to a lesser degree, upon the narrow beaches of the second body of water. The streams entering them are also of unpromising appearance due to their steep gradients, evident seasonal variation in flow and rough, rocky beds.

Gill net sampling at the inlet to the second lake revealed the presence of a population of the Dolly Varden-Arctic char complex. Scale readings on these fish point toward a slow growth rate. even though the total population, as indicated by the net catch, does not appear to be excessive. As many as six years may be required by these fish to attain a length of 12 inches. Cottids and sticklebacks were also observed.

Below this second lake the main river continues to drop swiftly through a number of rocky and rapid stretches. This descent is broken briefly by a slow-moving portion, which widens into a series of rather small lakes less than a mile above the main falls.

The main falls of the Copper River are made up of a straight drop of 28 feet plus supplementary obstructions immediately above the crest, which brings the total to approximately 36 feet. An additional block to upstream migration, a drop of 12 feet, is encountered some few hundred feet above the principal cascade.

From an evaluation of the above-listed conditions, it will be readily deduced that the favorable conditions for spawning and rearing which are found in the accessible portion of the Copper River are not duplicated above the block. A visual examination of the stream beds and shorelines at close range reveals that almost no gravels are available which appear to be desirable for spawning. The contribution of the lakes as a rearing area cannot be expected to be commensurate with their physical size. And, finally, in view of the magnitude of the obstacle presented by the

combined barriers, there now appears to be little hope than any project calculated to originate and maintain a salmon run in the upper Copper River could be economically feasible in the near future.

Conservation Education

In harmony with the Department's current program of increased effort toward acquainting the public more fully with the fish and game resources of the Territory and their importance, the District Biologist presented programs of motion pictures and slide-illustrated talks to audiences with a combined attendance of over 1,500 in the western portion of the district. During the spring this series featured a film, produced by the Department of Fisheries of the State of Washington, depicting the problems facing salmon production in many areas today. The above film was presented to several audiences in Dillingham, and in the communities of Aleknagik, Clark's Point, Ekwok and Manokotak. In Togiak and Kiliganek, where no facilities for the showing of motion pictures were currently available, talks on wildlife conservation illustrated with colored slides were substituted. Supplemental talks of graded level on the same topic were given before pupils of the Dillingham, Clark's Point, Aleknagik and Ekwok Territorial schools. In the fall of the year the films produced by the Department's own Education and Information Division were shown in Dillingham, Aleknagik and Ekwok, where they were accorded an excellent reception. It is felt that an educational program of this type is of great value. Present plans call for the extension of this coverage to the other communities of Bristol Bay.

NUSHAGAK KING SALMON STUDY

History and Present Status of the Fishery

Since the beginnings of the Bristol Bay fishery in the 1880's, the Nushagak king salmon have contributed substantially to the case pack of Alaska kings, with the exception of a period extending from the early 1930's to the early 1950's. (Table 7). Economic conditions during this time brought about a reduction in the take of this species to less than a quarter of the former yield, which had maintained an annual average of approximately 81,000 fish for over 30 years. During this 20 year period, packers rarely conducted fishing operations prior to the red salmon season and the entire pack of kings usually consisted of fish taken in 5½ inch mesh incidental to the red salmon fishery. Since 1950, effort has again been directed specifically toward the king salmon. In 1957 the take once more attained the magnitude of the pre-slump average, with a catch of approximately 82,000 fish. Figures 16 and 17 illustrate several phases of the Nushagak River king salmon fishery.

Concern has been expressed by many that the present rate of exploitation may damage the run. Urgency has given emphasis to the Department's program of study by the fact that total available knowledge of the Nushagak king salmon until very recently consisted of no more than rather general catch statistics. In view of the present red salmon decline, the importance of maintaining this fishery for kings at the level of its maximum sustained yield may readily be appreciated.

Table 7. Nushagak River king salmon catch in numbers of fish from 1893 to 1957. (1)

1893	44,000	1926	54,856
1894	10,000	1927	68,044
1895	18,473	1928	43,173
1896	14,777	1929	108,432
1897	18,134	1930	62,494
1898	16,736	1931	32,337
1899	37,011	1932	51,935
1900	55,146	1933	45,807
1901	86,431	1934	30,575
1902	98,216	1935	1,139
1903	81,640	1936	11,130
1904	85,787	1937	24,950
1905	96,929	1938	18,830
1906	105,058	1939	17,260
1907	104,157	1940	6,477
1908	69,175	1941	8,616
1909	108,175	1942	14,575
1910	86,533	1943	29,590
1911	103,806	1944	8,170
1912	87,489	1945	15,618
1913	67,656	1946	18,140
1914	88,693	1947	16,764
1915	116,387	1948	21,004
1916	81,921	1949	10,391
1917	74,316	1950	10,650
1918	46,386	1951	18,800
1919	93,778	1952	36,128
1920	97,937	1953	27,502
1921	71,048	1954	38,045
1922	60,924	1955	56,463
1923	56,397	1956	56,458
1924	53,532	1957	82,000
1925	68,596		

(1) Data from United States Fish and Wildlife Service and Pacific Fisherman.

Present information on the life history of the Nushagak race of kings from emergence from the egg to appearance some years later as adult salmon in the fishing area of Nushagak Bay is still fragmentary.

Fresh Water Existence

Analysis of scale samples taken from adult fish indicate that nearly all of the returnees spend a year of their lives in the fresh-water environment, prior to taking up the salt-water phase of their existence. A small percentage appear to remain in fresh water for two winters after hatching, while a few fish appear to have migrated downstream almost immeditely after their emergence as fry.

A period of intermediate growth differing from the early fresh-water and later salt-water existence is characteristic of the Nushagak race.

Figure 16. Nushagak River gill netter during king season.

Figure 17. Butchering kings in preparation for canning at Bristol Bay cannery.

Further study of this growth period through sampling and examination of juveniles is expected to help clarify the status of this stage in the young salmon's life history. Scale studies show that a majority of the Nushagak king salmon have attained this intermediate growth in a short period immediately after leaving fresh water. It is referred to as "estuarine growth", inferring that this part of the fishes' life history was spent in the bay or estuary, or some area where growth was faster than fresh water but slower than normal salt water growth.

Salt-water Existence

Reports of king salmon from Bering Sea areas adjacent to and within Bristol Bay have given rise to belief in some quarters that these fish may spend a portion of their ocean existence feeding in nearby areas. An attempt to test this hypothesis through sampling in the Togiak Bay region in mid-May yielded no conclusive information in regard to salmon. Prohibitive weather conditions which persisted during the greater portion of the time allotted for this activity made it impossible to carry out much of the scheduled operation.

Age Composition

The age composition of the commercial catch, as derived from samples taken at Pacific American Fisheries' Dillingham cannery, does not accurately represent the returning population as a whole, due to the biased sample provided by the selective mesh sizes employed in the fishery. It seems evident, however, that three, four and five-year-old fish constitute the bulk of the run. Most of these

Figure 18. King salmon spawning ground survey by rubber boat on tributary of the Nushagak River, King Salmon River.

fish have spent two, three, and four winters in the ocean. In 1957, 94% of the catch by 8½ inch mesh nets was made up of four and five-year-old fish. Two, three and six-year-olds comprise the remaining 4%. No specimens of one, seven or eight-year-old fish have been found, although the likelihood that these occasionally occur seems indicated by current knowledge. The two and three-year-olds escape the large-meshed nets almost entirely but the three-year-olds make up more than a quarter of the catch of kings taken after the start of the red salmon season, due to the smaller mesh used. This incidental catch taken with 5½ inch gear may vary considerably from year to year, depending upon the timing of the run. Ordinarily it constitutes only a small portion of the annual king take, when the species is fished prior to the red season.

Spawning

To locate the spawning areas utilized by this species and the period when this activity occurs, general aerial surveys of the Nushagak system have been made. Coupled with these surveys, index counts of numbers of spawners in specific areas have laid a basis for comparison in future years. In addition to the aerial counts, surveys of certain index areas have been made by rubber boat (Figure 18) in an attempt to obtain indices necessary for converting aerial enumerations into actual escapement figures. Also, during this latter operation, detailed information on the age and size composition of the escapement is gained by recording data similar to those taken from the catch. A picture of the total run is thus obtained.

Over 40% of the 1957 escapement sampled in the Nushagak and King Salmon River (tributary to the Nushagak) was made up of males which came back to spawn after two years in the sea (jacks). No females have been found with less than three years of ocean growth. This sampling revealed a three to one ratio of males to females on the spawning ground. At least part of this disproportionate escapement can be attributed to the selective action on large fish of the large mesh size used prior to June 25. Whether this is a normal situation on these spawning grounds cannot be said at this time, as this is the first year they have been sampled.

Although some variation is found between different portions of the system, spawning during 1956 and 1957 appears to have taken place largely between July 20 and August 25, with the peak of activity centered in the first half of August.

In the 1956 report of this section, the significance of the contribution to the spawning area made by the smaller tributaries was alluded to. Further study has confirmed this assumption. Notwithstanding the fact that the largest single concentrations of spawning fish may be observed in the Nushagak and Mulchatna River, (Figure 19) it now seems evident that the headwaters and tributaries outweigh the main streams in the percentage of fish utilizing their respective grounds. Figure 18 illustrates a typical tributary stream of the Nushagak River, the King Salmon River.

Conclusion

The status of the study does not yet permit any conclusion in regard to the existing relationship between catch and escapement or the relative condition of the run as a whole. Prospects appear optimistic, however, that such information may be forthcoming in the near future.

Figure 19. Aerial view of the Mulchatna River.

The Bristol Bay section of the Commercial Fisheries Division is indebted to the Pacific American Fisheries, Incorporated, for use of facilities in their Dillingham plant for sampling the king salmon catch and to both the Bureau of Commercial Fisheries and the Bureau of Sport Fish and Game of the U.S. Fish and Wildlife Service for generous assistance on many occasions.

HOMER DISTRICT

A Biologist was stationed in the Cook Inlet area, at Homer, for the first time in October 1957. Preliminary work was confined to becoming acquainted with the area and its fishery problems.

The Kenai Peninsula and the surrounding area contain numerous lakes, many of which have fishery potentialities. A good portion of these lakes will not be suitable for anadromous species but can be used for sport fish. Each of these bodies of water will have to be surveyed, during the coming years, to determine the feasibility of their use as a fishery resource. A portion of these already contain populations of various fish but, in most cases, the numbers and species composition is unknown. Limited biological work was started on two lakes, Beluga and Caribou, near Homer.

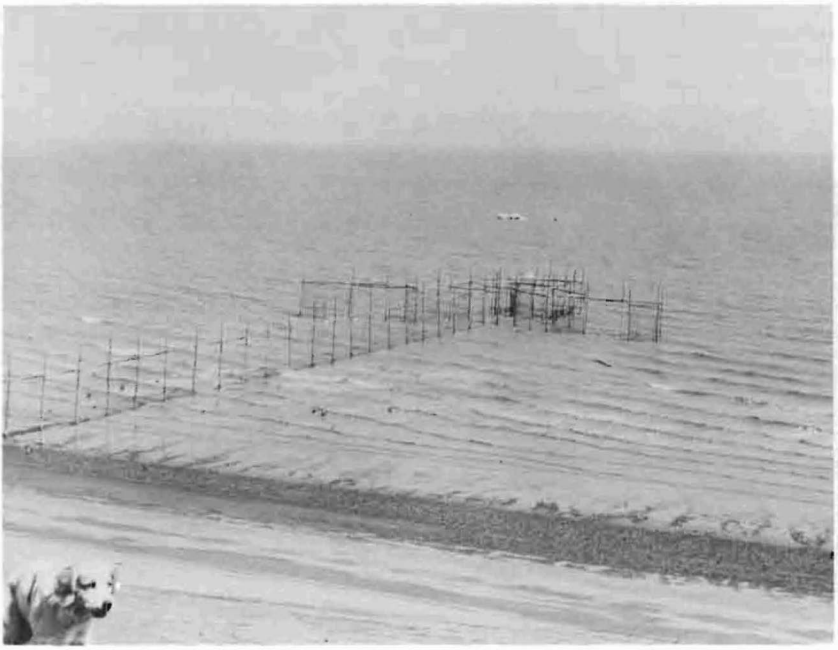
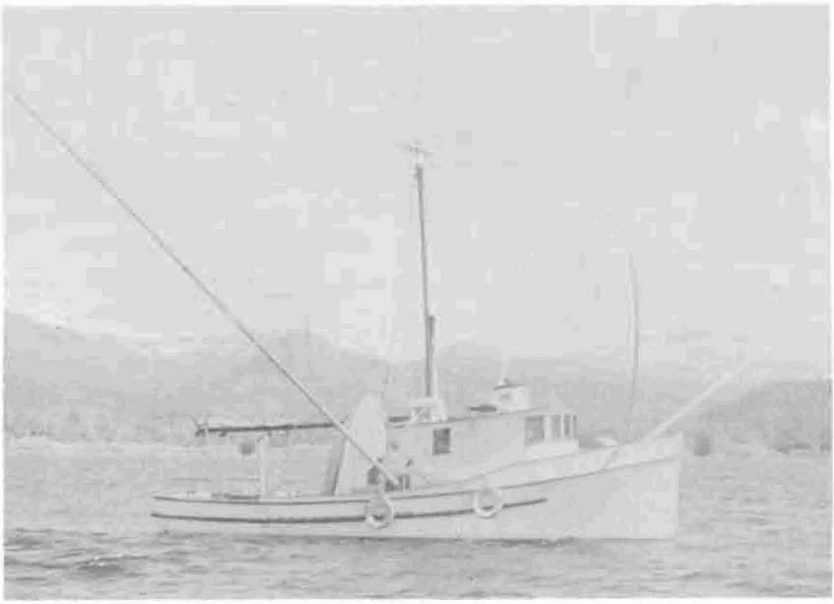


Figure 20. Hand trap in Cook Inlet.

Figure 21. Set net sites on the beach near Kenai.

Certain bodies of water contain blocks, of one type or another, which stop the passage of anadromous fish to the spawning grounds. Each of these areas will be investigated for the possible use of fish ladders or in the case where the falls are too high to permit the use of ladders, the possibility of using the lake as a rearing unit.

Several types of gear utilize the Cook Inlet fishery. A good portion of time will be spent with fishermen using these different types of gear to become acquainted with their specific problems. Figures 20 and 21 illustrate several forms of these gear.



Troller fishing in sheltered waters, Southeastern Alaska.

SPORT FISH

FOREWORD

The people of Alaska have long been apprehensive regarding the decline in the sport fish stocks. A method for financing work on sport fish was developed and culminated in the Territory embarking on its own sport fish program in 1951, when the Legislature passed the first Territorial Sport Fishing License Act, Chapter 93, Session Laws of Alaska 1951. This Act did not earmark the money collected for work on sport fish but provided that the collections were to be deposited in the General Fund. It was the intent of the Legislature to appropriate monies out of the General Fund during succeeding sessions for work on sport fish problems. From the table shown below one can readily see that the intent of the 1951 Session has been carried out by succeeding legislatures:

Biennium	Sport Fish General Fund Appropriations
1951-1953	$50,000.00
1953-1955	90,000.00
1955-1957	95,000.00

The 1957 Legislature passed a new Territorial Sport Fishing and Hunting License Act, Chapter 122, Session Laws of Alaska 1957 which, among other things, earmarked all of the collections from sport fishing and hunting license sales for work on the sport fish, fur, and game in the Territory. The new Act repealed Chapter 93, Session Laws of Alaska 1951 and provided that the license collections were to be deposited in the revolving Fish and Game Fund.

In addition, it was clearly stipulated that license monies could not be diverted from the Fish and Game Fund for any other purpose than "the protection, propagation, investigation and restoration of sport fish and game resources and the expenses of administration of the sport fish and game divisions of the Department." The Alaska Fish and Game Commission was delegated the responsibility for authorizing disbursements from the Fish and Game Fund. The above synopsis has been given to show how the Territory has financed its sport fish program.

The following report covers the activities and progress of the Sport Fish Division of the Department and represents the combined efforts of the following staff:

E. S. Marvich, Senior Biologist
A. H. McRea, Senior Biologist
R. J. Simon, Biologist

PROBLEM

The rapid population expansion in the Territory during the past decade has been accompanied by an increased demand for sport fishing. In many cases sport fish stocks have been sorely depleted, especially in

those lakes and streams adjacent to the population centers. Wherever waters are available by automobile or small boats, the sport fish stocks have been subjected to a heavy angling pressure (Figure 1). The Alaska Fish and Game Commission, realizing that maximum benefits would be obtained by restricting their efforts, to a large extent, to waters available by automobile or small boat, confined the authorized work projects to these accessible waters.

Figure 1. Anglers automobiles parked on shore of lake near Palmer.

BIOLOGICAL RESEARCH DISCUSSION

Previous Annual Reports have discussed in detail the applied research projects undertaken by the biologists in the various areas. In this report, an attempt will be made to summarize the programs initiated in the past and to bring the reader up to date.

Fish Sampling

Studies were adopted to determine the species of fish inhabiting the lakes available by automobile in the Cook Inlet, Glenn Highway, Valdez, Cordova, Alcan Highway, Fairbanks and Kodiak areas. Anglers were checked for catch composition and fishing success. Graduated mesh gill nets were used in fish sampling. These nets are capable of taking fish from about 4½ inches in length to fish well over 25 inches in length. From these studies, it soon became apparent that many of the lakes were saturated with trash fish such as suckers and stickleback and contained negligible numbers of sport fish (Figure 2). Natural spawning areas for trout were either entirely lacking or very limited.

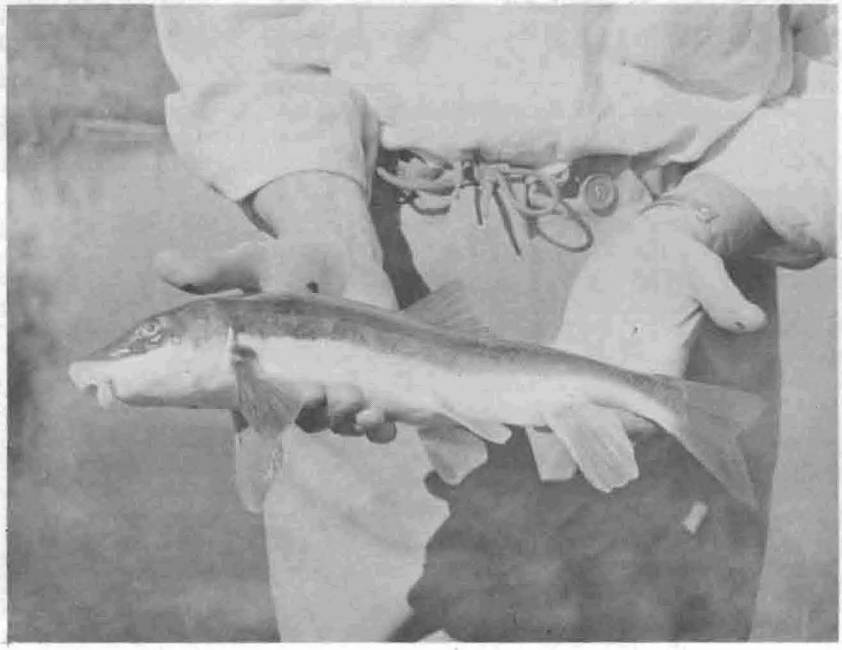


Figure 2. Sucker taken from a lake near Palmer.

In 1952 and subsequent years a series of experiments were set up to determine whether trout fry could be successfully stocked in lakes containing trash fish. The results from these experiments corroborated previous work that had been done in the states. The stocked trout succumbed. They could not displace the populations of rough fish by successfully competing for food and living space.

Many lakes throughout the study areas are shallow; the biologists were apprehensive regarding the ability of such lakes to support fish life over the long Alaska winters. They suspected that in some cases, insufficient dissolved oxygen was stored beneath the ice layer to last the many months the lakes were covered with a heavy ice and snow blanket. Questionable lakes were checked periodically during the late winter and early spring months, and the quantity of dissolved oxygen in the water was carefully ascertained. From this work, many lakes were classified as unsuitable for sport fish production, others were found to be marginal and still others were found to contain sufficient dissolved oxygen for sustaining fish populations.

Oxygen Determination

In instances where rough or trash fish populations had completely taken over a lake, the biologists had a valuable fish toxicant at their disposal that enabled them to kill the trash fish in the lake and start again with sport fish, such as trout, as soon as the toxic material had dissipated. This effort is called the lake rehabilitation program and has been discussed in detail in past

Lake Rehabilitation

annual reports. The program is aimed at eliminating competition and predation from undesirable fish so that all of the production is focused on producing sport fish for the angler.

The Territory started using lake rehabilitation as a tool in its sport fisheries work in 1951. Below is a table giving the pertinent data with regards to the amount of lake rehabilitation work undertaken by this department:

Year	Number of Lakes Treated	Acreage of Lakes Treated
1951	1	94
1952	None	
1953	5	192
1954	4	493
1955	3	444
1956	4	241
1957	4	172
Totals	21	1,636

Biological investigations conducted in the study lakes pointed out the need for a source of sport fish for stocking. The lake rehabilitation program required, as one of its essential components, the development of a reliable source of sport fish for planting the lakes after the toxicant used in eradicating the rough fish had dissipated. The important point here is that research and rehabilitation preceded any stocking, that the fish hatcheries are being used as a tool in the sport fish program of the Department. Fish hatcheries are not considered a cure-all; they have their place in sport fish management—to provide the type quality, and quantity of fish at the time requested.

Fish Hatchery

The sport fish hatcheries output has been used to "seed" lakes. Small trout fry are stocked in the lakes; rearing is accomplished in the lakes themselves. The Department has no intention of rearing "catchables" on a put-and-take basis; such a program would be prohibitively expensive. Following is a table giving the rate of expansion in the sport fish hatchery production:

Year	Number of Hatchery Troughs in Operation	Number of Trout Fry Stocked
1952	4	68,000
1953	14	172,000
1954	26	529,000
1955	38	765,000
1956	38	885,000
1957	54	533,000

The sharp decrease in the number of fish stocked in 1957 was due to excessively high summer water temperatures which caused excessive egg and fry mortalities.

The mechanics of stocking the trout fry from the hatcheries into the lakes had to be carefully worked out for Alaska. Special problems in transportation had to be solved. The trout hauling units had to be light in weight, yet able to carry a substantial load of fish.

Trout Hauling

Three different types of trout hauling equipment were designed and used over the past years. The first was the back pack can. This consists of a five gallon specially constructed container which fits nicely on a man's packboard, both in conformance and balance. About 2,000 trout fry, or one pound of fish, can be carried in this container. Back pack planting cans are used when stocking fish in hike-in lakes (Figure 3).

Figure 3. Isaak Walton League members assisting with a fish planting near Anchorage.

The second type of unit is called the portable fish planting unit and consists of four five gallon cans mounted in a light steel frame. Space is also provided for an air pump and a six volt hotshot battery. Air is pumped to each of the five gallon cans during fish hauling. Ceramic diffusers are attached to the ends of the air hoses as it enters the water. The entire unit, loaded with fish, weighs 206 pounds and has a capacity for carrying about 8,000 trout fry for a period of two and one-half hours. Common practice was to load the unit with trout at the Fairbanks or Anchorage airports and send them, unattended, via air freight, to the town located nearest to the lake to be stocked where

they were picked up by the biologist. This provided cheap fish transportation from the hatcheries to the outlying communities served by commercial air lines.

The third method of hauling trout fry is by an aluminum tank mounted on a ¾ ton pickup truck. The tank has a capacity of 250 gallons of water; air is supplied to the water by means of a piston air pump, powered by the truck battery. Up to 40,000 trout fry per load have been hauled over the highways using this equipment.

Experiments were set up to determine the capacities of the various pieces of fish hauling equipment. Varying numbers and poundages of trout fry were loaded in the units and hauled for different lengths of time, then placed in the live-boxes and held at the lakes for a week to check on fish hauling mortalities. From these experiments the load maximums for each piece of equipment were obtained. The units are loaded with a considerable safety factor in mind; no attempt is made to overextend the safe carrying capacity of the fish hauling equipment.

FAIRBANKS HATCHERY

The Fairbanks Trout Hatchery has been discussed in detail in past Annual Reports. This fourteen trough station, located 56 miles southeast of Fairbanks on the Richardson Highway, had a disastrous season. This is attributed to the unusually high water temperatures that occurred during egg incubation and subsequent holding of the hatched out fry. The rainbow trout eggs were received at this station on June 11 at which time water temperature was 71° Fahrenheit. For the next ten days the water temperature was never below 64°, and it was between 68° to 70° for the majority of the time. The steelhead eyed eggs were received on July 3; the hatchery water temperature being a tepid 69° Fahrenheit. High temperatures prevailed and took a heavy toll on these eggs as well. The Fairbanks Hatchery received a total of 400,000 eyed rainbow and steelhead trout eggs. The unusually warm water, for all practical purposes, practically annihilated these eggs. A mere 13,000 fry were stocked from this station, which gave a survival from egg to stocking of 3%—a far cry from the 1956 season when 297,000 fry were stocked, giving a survival of 86% from egg to stocking. A list of the waters stocked from the Fairbanks Hatchery can be found at the end of this report.

FIRE LAKE HATCHERY

The Fire Lake Hatchery "saved the day" as far as the 1957 fish stocking was concerned. Looking back, when this station was proposed in 1952, one of the primary reasons given for a station near Anchorage was, among others, that it would provide flexibility in the stocking program. The Fire Lake Hatchery bore this out during 1957 by picking up the slack provided when the Fairbanks Hatchery failed. The Fire Lake Hatchery produced trout fry for both Interior and Westward Alaska during the 1957 season.

High water temperatures prevailed at the Fire Lake Hatchery too. The Fire Lake Hatchery, however, received its eggs early in the season,

March 23, at which time the water temperatures were low enough to insure a good hatch and fry swim-up. A total of 800,000 rainbow trout eggs were received; 507,000 rainbow trout fry were stocked, giving a survival of 63% from eyed eggs to stocking. On July 3, 100,000 steelhead eggs were received at this station. High midsummer temperatures had their effect on these eggs by claiming an 87% mortality, so that only 13,000 steelhead fry were stocked. A complete list of fish stocking from the Fire Lake Hatchery can be found at the end of this report.

The unusually warm 1957 season pointed up the previously evident need for some means of water temperature control for the hatchery. Excessive midsummer water temperatures have been a source of trouble in the hatcheries almost every year since the inception of the program in 1952. A hatchery must have suitable water temperature controls if there is to be consistent year-after-year success and, most important of all, dependability in the segment of the sport fish program. With this in mind, the investigation of suitable means for providing the desired temperature control was intensified.

A temperature range between 50° and 60° Fahrenheit is considered to be optimum for a trout production station. A year-around water supply approaching this range was not available. The ground water temperature of 36° Fahrenheit, found thruout western Alaska, precludes the possibility of locating a spring water source within the desired temperature range.

The Fire Lake Hatchery is located adjacent to the outlet stream of Fire Lake and utilizes this outlet as its water supply. The hatchery water reaches 50° Fahrenheit by May and continues above this level into October of each year. If means could be found to suppress the midsummer temperatures above 60° Fahrenheit a rearing season of 4½ months, with optimum temperatures could be provided—as compared to the 1½ months obtained during 1957.

The Fire Lake Hatchery water supply during February, March and April hovers just above 32° Fahrenheit; a means for increasing the water temperature during the winter months would be highly desirable. Artificially heating and cooling the water would be prohibitively expensive. The cost for the required equipment would exceed $75,000.00 The operation and maintenance of the equipment would approach $15,000.00 annually. Artificially adding and subtracting heat to the large quantity of water required is obviously impractical.

An investigation of the feasibility of taking water directly from Fire Lake proved more fruitful. Fire Lake has sub-surface temperatures within the desired 50° to 60° Fahrenheit range during the summer. An investigation of the Fire Lake dissolved oxygen concentrations showed that proper levels could also be obtained.

During the winter months it was found that Fire Lake could provide sub-surface water with a temperature of 36° Fahrenheit. This would relieve the severe icing and freezing problem encountered during winter operation. Preliminary engineering indicated it would be possible to construct a suitable water supply line from the hatchery to the lake, and thus take advantage of the lake's sub-surface temperature range. The cost of such a line, with suitable control tower in the lake, was estimated

to be less than $15,000.00. The Department plans to use this means of controlling the water temperatures at the Fire Lake Hatchery.

LAKE REHABILITATION

The Department's rehabilitation program was continued during 1957. Four additional lakes were prepared for the rearing of trout. The rehabilitation program has been discussed in detail in past Annual Reports. Briefly, it entails the eradication of undesirable fish from a body of water—fish that would compete with, or prey upon, the desirable fish. After the undesirable fish are removed, the lake is stocked with game fish, trout in this case. In those lakes suitable for this program, and used in conjunction with the hatchery program, it permits the full utilization of a lake for trout rearing.

The following lakes were rehabilitated during 1957:

Lake	Surface Acreage	Location	Scrap Fish Killed
Knik	53	Knik	Stickleback
Meir	17	Matanuska Valley	Stickleback
Otter	90	Ft. Richardson Army Post	Stickleback
Broad Point No. 40	12	Kodiak	Stickleback
	172		

Knik Lake

Fifty-three acre Knik Lake located at the pioneer community of Knik, was rehabilitated in August, 1957. No salmonoids were native to this lake; the fish population was solely stickleback. In 1954 steelhead trout fry had been stocked by the United States Fish and Wildlife Service. In 1956 the Territory stocked 150 rainbow trout fry in the lake.

During rehabilitation a measure of the total survival was obtained by observation of the kill. An estimated 30 rainbow trout were still in the lake. The toxicity dissipated from the lake by September 4 and the initial post-rehabilitation plant was made shortly thereafter with 7,000 rainbow trout from the Fire Lake Hatchery. Knik Lake will be closed to the anglers until the spring of 1959.

Mr. and Mrs. Melvin Bjorn, of Knik, have donated a public fishing site on Knik Lake to the Department. Therefore, the public is insured access to Knik Lake through the generous contribution of Mr. and Mrs. Bjorn.

Meir Lake

Meir Lake, on the outskirts of Palmer, was rehabilitated in late July, 1957. This 17 acre lake is completely land locked, is comparatively deep (73 feet), and has some underground water exchange, thus precluding any possibility of a winter kill.

The fish population prior to rehabilitation consisted of stickleback only. However, during past years a few trout and salmon had been salvaged from nearby streams and introduced into the lake. Some survival was reported, but there was not enough to provide a sport fishery. None of these fish were found during the investigation.

Dense beds of stone-wart (Chara sp.) gave further indication of the lakes potential, since this algae occurs in water with abundant calcium—one of the essential ingredients for fish growth. However, these same dense beds of stone-wart pose a problem in rehabilitation. They provide a haven for the scrap fish which the toxicant, rotenone, cannot readily penetrate. And further, since the toxicity of rotenone is dissipated by oxidation, and the Chara manufactures and retains excess oxygen in the weed mass, the toxicant may be dissipated before the mass is pentrated. With this in mind, and since the treatment of the 17 acre lake did not involve a large quantity of rotenone, it was decided to use all of the applicable techniques developed for applying the toxicant in an effort to build up a concentration of toxic water in and around the heavy weed masses. The over-all concentration of the toxicant, calculated from the volume of water, was increased. The weed bed areas were treated prior to the open water in an effort to drive the fish away from this haven. The water over the stone-wart was carefully pattern sprayed with an excess of rotenone to insure uniform, dense coverage. This coverage was repeated several times. The deep water outside the masses was also treated with an excess of rotenone to prevent dilution of the toxicant from the critical weeds area. The stone-wart, however, still prevented a complete kill. Within ten days after rehabilitation, a few stickleback emerged from the weed masses and were observed moving freely about in the water above the masses. The deep water, with its low temperature, extended the period of toxicity to over eight weeks in the open water. Because of this, Meir Lake was not stocked in 1957.

Anglers were assured of access to Meier Lake when Mr. and Mrs. Harold K. Peirstorff and Mr. and Mrs. James T. Loyer generously donated a public fishing site to the Department.

Otter Lake

Otter Lake, on the Fort Richardson Army Post, was rehabilitated in July 1957. This 90 acre lake has a maximum depth of 35 feet; a large shoal area makes up over one-half of the acreage, thus reducing the winter carrying capacity.

A moderately heavy population of stickleback was removed. The residual population of Dolly Varden, as estimated during the rehabilitation, consisted of less than one-half pound of char per acre. Of these fish, only 8% were larger than 8 inches in length. A major portion of the dolly varden were small, slow growing fish found in a spring-fed tributary stream. An estimated total of 440 dolly varden were found in Otter Lake at the time of rehabilitation.

Twenty-four thousand cutthroat trout had been stocked during 1954. These fish had not survived in sufficient numbers to provide a sports fishery. Only one cutthroat trout was found during rehabilitation.

The rehabilitation of Otter Lake was basically a Fort Richardson

Army Post conservation project. The Department of Fish and Game conducted the management investigation, furnished technical assistance in the preparatory work, and supervised the rehabilitation. In addition to the rehabilitation work, the Army constructed an earthen dam over 500 feet long and installed a concrete spillway with a screen. It will prevent the trout from leaving the lake and also stop the re-entry of undesirable fish.

The swamp area of Otter Lake was in excess of 300 acres. The possibility that some of the scrap fish would survive in the swampy pot holes could not be ignored. The amount of rotenone needed for treating the swamp was small, since no large volume of water was involved. However, even one pot hole missed could prevent the complete eradication of the scrap fish. To facilitate treatment and help insure complete coverage, an observation plane with 50 gallon spray tanks under each wing was used. The rotenone was mixed with water and the tanks were filled with the concentrated rotenone mixture. Then, following a coverage pattern previously established, the spray plane worked the swampy areas in the same manner as mosquito toxicant is applied. Thorough checking indicated that complete coverage was obtained. The toxicity had dissipated by October 20, and 6,000 rainbow trout were planted in Otter Lake on October 24.

Otter Lake will be open to angling in the spring of 1959.

Broad Point No. 40

Broad Point No. 40, a small lake 18 miles east of the Kodiak Naval Station on the Chiniak Road, was rehabilitated in 1957. This 12.5 acre lake, on toxicant application, yielded an estimated 135,000 stickleback and only 13 steelhead trout from the 50,000 fry that were stocked in 1953 and 1954.

INTERIOR ALASKA LAKES DISCUSSION

Since the inception of the sport fish program in 1951, a great deal of effort has gone into biological surveys of the lakes in Interior Alaska. Admittedly, much of the information gathered was of a generalized nature, not too specific, however essential if one was to garner an overall appreciation of the sport fishery and its problems. As soon as the sport fish picture was brought into focus, specific projects were placed under more intensive investigation and the problems were narrowed down into workable components.

Boleo Lake

Boleo Lake suffered an unfortunate fish kill in 1955 when an insecticide being sprayed in the marshes around the lake by an aircraft drifted instead into the lake. The insecticide wiped out the 1955 trout fry plant. In 1956 an agreement was reached with the responsible parties that there would be no insecticide spraying in the vicinity of Boleo Lake, and the lake was stocked with 70,000 rainbow and steelhead trout fry. By the fall of 1957 these fish started to enter the sport fishery and were from 12 to 14 inches in length. Boleo Lake had a good population of trout at freeze-up time, October 6th, which should provide for a good sport fishery next season.

Deadman Lake, near Northway, had a very disappointing summer angling season. This shallow lake warms up to temperatures as high as 73° Fahrenheit at the surface; there is twenty-four hours of daylight for about two months during the summer. During the fall of the year, September, some fine catches were made in the lake (Figure 4). The largest fish taken was 25¼ inches in total length and weighed approximately seven pounds. Northern pike were reported to be in the lake. Repeated gill netting and creel checks did not confirm this; however, the failure of the trout fry plants certainly indicates that this predator may have become reestablished in the lake.

Deadman Lake

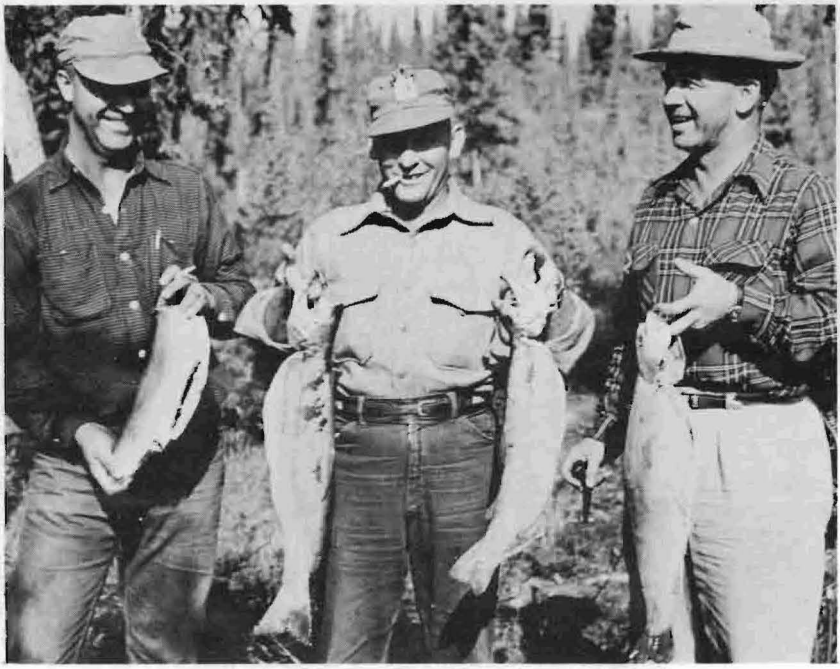


Figure 4. A nice catch of rainbow trout taken from Deadman Lake.

The gravel pits along the Richardson Highway located at Mile 20, Mile 30, Mile 80 and Mile 81 continued to produce good trout fishing. The status of these pits was, however, changed during the 1957 season. Prior to this season the pits were closed to all anglers, other than children under sixteen years of age. During 1957, the United States Fish and Wildlife Service was advised by the Federal Solicitor that the Alaska Game Commission did not have the authority to establish waters for juvenile only fishing. As a result, the gravel pits were opened to all sport fishermen—adults as well as juveniles. These pits, being small in size, have a limited production. By September they

Gravel Pits

were fished out; negligible carry-over of yearling fish into the second year will be one result of the new regulation.

The gravel pits adjacent to the Railroad Yard in Fairbanks, rehabilitated during 1955 and stocked in 1956, contained fine populations of rainbow trout that averaged seven inches in length by the fall of 1957. These pits were closed during 1957; they will be opened to angling sometime in 1958.

A series of gravel pits on Eilson Air Force Base, located 26 miles from Fairbanks on the Richardson Highway, was investigated. Two of the pits showed definite indication that they may provide suitable habitat for trout. These pits are interconnected and lie approximately fifty feet apart; water flows from the smaller into the larger pit at the rate of approximately 1500 gallons per minute. There is no above ground outlet from the larger pit and no above ground inlet to the smaller one. Obviously then, the smaller pit is spring fed with the surplus water flowing into the larger pit which, in turn, drains through subsurface gravel into a slough of the Tanana River. The two pits have a combined surface area of approximately sixty acres. A total of 6,500 rainbow and steelhead trout fry were stocked in the pits during September 1957. A portion of these fish were marked to check on the relative rate of growth and survival between the steelhead and the rainbow trout.

Prior to stocking the Eielson Pits an agreement was reached with the United States Air Force whereby the general public would be permitted to fish these waters, thus insuring public access to the pits.

Harding Lake

Harding (Salchaket) Lake, located 45 miles southeast of Fairbanks via the Richardson Highway, was stocked with rainbow and steelhead trout in 1956. This 7,000 acre lake, containing indigenous northern pike, was stocked on an experimental basis to determine if trout could be established. Thus far, no survival of the introduced trout has been confirmed. It is doubtful that the trout will be able to elude the predaceous pike.

Jan Lake

Jan Lake, located one mile off the Alcan Highway at Milepost 1353½, was first stocked with trout in 1955 and again in 1956. This lake contained no fish life prior to stocking by this Department. By the spring of 1957 the Jan Lake rainbow and steelhead trout were averaging 11 inches in length. Jan Lake was not closed to angling; the stocking had not been publicized. As a result, it was merely necessary to get out publicity as to the exact location of the lake along with the size of trout when a swarm of anglers congregated on the lake. Out of the first 36 anglers who fished the lake the first day, 29 took their limit of ten trout each or a total of 290 trout while only 7 of the 36 people failed to limit. The latter anglers did take 53 rainbow and steelhead trout (Figure 5).

Jan Lake produced spotty angling during midsummer. This is attributed, in part, to the high water temperatures found in Interior Alaska during the summer months. The surface water temperature of Jan Lake reached 76° Fahrenheit, on occasion, and was well above 60° Fahrenheit for most of June, July and August. By September when the water became

Figure 5. Anglers cleaning two limits of trout taken from Jan Lake.

Figure 6. A ten year-old angler with two rainbow trout, 19 and 16 inches in length, taken from Lost Lake.

cooler and the trout more active, good catches were made in the lake. Unfortunately, due to budgetary limitations, an accurate creel check was not made on this body of water for the entire season.

The successful midsummer anglers who fished Jan Lake confined their fishing to just before and after midnight. At this time of the day the sun would set for a short period, even though there was not total darkness, and the trout became more active in their feeding.

Lost Lake

Lost Lake continued to produce spotty angling for trout during the spring and summer; however, some good catches of trout were made during the fall of the year (Figure 6). The trout plants in this lake in the past have consisted of fish of small size, averaging well over one thousand trout per pound. An attempt will be made to increase the trout survival by stocking larger fish; the stocking in this lake will be restricted to fish that are 500 per pound or larger.

WESTERN ALASKA LAKES DISCUSSION

Beach Lake

Beach Lake, located near Birchwood, has had a declining sport fishery on an indigenous population of "land-locked" silver salmon. This 100 acre lake lies about 200 yards from Knik Arm and is connected to it by a small outlet stream. In past years a few silver salmon have been reared in the lake, and at times have been in sufficient numbers to provide an attractive fishery. "Land-locked" silver salmon up to 14 inches in length have been taken from the lake. In recent years the sport fishery has declined, and it no longer attracts any number of anglers.

The Department has been conducting an investigation on Beach Lake for several years. Its potential appears to be quite high. Since the only access to the lake is a one and one-half mile trail, it has not been possible to get the various equipment (boats, nets, chemical water analysis gear, etc.) on the lake for a complete survey.

Small experimental plants of rainbow and steelhead transported to the lake in backpack containers, were made in 1955 and 1956. At the present time there are indications that these trout have not had enough survival to make continued stocking the means of utilizing the lakes basic productivity.

The United States Army is cooperating with the Department in an effort to build an access road into the lake. It is hoped that this will be accomplished in 1958 and that the investigational work can then be accelerated.

Clunie Lake

Clunie Lake, located in the Eagle River flats near Chugiak, was rehabilitated and stocked with rainbow trout in 1956. The 1957 sampling in this 103 acre lake has indicated the planted trout have had satisfactory survival and growth. The sampling work, done with a graduated mesh sampling gill net, has averaged 24 trout per overnight set, the trout being up to 12 inches in length and

0.85 pounds each in weight. Clunie Lake will be opened to fishing in the spring of 1958.

Long Lake

Long Lake, 105 acres in size and located in the middle of the Matanuska Valley was rehabilitated in late June 1956 to eradicate a population of stickleback. It is a land-locked lake with a maximum depth of 56 feet. It has never supported a sport fishery, although the investigational work indicated that it could be quite productive for sport fish. The first trout fry were stocked in July 1956, shortly after rehabilitation, and again in 1957. The growth of the planted trout has been good and the survival appears satisfactory. Long Lake will be open to angling in the spring of 1958.

Bonnie Lakes

Lower and Upper Bonnie Lakes, located 2½ miles off the Glenn Highway at Mile 84, continued to provide excellent fishing for the anglers. These virgin lakes of approximately 300 surface acres in size, were originally stocked by the Department in 1953. In 1954 homesteaders built a road into Lower Bonnie Lake, and the lower lake received a heavy fishing pressure. The public fishing access to Upper Bonnie Lake is not accessible by road. However, those anglers who have hiked the 1½ miles into Upper Bonnie Lake have enjoyed exceptional angling.

The trout planted in the lakes have maintained a high growth and survival rate since the original stocking in 1953. Four and five pound rainbow trout are not uncommon.

A screen was constructed in 1957 on the outlet of Lower Bonnie Lake to prevent the movement of trout out of the lake and over a falls, where they would be lost to the anglers.

At present, negotiations are underway with the Territorial Department of Roads and the U.S. Bureau of Public Roads to build an access road to Upper Bonnie Lake.

Lower Fire Lake

Lower Fire Lake has attracted a large number of fishermen since the trout stocked by the Department started entering the catches in 1955. Because of the lakes location at Mile 16, Palmer Highway, near the Anchorage population center, the angling is intensive. Most of the trout are removed in their second year at a size of 10 inches or less.

There are not sufficient catch records available to completely evaluate the fishing success. However, comparison between catches by gill net sampling from year-to-year does give some indication of the relative abundance of fish in the lake. Following is a table showing the catches by gill net sampling in Lower Fire Lake:

Year	Average Number of Trout Caught in One Day by One Net
1952 through 1954	4
1955	27
1956	30
1957	69

Since 1955, when the trout stocked by the Department first entered the sampling, the size of the fish taken has remained relatively stable. The combination of the annual stocking of trout along with the adequate survival and growth and the intensive sport fishing has resulted in the near-maximum use of Lower Fire Lake.

Lucille Lake, near Wasilla, was rehabilitated and restocked for the first time in 1956. The lake was closed to angling during 1957. Both rainbow and steelhead trout were planted in this 370 acre body of water. Additional trout plants were made in 1957. The planted trout have had very rapid growth—in the fall of 1957, when the rainbow trout were one and one-half years of age, they ranged up to 18 inches in length and three pounds in weight. The sampling in the lake also appeared very favorable in the number of trout taken per unit of sampling—the highest catch per sampling set ever encountered in Western Alaska. It must be assumed that these sets were, for some reason, unusually productive. Still, it does indicate a good population of trout in Lake Lucille.

Lucille Lake

In the spring of 1957, just after the breakup, a moderately heavy winter kill was observed in the large shallow water area above the outlet. This shallow area, ranging up to 9 feet deep, comprises over one-half of the lake. The fish had become trapped in the shallow water with the advent of winter, and because of the areas size, were unable to sense and move to the deep water areas. The kill observed was estimated to be between 2,000 and 6,000 trout.

The reappearance of stickleback, both 3-spined and many-spined, was noted in Lake Lucille during 1956. The reappearance of these fish could be attributed to any of the following factors:

1. Not attaining a complete kill during rehabilitation—although suckers, also present in large numbers before rehabilitation, had not re-infested the lake.
2. The stickleback moved upstream and through the outlet into the lake. A barrier was constructed at the outlet prior to rehabilitation to prevent this (Figure 7). However, a partial failure of the barrier was experienced in 1955.
3. Re-introduced manually. While no informed individual would take such a step, it is still common practice in Alaska for individuals, usually with the best of intentions, to move fish from one body of water to another. There are a number of instances on record where this has happened.

Some "land-locked" silver salmon were also found in Lucille Lake during the fall sampling in 1957. The presence of these fish could not be attributed to survival during rehabilitation. Their re-entry through the outlet, in the numbers indicated by the sampling, was rather unlikely, although not impossible. The most reasonable premise is that they were re-introduced by man. Lake Lucille will be open to the anglers in the spring of 1958.

Matanuska Lake, a few miles from Palmer, was rehabilitated by the

Department and opened to fishing in the spring of 1956. The 65 acre lake provided a very satisfactory fishery in 1956 and again in 1957. The 1957 fall sampling produced 27 trout per unit of sampling gear, indicating that an adequate stock for replacement is being maintained. 25,000 rainbow trout fry were planted in 1957.

Matanuska Lake

Mirror Lake, 80 acres of water located at Mile 25, Palmer Highway, is ideally located to provide recreational fishing for the Upper Cook Inlet populations centers. This shallow lake was known to be marginal for winter survival. It was rehabilitated and stocked with rainbow and steelhead trout in 1956 to explore the possibility of utilizing such marginal water for the production of game fish.

Mirror Lake

The 1957 fall sampling produced 19 trout per unit of sampling gear—a satisfactory number, considering the winter conditions to which these trout had been subjected. If comparable survival is possible through the ensuing winter, the lake may very well support a significant sport fishery when it opens to the anglers in the spring of 1958.

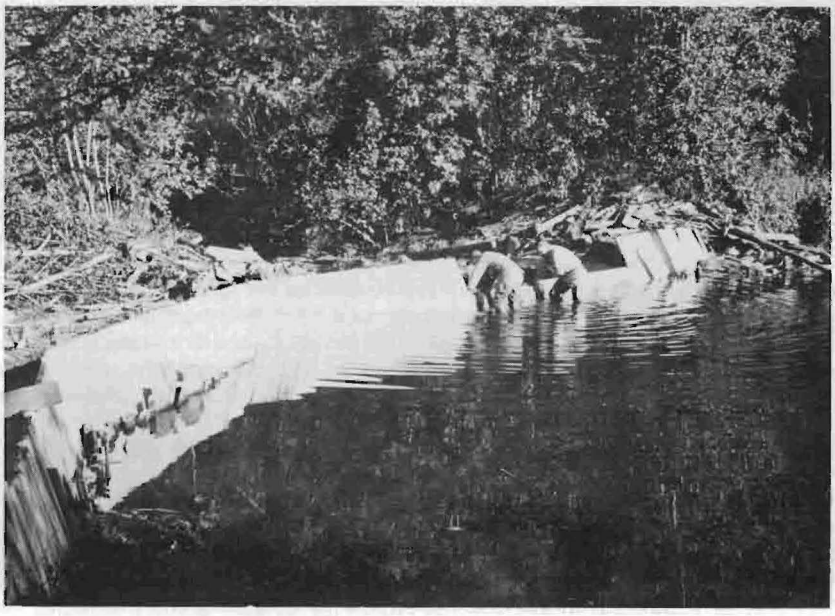


Figure 7. Constructing the barrier at the outlet of Lake Lucille.

Ravine Lake is located at one-half mile on the Bonnie Lake road, Mile 84, Glenn Highway. Investigation indicated a comparatively high sport fish production potential, and at least a reasonable chance that this 15 acre virgin lake could carry trout without a severe winter kill. Four thousand rainbow trout from the Fire

Ravine Lake

Lake Hatchery were transported to Ravine Lake in 1955. When it opened to fishing in the spring of 1957, it did not attract sufficient fishermen to arrive at any estimate of angling success. There are indications that the planted trout have had sufficient survival and growth for a sport fishery. An attempt will be made to attract more fishermen to the lake in 1958.

Rocky Lake

Rocky Lake, located in the Matanuska Valley, was rehabilitated by the Department in 1954. It has consistently provided attractive angling for the recreational fishermen. It is estimated that the anglers took 1,300 trout from the lake on the 1957 opening weekend. The prize winning trout in the 1957 Palmer area-wide fishing derby was a 6½ pound rainbow trout taken from Rocky Lake. Gill net sampling indicated that the older age groups were being removed from the lake by the sport fishermen, leaving adequate living space and food for the young, fast growing trout.

Sand Lake

Sand Lake, near Spenard, was rehabilitated by the Department in 1953. It has not provided a satisfactory sport fishery, although the size of the few fish taken by anglers has been large. Four and five pound trout are not uncommon. A 9½ pound rainbow trout was taken from Sand Lake in 1957. This is the largest fish on record from the Department's planted trout.

KODIAK AREA DISCUSSION

Lake Investigations

One of the first things the biologist must do upon being assigned a district is ascertain the nature of the water he has to work with. This is done by periodically sampling lakes and analyzing the water samples for such factors as dissolved oxygen, pH (acidity), temperature and total hardness. When dealing with such species as trout, which have relatively low tolerance for low dissolved oxygen concentrations, winter sampling is of the utmost importance. As discussed in previous reports, when ice covers a lake the gaseous exchange of oxygen and carbon dioxide between the water and the atmosphere ceases. When the ice is covered with snow, the release of oxygen by algal photosynthesis ceases. In the Kodiak area moderate winter temperatures and occasional rains keep the lake inlets and springs active throughout most of the winter so that only those lakes that are six feet or less in depth and have heavy growths of water plants become critical for trout survival. Sampling in the Kodiak area has revealed that fear of winter kill in any but the rich, very shallow lakes is groundless.

Since winter kill can be desregarded in most of the lakes in the Kodiak area, it would seem to follow that one could immediately set about planting trout in every pond and lake in the area. The biologist's task is not so simple however.

Many of Kodiak's small lakes are little more than wide spots in a short stream flowing into salt water. The tendency of steelhead to leave these lakes and run to sea was discussed in the 1956 Report. In numerous cases where cataracts or falls do not bar the way, the lakes

can become populated with cottids, stickleback, and dolly varden char from the sea. The presence of the cottids and stickleback in large numbers seriously depress the production of trout through competition. Dolly varden char not only compete with, but prey on the trout fry that may be introduced. Simply planting trout in lakes already populated with char and rough fish results in a poor survival in the lake.

To insure the success of a trout introduction, it is often advisable to remove the competitors or predators, by using rotenone, a specific fish toxicant. The small trout are then introduced into an ideal environment, and, in addition, the lake's production is limited to a single desirable species.

In addition to rehabilitation it is often necessary to construct a screen at a lake's outlet to prevent the young steelhead from running to sea. Screens were installed at the outlets of Lake Aurel in the Bell's Flats area and Lake Tanignak on Woody Island. The Kodiak Conservation Club and Civil Aeronautics Administration employees made possible the construction of the screens by donating time, materials and transportation.

Outlet Screens

A supply of trout eggs or fry is necessary in any lake development program and the Kodiak district is fortunate in having fine steelhead rivers for an egg source. At great expense of time and effort, members of the Kodiak Conservation Club constructed a camp and weir on the Karluk River in 1953 (Figure 8). Each spring a group of volunteers and a professional advisor assemble the weir and tramp, take eggs from the spawning run of steelhead, and transport them to the fish hatchery at the Kodiak Naval Station. As soon as the eggs are "eyed" or when the eye pigment is visible through the egg membrane, the eggs are shocked to blank out the infertile eggs. The eyeing of the eggs coincides with the complete envelopment of the yolk material by the embryonic membrane. This renders the egg quite resistant to rupture by reasonable shock. Those eggs that failed to fertilize lack this protecting embryonic membrane and shocking will rupture the delicate membrane surrounding the yolk, allowing fresh water to enter which causes some of the proteins to turn white or "blank out." The dead, white eggs are easily identified among the reddish translucent ones, and are then removed by picking. After the infertile eggs are removed the eyed eggs are distributed to the various hatcheries throughout the Territory. The 1957 egg shipments were as follows:

Egg Take

Agency	Location	Number
U.S. Navy	Adak	100,000
U.S. Fish & Wildlife Service	Anchorage	100,000
U.S. Fish & Wildlife Service	Juneau	40,000
Alaska Dept. of Fish & Game	Anchorage	100,000
Alaska Dept. of Fish & Game	Fairbanks	150,000
	TOTAL	490,000
Held for Kodiak area		328,830
Pickoff		135,827
	TOTAL EGG TAKE	954,657

Two hundred three (203) female steelhead were used in the egg take, thus the average female produced about 4,700 eggs. This was a little higher than has been the case in former years—the average being between 4,200 and 4,400 per steelhead. An early spring caused the run to peak before the weir was installed on May 4, thus the late run steelhead may tend to be a little larger and give more eggs. The above is pure conjecture, however, since insufficient measurements have been obtained to be siginificant.

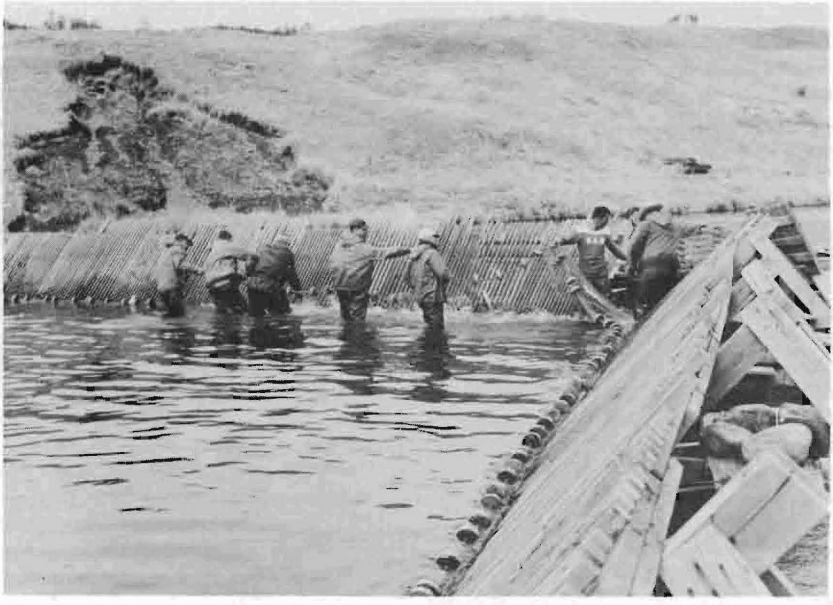


Figure 8. Weir across the Karluk River.

To defray the expense of feeding personnel at the camp and the upkeep of the camp and equipment, the Club charges a service fee for the eggs exported to other agencies. There is no charge for the eggs retained to be used in the Kodiak area, nor is the planting of fry restricted to the Naval Reservation.

Of the 328,830 eggs held for the Kodiak area, 322,836 hatched and survived to be planted. Ofthese, 20,000 were shipped to the United States Fish and Wildlife Service, Anchorage. The survival of the fry was considered good, no doubt because the small number precluded crowding in the troughs, and a new commercial dry feed was used that was easier to feed and much easier for the fry to take.

Buskin River

Prior to World War II, the Buskin River which flows from 275 acre Buskin Lake about three and a quarter miles to salt water, was famous for its steelhead runs. The large numbers of men stationed in the Kodiak area effectively fished the run out. Since then only a remnant run has remained. Each year since 1953,

the Buskin system has been heavily stocked with fry in an effort to rejuvenate the run. The magnitude of the fish plants were as follows:

Year	Number of Steelhead Trout Stocked
1953	279,000
1954	138,400
1955	600,000
1956	274,371
1957	195,568

During the summer of 1957 juvenile steelhead were taken regularly by sportsmen from the Buskin River. One fisherman took and released nineteen in less than an hour. Youngsters took them regularly on salmon eggs. Sizes ranged from 5½ inches to 11 inches. Mature steelhead appeared in greater numbers during the fall of the current year than in any previous recent year. Reports from sportsmen indicate that the run is definitely on the increase.

Low water temperature at the Kodiak hatchery delayed the hatch during 1957 until mid July, and subsequent yolk absorption was not finished until August. In the two years that the Department has operated the hatchery, fry have been held until November, but this has not resulted in a large enough size to the trout that would permit marking. Steelhead fed until November 1957, a warm season, weighed 283 fish to the pound. Admittedly the hatchery fish were not marked and cannot be identified; the efficiency of stocking the Buskin River can only be assumed up to this point. An obvious increase of steelhead in the system is encouraging, however.

Lakes Catherine and Louise

For two seasons attempts have been made to measure the contribution to the salmon runs of two lakes adjacent to the road on the Naval Station. Lake Catherine and Lake Louise have small runs of red and silver salmon. The lakes have also received steelhead fry from the hatchery each year since the program on Kodiak began. As yet no sport fishery has resulted from the stocking.

Initial steps were taken to set up an experiment whereby lakes infested with stickleback will be compared to rehabilitated lakes as to trout growth and fisherman success. Two lakes with heavy stickleback populations are to be compared with three rehabilitated lakes and one lake that supposedly contained stickleback at one time, but in which none has been found in two seasons. Thus far the surface acreage of all lakes has been accurately ascertained by surveying. The lakes were each planted at two hundred fish per acre during the 1957 season. Screenways and screens have been installed at the outlet of each lake to halt the downstream migration of steelhead smolts. Voluntary creek census stations were placed at the lakes but proved to be unsatisfactory since the small amount of information gleaned was biased and often inaccurate. As time passes, limnological data will be gathered from each lake to aid in interpreting the results in fish growth and fisherman success.

1957 FIRE LAKE HATCHERY TROUT PLANTS

Date	Lake	Number Planted	Number of Trout per Pound	Species	Area
June 25	Bradley	8,000	670	Rainbow	Matanuska Road, Matanuska Valley
September 15	Boleo	7,000	355	Rainbow	Big Delta
September 15	Boleo	3,000	650	Steelhead	Big Delta
June 14	Clunie	25,000	1,315	Rainbow	Eagle River Flats, Anchorage
September 7	Deadman	25,000	355	Rainbow	Northway, Alaska Highway
September 9	Deadman	19,000	355	Rainbow	Northway, Alaska Highway
September 23	De Laney	3,000	185	Rainbow	Spenard Area
June 26	Echo	3,000	670	Rainbow	Matanuska Road, Matanuska Valley
September 23	Falk	1,000	400	Steelhead	Butte Road, Matanuska Valley
June 28	Frank & Jerry's	10,000	520	Rainbow	Mile 149, Glenn Highway
July 16	Green	2,000	472	Rainbow	Elmendorf Air Force Base
July 16	Green	3,000	568	Rainbow	Elmendorf Air Force Base
June 20	Gregory	25,000	933	Rainbow	Elmendorf Air Force Base
June 26	Keppler	17,000	670	Rainbow	Matanuska Road, Matanuska Valley
September 5	Knik	7,000	360	Rainbow	Knik
September 24	Jan	9,000	230	Rainbow	Mile 1353½, Alaska Highway
September 24	Jan	1,000	450	Steelhead	Mile 1353½, Alaska Highway
June 20	Jewel	10,000	833	Rainbow	Spenard
June 17	Long	17,000	1,024	Rainbow	Matanuska Road, Matanuska Valley
June 16	Long	20,000	1,321	Rainbow	Mile 86, Glenn Highway

June 15	Lower Bonnie	33,000	1,018	Rainbow	Mile 84, Glenn Highway
June	Lower Fire	25,000	——	Mixed	Mile 16, Palmer Highway
June 10	Lucille	80,000	1,813	Rainbow	Wasilla
June 14	Lucille	35,000	1,315	Rainbow	Wasilla
June 27	Matanuska	25,000	520	Rainbow	Matanuska Road, Matanuska Valley
June 18	Mirror	18,000	1,027	Rainbow	Mile 21, Palmer Highway
August 24	Otter	6,000	400	Rainbow	Fort Richardson Army Base
June 15	Ravine	6,000	1,018	Rainbow	Mile 84, Glenn Highway
June 18	Rocky	18,000	1,027	Rainbow	Big Lake Road, Matanuska Valley
June 20	Sand	20,000	733	Rainbow	Spenard
September 23	Sharron	1,000	400	Steelhead	Big Lake Road, Matanuska Valley
September 27	Sportsmen's	1,000	305	Steelhead	Soldatna
September 27	Sportsmen's	1,000	168	Rainbow	Soldatna
September 23	Sundi	1,000	185	Rainbow	Spenard
June 28	Tex Smith	12,000	520	Rainbow	Mile 161, Glenn Highway
July 19	Thompson	2,000	472	Rainbow	Fort Richardson Army Base
June 17	Unnamed	10,000	1,024	Rainbow	Matanuska Road, Matanuska Valley
September 23	Upper Fire	1,000	165	Rainbow	Mile 16½, Palmer Highway
September 23	Upper Fire	1,000	300	Steelhead	Mile 16½, Palmer Highway
June 16	Wiener	9,000	1,121	Rainbow	Mile 88, Glenn Highway
	Totals Planted:	507,000	Rainbow		
		13,000	Steelhead		
	TOTAL	520,000			

1957 FAIRBANKS HATCHERY TROUT PLANTS

Date	Lake	Number Planted	Number of Trout per Pound	Species	Area
September 9	Gravel Pits	4,000	400	Rainbow	Fairbanks, Alaska Railroad Yard
September 9	Gravel Pit	500	400	Rainbow	20 Mile, Richardson Highway
September 9	Gravel Pit	500	400	Rainbow	30 Mile, Richardson Highway
September 10	Gravel Pit	500	400	Rainbow	80 Mile, Richardson Highway
September 21	Eielson AFB Pit	6,500	200	Rainbow. Steelhead	Eielson Air Force Base
September 22	Lost	1,250	250	Rainbow	Fairbanks
	Total	13,250			

1957 KODIAK CONSERVATION CLUB HATCHERY STEELHEAD TROUT PLANTS

Date	Lake	Number Planted	Number of Trout per Pound	Area
August 10	B.F. No. 20 Jack	1,000	1,378	Bells Flats
August 10	B.F. No. 21 Lee	2,800	1,378	Bells Flats
August 24	B.F. No. 23 Cicely	1,000	1,000	Bells Flats
August 25	B.F. No. 25 Caroline	2,300	1,148	Bells Flats
August 24	B.F. No. 24 Aurel	3,000	1,000	Bells Flats
August 12	S.C. No. 12	4,000	1,378	Miller Point
August 15	S.C. No. 13 Milnitsa Lake	11,000	1,630	Spruce Cape
September 5	Dark	4,300	720	Spruce Cape
October 19	S.C. No. 15	4,000	432	Spruce Cape
Aug. 17-Sept. 7	W.I. No. 61 Tanignak	6,200	720-1.600	Woody Island
September 7	W.I. No. 63 Elephant	2,900	720	Woody Island
September 27	W.I. No. 62	5,600	484-604	Woody Island
October 7-8	L.I. Dolgoi (No. 70)	3,900	432	Long Island
November 5	L.I. No. 72	2,100	520	Long Island
September 30	A.L. No. 3	1,000	500	Anton Larsen Bay
August 16	Base No. 18 Catherine	11,000	1,600	Naval Base
August 21	Base No. 19 Louise	11,000	1,062-1,330	Naval Base
August 21	Base No. 86 Lilly Pond	500	1,062	Naval Base
September 2	C.P. No. 34-5	2,000	760	Cliff Point
October 1	C.P. No. 29	1,000	480	Cliff Point
August 14	C.P. No. 30	400	1,200	Cliff Point
August 22	B.P. No. 40	2,700	866	Broad Point
August 22	C.C. No. 47	400	866	Cape Chiniak
Oct. 17-Nov. 7	C.C. No. 46	5,000	456-520	Cape Chiniak
Oct. 18-Nov. 2	C.C. No. 45	4,000	420-436	Cape Chiniak
November 3-7	C.C. No. 44	4,000	420-488	Cape Chiniak
September 17	N.C. No. 53	1,100	574	Narrow Cape
September 17	N.C. No. 54	1,100	574	Narrow Cape
Aug. 28 thru Nov. 8	Buskin	196,000	382-988	Naval Base
	Total	295,300		

FINANCIAL REPORT

ALASKA DEPARTMENT OF FISH AND GAME

Expenditures, July 1, 1957 - June 30, 1958

FUNDS ALLOTTED, BIENNIUM JULY 1, 1957 - JUNE 30, 1959

Fish and Game Commission	$ 12,000.00
Administration	54,355.00
Biological Research	194,000.00
Commercial Fisheries	193,000.00
Education and Information	19,000.00
Engineering	32,000.00
Inspection	34,000.00
Land Animal Predatory Investigation & Control	25,000.00
Marine Predator Investigation & Control	73,000.00
Sport Fish	75,000.00
Construction of Fishways & Other Projects	120,000.00
	$831,355.00
Fur and Game (separate appropriation)	25,000.00
TOTAL	$856,355.00

	Allotted biennium July 1, 1957-June 30, 1959	Encumbrances	Expenditures	Unencumbered Balance June 30, 1958
Fish and Game Commission	$12,000.00	$ 440.25	$ 4,236.44	$ 7,323.31
Administration	54,355.00	3,020.70	22,256.26	29,078.04
Biological Research	194,000.00	12,253.11	101,574.85	80,172.04
Commercial Fisheries	193,000.00	19,565.21	93,465.61	79,969.18
Education and Information	19,000.00	708.28	7,861.65	10,430.07
Engineering	32,000.00	1,813.24	15,910.53	14,276.23
Inspection	34,000.00	3,398.11	15,878.39	14,723.50
Land Animal Predatory Investigation & Control	25,000.00	2,073.57	9,184.20	13,742.23
Marine Predator Investigation & Control	73,000.00	3,976.12	28,062.36	40.961.52
Sport Fish	75,000.00	8,266.74	63,556.05	3,177.21
Construction of Fishway & Other Projects	120,000.00	108,442.50	11,557.50	———
Fur and Game	25,000.00	1,833.95	12,643.23	10,522.82

SPECIAL FUNDS:

	Total Amount Received	Balance June 30, 1958
Monies received from Wakefield's Deep Sea Trawlers, Inc., Seattle, Washington, from October 13, 1953-August 15, 1955	$3,000.00	$339.46
Monies received from Fishermen and Cannery Workers Union No. 24365 Juneau for destruction of seal on Taku River	$ 300.00	$ 77.30
CONTRACT NO. 14-19-008-9382 - June 14, 1957 - June 13, 1960		
For Investigation of the Growth Rates of King Crab in the Kodiak area, total of $14,650.00 allotted or $4,880.00 for each of the three years. First year, June 14, 1957-June 13, 1958	$4,655.00	$225.00
CONTRACT NO. 14-19-008-9347 - June 23, 1957 - June 22, 1958		
For Investigation of Predatory Animals and Their Influences on Prey Species of Fish with Commercial Importance. Funds allotted for salaries of Biological Aides only	$4,000.00	———

The commercial catch of fishery products in Alaska during 1957 amounted to over 372 million pounds valued at nearly 32 million dollars to the fisherman. This represented a decrease of about 27 million pounds and six million dollars compared with the volume and value of the 1956 catch. The number of persons engaged in the fishing industry decreased from 23,598 in 1956 to 23,130 in 1957. The number of wholesale and manufacturing establishments increased from 168 in 1956 to 170 in 1957 while the value of products prepared for market decreased over 13 million dollars in the same period.

(1) Fisheries statistics in Alaska are compiled by the U.S. Fish and Wildlife Service. The gross details are included in this Annual Report in order to acquaint the readers with the magnitude and the trend of this important industry. We have drawn our material from **Alaska Fisheries**, 1956, Annual Summary, published and obtainable from the U.S. Fish and Wildlife Service, and from unpublished data obtained from the U.S. Fish and Wildlife Service, Juneau, Alaska. The use of this data is here gratefully acknowledged.

Table 1. Comparative values of canned salmon giving initial price per case, approximate total value per species, and total for all species.

Year	Silver	Chum	Pink	King	Red	Total Value
	$ 25.96	21.10	24.24	26.70	27.51	
1948	$5,732,253	15,082,926	31,445,485	1,435,578	44,964,049	98,660,291
	22.00	15.00	16.00	24.00	26.05	
1949	3,781,482	7,498,382	44,147,496	1,402,934	25,581,995	82,412,289
	22.00	21.10	24.00	23.00	29.00	
1950	5,556,430	15,539,056	26,753,868	1,590,996	34,811,975	84,252,325
	25.28	15.18	20.84	28.41	31.85	
1951	8,726,587	10,925,359	32,505,086	2,489,046	24,603,107	79,249,185
	21.34	15.66	18.52	26.76	28.60	
1952	4,206,757	15,140,209	21,705,200	1,526,532	33,783,606	76,362,304
	19.67	13.43	17.59	27.64	28.50	
1953	2,511,209	10,622,248	16,613,896	1,553,585	26,877,507	58,178,445
	22.87	14.66	19.55	26.76	28.89	
1954	3,826,839	14,766,146	22,230,115	1,374,656	21,158,968	63,356,724
	26.67	17.39	21.29	28.65	31.81	
1955	3,056,498	6,322,462	26,345,976	1,369,984	19,774,011	56,868,931
	28.82	18.75	22.31	31.10	34.55	
1956	2,763,122	12,873,940	26,601,559	1,426,590	34,912,246	78,577,457
	27.40	18.49	23.04	31.95	34.99	
1957	**2,391,960**	15,344,031	16,945,404	1,533,286	26,694,705	**62,909,383**
					Total value for all species 1948-1957	**$740,827,334**

Table 2. Total salmon pack in cases (48 one pound cans) and number of operating salmon canneries by district.

Year	Southeastern Pack	Canneries	Central Pack	Canneries	Western Pack	Canneries	Total Pack	Canneries
1948	1,277,773	34	1,316,494	53	1,374,254	17	3,968,521	104
1949	2,493,709	37	1,281,212	51	588,550	19	4,363,471	107
1950	1,190,174	39	1,439,029	54	643,889	15	3,273,092	108
1951	2,028,262	39	1,067,687	59	388,519	24	3,484,468	122
1952	1,320,925	40	1,456,417	46	796,786	24	3,574,128	110
1953	977,682	37	1,350,589	43	533,996	20	2,862,267	100
1954	1,302,939	29	1,394,981	43	396,833	17	3,094,753	89
1955	839,694	30	1,162,541	39	382,910	15	2,385,145	83*
1956	1,032,487	26	1,349,116	37	641,303	14	3,022,906	77*
1957	904,970	27	1,001,792	36	556,910	18	2,463,672	80*

*Adjusted to eliminate duplication.

Table 3. Number of Salmon Taken in 1957 by Apparatus and Species in Each Geographical Section of Alaska.

Apparatus and Species	Southeastern Alaska	Central Alaska	Western Alaska	Total
SEINES: Number of	441	956	59	1,397
% of catch	57	63	3	47
King, or spring	3,975	3,056	143	7,174
Red, or sockeye	457,542	488,564	27,508	973,614
Coho, or silver	125,188	39,528	72	164,788
Pink, or humpback	4,593,865	5,161,513	3,604	9,758,982
Chum, or keta	2,120,323	2,724,184	209,897	5,054,404
Total	7,300,893	8,416,845	241,224	15,958,962
GILL NETS: Number of	785	2,407	2,822	6,010
% of catch	9	20	97	33
King, or spring	22,623	47,194	156,711	226,528
Red, or sockeye	261,235	1,270,219	6,603,235	8,134,689
Coho, or silver	164,028	185,748	87,117	436,893
Pink, or humpback	40,026	135,967	212	176,205
Chum, or keta	617,643	1,056,256	338,216	2,012,115
Total	1,105,555	2,695,384	7,185,491	10,986,430
TRAPS: Number of	123	92	—	215
% of catch	25	17	—	17
King, or spring	2,363	6,823	—	9,186
Red, or sockeye	310,952	312,634	—	623,586
Coho, or silver	132,938	76,184	—	209,122
Pink, or humpback	2,179,618	1,361,655	—	3,541,273
Chum, or keta	620,959	581,189	—	1,202,148
Total	3,246,830	2,338,485	—	5,585,315
LINES: (Hooks) No. of	31,624	—	—	31,624
% of catch	9	—	—	3
King, or spring	269,333	—	—	269,333
Red, or sockeye	1,484	—	—	1,484
Coho, or silver	794,709	—	—	794,709
Pink, or humpback	44,386	—	—	44,386
Chum, or keta	9,940	—	—	9,940
Total	1,119,852	—	—	1,119,852
FISH WHEELS: No. of	—	—	5	5
King, or spring	—	—	1,530	1,530
Total	—	—	1,530	1,530
TOTAL:				
King, or spring	298,294	57,073	158,384	513,751
Red, or sockeye	1,031,213	2,071,417	6,630,743	9,733,373
Coho, or silver	1,216,863	301,460	87,189	1,605,512
Pink, or humpback	6,857,895	6,659,135	3,816	13,520,846
Chum, or keta	3,368,865	4,361,629	548,113	8,278,607
Grand Total	12,773,130	13,450,714	7,428,245	33,652,089

Table 4. Comparative annual catches of fish and shellfish in pounds round and value.

Species	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957
Salmon	338,369,670	388,345,160	264,918,844	276,588,312	282,966,799	220,276,191	247,032,557	203,674,983	269,897,525	203,437,106
	$23,143,760	$32,662,497	$22,637,117	$32,368,160	$31,020,258	$21,497,532	$24,597,049	$21,614,924	$32,930,179	$25,036,218
Herring	174,449,254	33,061,172	165,366,843	81,624,700	45,802,151	34,812,369	35,321,918	64,216,435	103,758,710	118,290,240
	$1,852,972	$414,072	$2,067,085	$1,003,292	$444,461	$452,811	$472,721	$793,752	$1,280,070	$1,478,628
Halibut	34,960,888	35,196,343	38,636,402	32,045,000	33,390,807	26,749,543	36,075,542	26,504,787	33,075,770	27,699,910
	$5,095,063	$5,157,902	$5,776,224	$4,117,608	$4,533,808	$2,959,704	$4,352,759	$2,371,623	$4,803,627	$3,175,414
Sablefish	6,512,346	5,753,724	954,901	5,815,405	1,804,417	3,547,271	4,721,750	4,171,759	2,750,200	4,966,270
	$707,734	$427,374	$35,791	$529,368	$141,364	$250,792	$336,200	$282,089	$185,913	$274,765
Cod	2,337,770	2,185,547	858,318	———	———	———	———	119,001	6,170	15,443
	$73,860	$54,639	$22,676	———	———	———	———	$2,082	$108	$772
Sharks and Skates	2,250,474	1,507,325	18,883	11,008	3,550	2,450	2,783	———	———	———
	$36,358	$24,333	$105	$110	$53	$131	$141	———	———	———
Miscellaneous bottom fish[1]	408,989	192,157	20,604	25,264	377,414	14,146	46,914	98,075	19,885	37,335
	$17,387	$12,281	$528	$1,620	$22,325	$586	$2,217	$7,414	$625	$1,439
Clams:										
Butter	15,644	5,652	———	80	23,116	80,394	9,459	158,558	———	———
	$939	$339	———	$8	$1,828	$6,432	$643	$13,509	———	———
Razor	1,222,649	1,699,695	2,201,717	2,355,681	1,272,454	1,486,222	1,229,135	1,969,226	1,452,673	1,551,605
	$128,378	$203,693	$264,206	$347,574	$165,419	$193,209	$159,788	$255,999	188,847	$201,709
Crabs:										
Dungeness	1,222,326	1,428,401	4,119,425	5,482,416	3,749,412	3,471,806	2,739,383	4,384,043	2,446,122	551,841
	$63,217	$80,716	$277,382	$478,387	$331,433	$312,463	$246,146	$374,567	$211,844	$27,592
King	2,133,354	1,206,945	1,519,249	1,993,912	2,772,833	4,613,209	8,871,070	8,162,920	8,796,022	13,076,565
	$96,001	$72,417	$91,155	$227,622	$388,197	$547,431	$880,465	$808,654	$864,065	$1,046,125
Shrimp	2,834,803	2,267,934	2,158,260	1,707,816	1,952,777	1,733,882	1,451,929	1,828,127	3,043,598	2,380,154
	$226,784	$181,434	$172,661	$179,301	$181,609	$225,405	$188,751	$237,657	$395,668	$309,420
Miscellaneous shellfish[2]	7,329	19,630	73,200	44,193	23,021	91,956	67,778	672	85,460	
	$733	$1,348	$4,392	$3,596	$2,081	$8,074	$5,422	$61	$6,860	
Miscellaneous fish[3]	174,467	19,596	1,445,976	32,909	45,424	87,023	58,502	34,312	21,106	23,590
	$38,116	$1,564	$22,304	$3,594	$5,548	$12,265	$8,739	$5,241	$3,473	$2,767
TOTALS	566,899,963	472,889,281	482,292,622	407,726,696	374,184,175	296,966,462	337,628,720	315,322,898	425,353,241	372,017,839
	$31,481,302	$39,294,609	$31,371,626	$39,260,240	$37,238,384	$26,466,835	$31,251,041	$26,767,572	$40,871,280	$31,554,199

1 Includes rockfishes, flounders, lingcod.
2 Includes cockles, oysters, tanner crabs.
3 Includes trout, smelt, albacore, sheefish.

Note—The weights of oysters and clams represent the shell weight of these mollusks.

Table 5. Comparative annual production of fishery products as prepared for market by poundage and value.

Species	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957
Salmon	210,608,877	232,616,358	174,765,212	189,100,990	194,611,255	156,657,320	174,484,964	131,280,885	160,569,980	135,849,049
	101,193,919	$86,112,666	$87,091,068	$85,887,641	$80,054,432	$62,067,161	$68,206,971	$60,617,136	$81,955,083	$68,157,426
Herring	58,388,893	15,081,412	52,106,111	28,213,195	15,995,582	14,365,884	12,464,513	23,025,111	32,721,689	34,182,146
	$5,694,889	$944,106	$3,819,994	$2,069,608	$944,667	$805,260	$793,790	$1,531,354	$2,262,660	$2,356,191
Halibut	27,566,134	27,513,244	27,401,794	23,607,098	25,591,753	20,534,801	27,345,901	23,247,276	25,476,465	20,184,864
	$6,615,876	$5,425,754	$6,081,896	$4,198,542	$4,730,643	$3,261,482	$4,477,799	$3,220,205	$5,203,496	$3,570,019
Sablefish	4,943,507	4,281,771	680,301	4,170,292	1,297,365	2,455,115	3,277,673	3,042,343	1,923,217	3,472,916
	$968,100	$529,935	$51,579	$548,426	$161,812	$271,366	$394,791	$369,866	$305,931	$380,048
Cod	786,931	660,664	519,035	———	———	———	———	107,327	5,557	2,583
	$85,389	$74,680	$65,347	———	———	———	———	$2,655	$167	$82
Sharks and Skates	177,847	153,777	2,104	1,321	426	294	334	———	———	———
	$82,016	$42,019	$125	$155	$170	$131	$141	———	———	———
Miscellaneous bottom fish[1]	240,463	140,167	14,804	20,298	372,809	6,938	24,777	88,308	16,142	29,175
	$24,115	$14,938	$689	$2,170	$22,591	$832	$2,983	$10,231	$1,579	$82
Clams:										
Butter	13,452	5,916	3,192	80	11,483	36,108	423,262[2]	82,068	———	———
	$3,584	$1,219	$3,073	$40	$3,303	$12,745	$502,771	$41,358	———	———
Razor	428,551	613,140	754,684	670,398	390,956	471,222	———	551,333	411,488	490,800
	$498,469	$680,171	$857,871	$812,791	$501,354	$607,326	———	$732,478	$545,210	$651,057
Crabs:										
Dungeness	302,972	375,908	1,130,828	1,715,967	1,037,741	723,158	2,857,599[3]	1,110,859	496,979	176,161
	$293,550	$349,693	$972,812	$1,125,419	$876,432	$921,893	$2,994,518	$881,686	444,025	$141,782
King	572,107	499,121	626,871	812,690	618,408	1,272,524	———	2,086,565	1,628,603	3,803,944
	$684,260	$272,905	$630,876	$754,208	$683,882	$1,171,554	———	$1,767,923	$1,566,750	$3,504,601
Shrimp	493,271	521,703	500,566	427,096	507,857	503,168	481,225	567,919	715,808	699,907
	$523,750	$473,790	$443,410	$434,201	$485,153	$476,469	$442,159	$495,557	$500,252	$549,278
Miscellaneous shellfish[4]	1,026	4,356	47,400	2,174	3,561	8,398	———	150	530	———
	$684	$3,504	$8,875	$1,609	$3,069	$7,734	———	$80	$413	———
Miscellaneous fish[5]	181,390	14,249	55,441	20,658	30,963	71,888	50,978	23,092	11,285	17,687
	$50,827	$3,481	$16,508	$4,391	$9,941	$16,311	$10,482	$6,325	$1,952	$4,570
Miscellaneous livers, oil & viscera	417,704	23,337	529,963	———	———	———	———	———	465,149	———
	$149,906	$4,396	$39,149	———	———	———	———	———	$67,632	———
TOTALS	305,123,125	282,505,123	259,138,306	248,762,257	240,470,159	197,106,818	221,411,226	185,213,236	224,442,892	199,211,431
	$116,869,334	$94,933,257	$100,083,272	$95,839,201	$88,477,449	$69,620,264	$77,826,405	$69,676,854	$92,855,150	$79,415,580

1 Includes rockfishes, flounders, lingcod
2 Includes both butter and razor clams.
3 Includes both dungeness and king crabs.
4 Includes cockles, oysters, tanner crabs.
5 Includes trout, smelt, albacore, sheefish.

LOOKING FORWARD

BIOLOGICAL RESEARCH

The problems of enumerating upstream migrants in a turbid, glacial river will be continued by the Division of Biological Research. The effectiveness of the fish wheel, as a sampling device to accurately measure escapement, requires further study and a more intensive tagging program in connection with the wheel will be carried out. The sampling and enumeration of juvenile downstream migrants in the same type of river, constitutes an important problem that will also be studied on the Taku River. An effective device, which will safely catch migrating fry and fingerlings, needs to be developed. It will enable management to evaluate in advance of subsequent fishing seasons, the success of a spawning brood year and to forecast the abundance of salmon in the various fisheries.

Taku River Salmon Investigation

At Kitoi Bay the initial success in the introduction of sockeye salmon into waters not formerly producing salmon will be pursued further and expanded to other suitable lakes in the vicinity of the Research Station. Research on the techniques for measuring the basic productivity of lakes will continue, with the ultimate objective that present or potential salmon-producing waters may be rated as to possible maximum production.

Kitoi Bay Research

Research of the growth, mortality rates and migratory habits of the king crab will continue in the Kodiak-Afognak area. A more effective way of tagging crabs will be developed, allowing the release of greater numbers of tagged crabs to provide data of statistical significance. Life history data is required by management for effective regulation of the king crab fisheries.

King Crab Studies

Experiments on the introduction of new runs of silver salmon into waters not now producing this species will be continued. This will also involve the study of the inter-relationship of silver salmon and red salmon fry feeding in the same body of water. There is reason to believe that the total production of salmon from a body of water may be greater, if it is utilized by more than one species, if they are in proper balance.

Silver Salmon Research

COMMERCIAL FISHERIES

District biologists in the Commercial Fisheries Division, located at Ketchikan, Wrangell, Kodiak, Homer and Dillingham will carry out programs previously started, with the main emphasis on watershed improvement work. It is anticipated that the Division will make extensive strides into research aimed at habitat improvement through the use of chemicals to remove trash fish.

MARINE PREDATOR CONTROL AND INVESTIGATION

Investigations of the biology of sea lions and their relationship to commercial fishes will be continued. Increased attention will be given to harbor seal studies, and the search for effective methods of repelling belugas from areas where they prey on salmon will be continued. An intensive study of the wolf in Southeastern Alaska will be inaugurated.

Harbor seal control will be continued in the Stikine, Taku and Copper River areas, and wolves will be controlled in localities in Southeastern Alaska wherever their predation on deer is considered excessive.

FUR AND GAME

The newly created Division of Fur and Game will be fully staffed as soon as competent men can be recruited. Much of the coming year will be devoted to familiarizing new personnel with the fur and game resources and problems of their management in Alaska. Specific problems, already identified, will be studied. These include the period of optimal fur primeness of various fur-bearers in different parts of Alaska, the abundance of fur-bearers, small and big game animals in specific localities, and the possibilities of moose and caribou transplants to unoccupied ranges. The Division will actively cooperate with the Territorial Sportsmen, Inc., and the U.S. Fish and Wildlife Service in a transplant of moose calves to Berners Bay, Lynn Canal.

SPORT FISHERIES

The Sport Fish Division will continue its program along much the same lines, continuing to work on the pressing recreational fishing problems near the population centers.

The background information obtained since 1951 when the sport fish program was inaugurated, has indicated the need for a greater variety of game fish in the hatchery and stocking programs. The two stocks used in the past, rainbow and steelhead, are not completely compatible with the varied ecological conditions found throughout Alaska. It is planned to commence working with other species in the lake programs; grayling, dolly varden trout and landlocked salmon are three species which hold definite promise.

The hatchery water supply problem, both excessive mid-summer water temperatures and freezing winter water temperatures, have been given investigation priority. Adequate water temperature control must be provided for the Fire Lake Hatchery. It is planned to move ahead with the installation of a new water supply line into Fire Lake, and thus provide the desired temperature control. It is anticipated this will increase the efficiency and adaptability of the Fire Lake Hatchery in handling rainbow and steelhead trout and will also provide the flexibility for handling some of the other species.

INSPECTION

It is expected that next season only two temporary inspectors will be employed. The reduction in the number of men employed as inspectors

is necessary since enforcement of the hunting license has extended the season for the inspectors beyond the month of September when their services were formerly terminated. All of the field staff is deputized to enforce the Sport Fishing and Hunting License Act and will work on this problem from time to time.

ENGINEERING

The Engineering Division has the Bakewell Fishway Project under contract and construction will be undertaken in 1958, with funds made available by the Territory. Prefabricated steep-pass fishways of lightweight alloys have been delivered and will be installed during the coming season for further research to develop low-cost functional fishway facilities.

EDUCATION AND INFORMATION

Eight films made by the Education and Information Division depict the Department's work in biological research, commercial and sport fisheries, Predation Investigation and Control. A film on the new division of fur and game is planned. Although films are purchased from outside sources, it is often difficult to find films that point up specific Alaskan problems. Both, however, if the right kind, are effective mediums for reaching the more than 250 schools and numerous other groups in the Territory that will be vitally interested in the administration of its fish and game resources. Talks by the Director and Members of the staff at meetings and with discussion groups is constantly carried on.

In the scattered, comparatively thinly populated areas of Alaska, it is important to have Alaskans well informed about the stake all share in its fish and game resources. Biological wealth cannot last under increasing population pressure without wise management and public support; with it, fish and wildlife promise to be major resources indefinitely. In law observance and protection of commercial and sport fishing waters and natural forage pastures, the cooperation of the public is of vital importance. In order that thinking on conservation keep pace with the accelerating technological speedup and to invite and encourage this continued cooperation, motion pictures, slide lectures, conferences, press releases, photographs, and verbal and written reports should be widely and effectively used to keep the general public, commercial fishermen and sportsmen well informed about the progress and aims of the Department's program.

CLIFTON KILKENNY

1886-1957

It is with great sorrow that we report the passing of Clifton Kilkenny on June 20, 1957. Mr. Kilkenny joined the Department of Fisheries on June 12, 1950 as a stream inspector. The following year he worked as a seal hunter on the Stikine River Flats, adjacent to Wrangell. He continued seal hunting each season thereafter until his death. His performance was superior by any standard, and was a source of pride to himself and all of his associates. His sincere friendliness and hospitality were in harmony with the finest traditions of old time Alaskans. Cliff's death harkens the end of a pioneer period, though his actions and spirit will continue to afford inspiration and direction to all who knew and loved him.

LITHO BY MINER PUBLISHING CO., JUNEAU, ALASKA