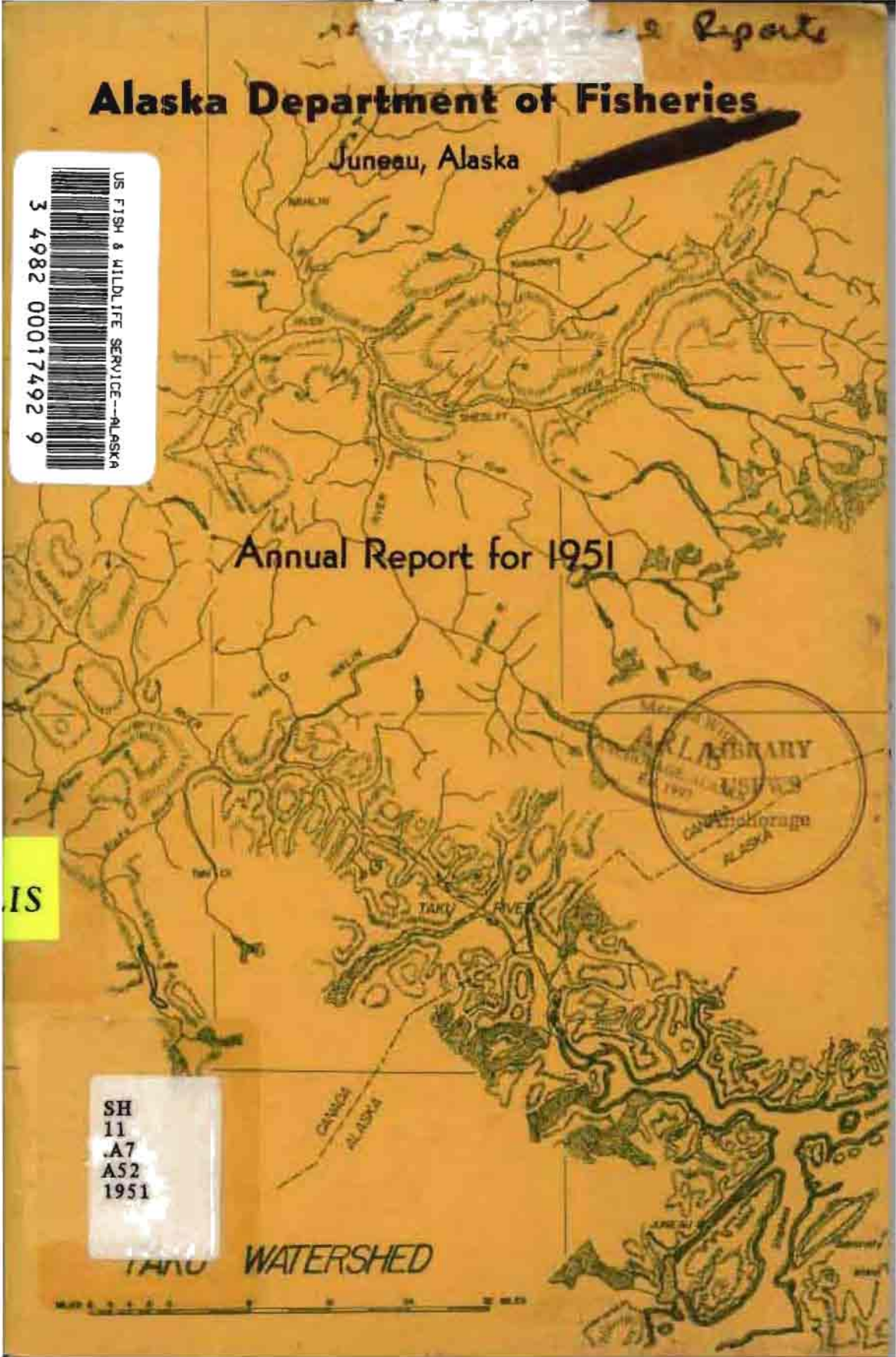
Alaska Department of Fisheries

Juneau, Alaska



Annual Report for 1951

1951
ANNUAL REPORT

Alaska Fisheries Board

and

Alaska Department of Fisheries

Ernest Gruening
Governor

J. Howard Wakefield
Chairman

C. L. Anderson
Director

REPORT NO. 3

JUNEAU, ALASKA

KARLUK BEACH SEINE FISHERY, KODIAK ISLAND

To:

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

Herewith is submitted the Third Annual Report of the Alaska Fisheries Board, created by the 19th Territorial Legislature and approved March 21, 1949.

This report covers the activities of the Board and the Alaska Department of Fisheries based on the calendar year January 1 to December 31, 1951.

C. L. ANDERSON, Director
J. HOWARD WAKEFIELD, Chairman
IRA H. ROTHWELL, Member
J. P. VALENTINE, Member
KARL BRUNSTAD, Member
WILLIAM WALTON, Member
W. O. SMITH, Member

FOREWORD

The following report contains a summary of the activities of the Alaska Fisheries Board and the Alaska Department of Fisheries for the calendar year 1951, except for the financial statement, which, of necessity, is based on the Territorial fiscal year, April 1, 1951 to March 31, 1952.

A review of the work of each division is presented, so that the general public may become acquainted with the overall program of the department. Attention is directed to the new sections on Predator Control, Sport Fish, and Watershed Management. These new activities were made possible by the increased funds appropriated by the 1951 Legislature.

The statistical tables have been brought up to date and a chronological history of the salmon canneries of Central Alaska has been added.

When the biological research division was inaugurated in 1950 every effort was made to bring the program as close to the people as possible. Fishermen and dealers were invited to meetings in the principal ports. The response was excellent and the exchange of ideas was of mutual benefit. The continued interest at subsequent meetings has been very encouraging.

In establishing the new divisions in 1951, a similar procedure was followed. The Wrangell and Cordova fishermen and packers were especially helpful in organizing the hair seal predator control program. The fishermen and packers of the Kodiak-Afognak area contributed to the successful starting of the watershed management project in that area.

The reception accorded the work of the Sport Fish division has been especially gratifying. The Tanana Valley Sportsmen aided immeasurably in the first project undertaken in that district by furnishing manpower, materials, boats and other equipment.

Without this wholehearted support from Territorial residents it would have been exceedingly difficult, if not impossible, to have inaugurated these new divisions and started the actual work within such a short time. Each and every employee of the Department is grateful for this splendid cooperation and trust that they will merit the continued support of all groups in solving the many problems vital to Alaska's first-ranking industry—fishing.

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FISHERIES BOARD

During the year 1951 two regular meetings of the Alaska Fisheries Board were held at the office of the Alaska Department of Fisheries in Juneau. A summary of each meeting follows.

REGULAR SPRING MEETING, APRIL 2-6, 1951

The Board elected William R. Walton, Sitka fisherman, to serve as chairman for the ensuing year. The Director's report, covering the general activities of the Department since the November 1950 meeting was presented along with a resume of bills and appropriations, effecting the operations of the Board and the Department, approved by the 1951 Legislature. All members of the Board were most appreciative of the splendid support given the Department by members of both houses.

At a joint conference with officials of the U. S. Fish and Wildlife Service agreement was reached on Department assistance and cooperation with the Service for Inspection, Enforcement and Stream Improvement projects for the 1951 season. On the subject of Predator Control, it was agreed that the Alaska Department of Fisheries should confine its efforts largely to the reduction of hair seal in places where they are a menace to the fisheries; and that the Fish and Wildlife Service should concentrate on the elimination of sea lion.

The proposed program for 1951 of the Biological Research Division was accepted as outlined. This provided for a continuation of the troll salmon investigation with allowance for an expansion to cover the king salmon fishery of the Taku River. The blackcod (sablefish) investigation was also to be continued insofar as time and personnel permitted.

The Inspection Division was authorized to purchase a limited number of outboard boats and motors for use in districts, where men with their own boats were unavailable. The overall plan called for a limited expansion of the enforcement program during the 1951 fishing season.

With the additional funds appropriated by the Legislature, it became possible to set up two new divisions within the Department: the Watershed Management Division and the Sport Fish Division. The outlining of the 1951 work programs for these two new divisions was left to the discretion of the Director, with an understanding that the Watershed Management projects be started in the Kodiak-Afognak area and the Sport Fish work be centered near Fairbanks, preferably at the University of Alaska if suitable space becomes available at that institution.

In the matter of Predator Control for which a special appropriation was made by the Legislature, it was decided that the greatest benefit could be derived by concentrating the efforts in a few districts. Since all reports indicated that the Copper River and Stikine River deltas were suffering the greatest damage from hair seal predations, these two locations were given top priority.

The financial report for the biennium, 1949-1951 was accepted by the Board as presented. After adoption of a personnel classification and salary schedule the meeting was adjourned.

REGULAR FALL MEETING, NOVEMBER 26 - DECEMBER 2, 1951

Mr. J. H. Wakefield was elected chairman to complete the unexpired term of Mr. William R. Walton who had resigned after his election at the spring meeting. Mr. W. O. Smith, fisherman of Ketchikan, was welcomed as a new member of the Board.

Detailed reports on the summer activities of various divisions were presented to the Board and are incorporated in other parts of this Annual Report.

The principal business of the fall meeting was the consideration of recommendations to the U. S. Fish and Wildlife Service for the 1952 fisheries regulations. A joint conference was held with local officials of that Service; a number of fishermen and others attended the meeting, and numerous letters were received, all dealing with the 1952 regulations. After due deliberation the Board adopted the following recommendations for transmittal to Mr. Albert M. Day, Director, Fish and Wildlife Service, Washington, D. C.:

The Alaska Fisheries Board is hereiwth submitting its recommendations for your consideration in promulgating the 1952 regulations for the protection of the commercial fisheries of Alaska. As you are undoubtedly aware, the members of this Board are residents of Alaska and, as such can appreciate the viewpoint of the resident fishermen of Alaska in matters pertaining to the fisheries of the Territory. Because these fishermen have their homes in Alaska and because their future livelihood is closely tied in with the successful continuation of the fishing industry, you can be assured they are vitally interested in the protection and proper utilization of this resource.

In its 1949 brief to you the Board outlined a broad general policy as follows:

> "As a general statement it is recognized by all conversant with fishing methods, that the effectiveness of the several types of legal salmon gear in Alaska may be rated: No. 1. traps. No. 2 seines; No. 3. gill nets and No. 4. hook and line. In setting up the general fishing areas the Fish and Wildlife Service has specified which types of gear are legal for each area. When based on valid reasons and when done without discrimination this is recognized as a proper function of all fishery management agencies. In certain of these areas the Service has seen fit to prohibit the use of the more effective types of gear restricting fishing to gill nets only. These restrictions can undoubtedly be justified for conservation and other reasons and the Board is in accord with these regulations. However, in other areas the most effective gear, namely the trap, is legal but the less effective ones, purse seines or gill nets, are prohibited. This the Board believes to be discriminatory and without valid justification. There are many cases in the regulations of such discriminations against the less effective types of gear. It would therefore seem proper for the Service to revise these particular sections and to set up some over-all policy to eliminate all discrimination. Unless some peculiar local conditions interfere, a general rule should be established that in any area in which the more effective types of gear are legal, then all the less effective should likewise be legalized. This policy has been recognized for years by other conservation agencies."

The Board still believes this policy is fundamentally right and urges that the Service consider this carefully before prohibiting the use of less effective gear where more effective gear is presently legal.

PART 102 - GENERAL PROVISIONS

Sec. 102.28 - One year ago a recommendation advocating the opening of a section of all trap leads during closed periods was offered. Your proposal for next year, although not identical with that of the Board, is certainly a step in the right direction and meets with full approval. Any provisions that will facilitate the free movement of salmon while on their spawning migrations must be encouraged.

In this connection it might be well to direct your attention to Sec.102.29 in which stringent regulations are provided to make traps inoperative within 24 hours after the close of the season. These provisions must be included in the regulations for a very definite reason. The only justifiable reason from a conservation standpoint must be to insure "the free and unobstructed passage at all times of all fish." If such restrictions are considered necessary within 24 hours after the close of the season, it would seem logical to provide the same or some other compensating regulation during the regular weekly closed period of 36 hours or more.

Sec. 102.50 - It is suggested that this section be made more inclusive by changing it to read as follows: "Fishing for, taking, or molesting any fish by any means, or for any purpose, is prohibited within 500 feet of any dam, fish ladder, weir, culvert, or other artificial obstruction."

The Board is in accord with the proposal of the Service to curb the use of commercial gear for personal use during 48 hours before and after legal season. However, it is their belief that such a provision will curb only a part of the present abuses of the present personal use privilege. Eventually some possession limit must be set on personal use fishing. This could be different in the several areas in recognition of variations in local conditions. A review and thorough study of the present laws may disclose such a possibility without further legislation.

Your proposal to prohibit the capture of any species of salmon by snagging is most timely and meets full approval.

At this time the Board would like to repeat its recommendations of last year that the mesh of the webbing of trap spillers be set at a minimum of $3\frac{1}{2}$ inches stretched measure. Investigations indicate that such a provision would be an aid in allowing the escape of small salmon and other small fish, especially herring, that find their way into the spillers. Reasonable time should be allowed for conversion.

PART 104 - BRISTOL BAY AREA

The Board is of the opinion that under the present conditions and until more detailed knowledge is obtained on the salmon runs of the area, the only practical means of regulation is by means of limiting the weekly fishing time as is being proposed by the Service.

PART 105 - ALASKA PENINSULA AREA

Since it seems necessary to restrict fishing effort in Bristol Bay, some additional restrictions should be put on those sections of the Peninsula fisheries which tap the Bristol Bay runs. All profiting from these runs should share in the endeavors to protect them.

The proposals of the Service for the Peninsula area seem to be in order,

especially those opening new areas or extending fishing time in order to properly utilize some of the local salmon runs.

PART 107 - CHIGNIK AREA

Sec. 107. 2 - Having the opening date in this area coincide with that of Kodiak is definitely in order.

Sec. 107. 6 - Apparently the justification for allowing traps within Chignik Lagoon is based on the fact that the catch is regulated by the weir count, hence it is immaterial how the fish are caught. This same reasoning can be used in support of the use of purse seines and drift gillnets in the same district. If under competition of all types of gear the Service still feels that some gear curtailment is in order, then the logical procedure would be to prohibit both traps and purse seines and permit only the less effective types of gear.

The Board reiterates its recommendations of 1949 as follows:

> "Sec. 107. 13 - Two different methods are used for measuring the distance between traps. This should be uniform and in all cases should be by 'most direct water measurement,' and should apply to the 10 mile measurement within the lagoon."
>
> "Sec. 107. 14 - As has been recommended many times before by the fishermen and by former agents of the Service, the Board believes no traps should be allowed within Chignik Lagoon. A general policy of allowing no traps in waters near the mouths of important salmon streams has been in effect in other areas for many years."

PART 108 - KODIAK AREA

Sec. 108. 3 - The Service's proposal for an open season from June 16 to July 15 in the Karluk district is satisfactory. However, should the anticipated pink run develop, provision should be made for an opening by field announcement so that this species may be properly utilized.

Sec. 108. 3a - The Board is in accord with the open seasons proposed for
Sec. 108. 3b Mainland, Afognak, and general districts: June 15 to July 15;
Sec. 108. 3c July 31 to August 13; and from September 10 to September 30.

Sec. 108. 4 - Although the Red River runs may not be in too healthy a condition, the Board does not believe that a total closure is in order. As a substitute measure it is suggested that a considerably longer weekly closure be instituted. Such a curtailment of fishing time would reduce the catch a measurable amount. Those accustomed to fish this district could continue if they so chose, and undoubtedly many would. However, a total closure would force all these fishermen into other districts.

Sec. 108. 5 - For reasons outlined above a total closure is not justified. A season similar to last year is recommended with a lengthened weekly closure. Three or four days fishing per week should be considered.

Sec. 108. 24 - It is recommended that a new closure be added to this list, namely, The Raspberry Straits vicinity, which can be defined as all waters of the Straits from a line drawn between Steep Cape on Afognak Island to Gold Beach on Raspberry Island to Afognak Narrows.

PART 109 - COOK INLET AREA

Sec. 109.2 - In paragraph (c) of this section there is a provision prohibiting the use of gear having a mesh of less than $8\frac{1}{2}$ inches before June 25. It would seem advisable to apply this regulation to all sections of Cook Inlet.

Sec. 109.13 - The proposal of the Service to increase the distance interval between traps from 2,500 feet to one mile is in agreement with recommendations of the Board for the past two years.

Sec. 109.59 - Your proposal to close additional streams to all fishing in 1952 is fully endorsed. Others should be added in this and other areas as rapidly as the necessity may require.

Last year the Board requested the Service to explore the feasibility of setting an over-all quota on the pack of red salmon. This has been done and a very fair quota of 1,500,000 fish has been proposed. It has been suggested that this be further broken into weekly quotas in order to guarantee adequate escapement from each race or segment of the run. Proper allocation of the weekly quotas would not only do this, but would also distribute the salmon more uniformly to the various sections of the Inlet. Such a system would require very close contact with the fisheries to obtain the necessary catch figures, so that fishing could be halted each week at the proper time. If sufficient personnel and equipment is now available to accomplish this, the Board would be in favor of this new method of control for 1952. However, if such is not available, it would appear advisable to postpone such action to some later date.

PART 111 - PRINCE WILLIAM SOUND AREA

Sec. 111.2 - The fishermen and packers of this area have proposed that the closing date of August 7 be changed to August 16. The contention is that the runs are becoming later and later, and part of these later runs should be tapped now. The Board concurs in this suggestion. However, it is recommended that the Service watch these runs carefully and if they do not materialize, it should not hesitate to close the season.

PART 112 - COPPER RIVER AREA

Sec. 112.2 - Your proposal for a continuous summer and fall season from July 10 to September 18 is in accord with the Board's thinking.

Sec. 112.5 - Since the indications are that the weekly closure of 72 hours, which was in effect last year, allowed for a sufficient escapement, there does not appear to be any justification for your proposal to add another 12 hours for a total of 84 hours. If there is an influx of additional gear or should a poor run develop, additional closures can always be made by field announcement.

PART 113 - BERING RIVER AREA

Since the Board has been advised that your proposal for this area is being dropped, no further comment is necessary.

PART 114 - YAKUTAT AREA

The Board is convinced that the Service has made a determined effort to give this area due consideration. By holding a hearing at Yakutat the residents have had a chance to express their views and this is evidenced

by the proposals for next year. Therefore, the Board will go along on all proposals for this area.

PART 115 - SOUTHEAST ALASKA AREA

Sec. 115.6e - The Board is again recommending that the minimum size on king salmon be based on length only. This is the only practical method that can be used by the fishermen to determine undersize fish for return to the water without injury. Weighing the fish in the round before return to the water would be very difficult and would often result in injury to the fish. Furthermore, the fishermen are still faced with the problem of estimating the dressed weight from the round weight. Some of the buyers have been using the 6 pound minimum weight entirely in grading kings. As a result salmon, exceeding the 26 inch minimum length but weighing less than 6 pounds, are being refused by these buyers. These discarded fish are thrown overboard and wasted. This suggested change in the regulation would eliminate this condition.

Sec. 115.9 - It is recommended that this section be changed to read as follows: Fishing by means of any trap is prohibited prior to 6:00 o'clock antemeridian August 1 and after 6:00 o'clock postmeridian September 5. For 1952 the Board is recommending, in addition to the regular salmon season, an early and a late season with limited fishing only. The early salmon runs in S. E. Alaska have now been given practically complete protection for four or more years. While it may be true that all of these runs have not been rehabilitated, it cannot be denied that many are now in good condition and ready for cropping. With a prohibition on trap fishing before August 1 and with limited fishing by other types of gear, it is felt that a part of these rehabilitated runs could be safely harvested in 1952. The Board would be opposed to an early season with unrestricted fishing both as to gear and weekly fishing time.

The suggestion for prohibiting traps after September 5 is predicated on similar reasoning, in that these fall runs are not of sufficient volume to warrant fish by all types of gear and for full weekly fishing periods.

GENERAL SEASONS

In line with the above, the following dates for the salmon fishing seasons, other than trolling and gillnetting, are offered for your consideration for the 1952 season:

Early Season - 6:00 A. M. June 30 to 6:00 P. M. July 23. Fishing permitted three days per week from 6:00 A. M. Monday to 6:00 P. M. Wednesday.

Main Season — 6:00 A. M. August 4 to 6:00 P. M. August 29. Fishing permitted five days per week from 6:00 A. M. Monday to 6:00 P. M. Wednesday.

Fall Season — 6:00 A. M. September 22 to 6:00 P. M. October 8. Fishing permitted three days per week from 6:00 A. M. Monday to 6:00 P. M. Wednesday.

Sec. 118.4 - The Board is in accord with your proposal for a continuous season in the North Sullivan Island section from June 18 to September 20 with weekly closed periods of 72 hours.

Sec. 119.4 - Your proposal for Taku Inlet, Port Snettisham and adjacent waters for a continuous season from June 18 to September 20 with a

weekly closed period of 72 hours per week is excellent. However, from the biological data collected this past summer it would seem advisable to extend this same principal to the period from April 1 to June 18, thus making a continuous season from April 1 to September 20 with 72 hours closure per week. The biological data supporting this recommendation has been presented to officials of your Service in Juneau.

With respect to the location of the line defining the outer limit of Taku Inlet, it is suggested that the Service accept the line proposed by the Taku River Gillnetters' Union or in lieu thereof a line from Pt. Bishop to the waterfall on the opposite shore.

Sec. 119.7 - Your proposal for 1952 pertaining to this section is acceptable.
Sec. 120.3a - Your proposals for the Stikine area are agreeable to the Board.

Last year the Board invited representatives of your service to attend its fall meeting to discuss your proposals for the ensuing fishing season. This practice was followed again this year when Clarence Rhode, Regional Director, Howard Baltzo, Assistant Regional Director, and Richard Shuman, Fishery Management Supervisor, attended the Board meeting in late November. It is hoped that this custom can prevail in the future for it has proved of much benefit to both organizations.

Although each agency approaches the subject from a somewhat different viewpoint, there is much common ground for a basis of understanding the problems involved. The Alaska Fisheries Board, representing the people of the Territory, is just as vitally interested in the protection and conservation of the fisheries of Alaska as is your Service or any other organization be it public or private. However, the Board prefers the term "proper utilization" instead of the much mis-used term, "conservation."

ADMINISTRATION

During the Legislative session in early 1951, the Director was called on numerous occasions for information and assistance on legislative matters pertaining to fishery subjects. It was also his duty to explain the departmental budget to the Ways and Means Committee of the House and the Senate Finance Committee. The Director wishes to take this opportunity to formally thank the members of these two committees for their sympathetic understanding of the problems of this new department. Thanks are due also to the many members of both houses, whose generous support has allowed a sizeable expansion of our activities during the year 1951.

At the spring meeting of the Fisheries Board, the Director was authorized to travel to Washington, D. C., to protest the promulgation of a new order by the Defense Fisheries Administration. This so-called salmon concentration plan was drawn up without consultation with the resident fishermen of Alaska and would have been extremely detrimental to their interests. The strong opposition of the Alaska Fisheries Board, aided and abetted by other groups in Alaska, was sufficient to postpone action for the 1951 season. Unless the defense situation becomes considerably more serious, it is unlikely that any action of this type will be taken in the immediate future. However, should such action become necessary Alaskans will be given an opportunity to participate in the formation of a new plan.

In order to get the newly authorized divisions underway as quickly as possible, a great deal of time was spent in the field during the summer of 1951. The first trip was to the Fairbanks area to inaugurate the sport fish program and then to the Kodiak-Afognak area to start the watershed management work.

Visits were also made to Wrangell and Cordova to organize the hair seal predator control projects. Matching monies on a five to one basis were given by Cordova fishermen and packers to the Department to aid in the control of hair seal on the Copper River delta. Routine field trips were made to Bristol Bay, Cook Inlet, and various points in Southeast Alaska.

In October the Director and one member of the biological staff attended the annual meeting of the Pacific Marine Fisheries Commission at Portland, Oregon, to present the results of the departmental research on the king salmon and blackcod fisheries of Southeast Alaska. Although official membership in this commission is limited to the three Pacific Coast states, representatives from Alaska, British Columbia, and the Federal Government are invited to attend and participate in the discussions. Upon assuming statehood, Alaska will undoubtedly be invited to join in an official capacity. The ultimate aim of this commission is the proper utilization of all our coastal fisheries with equitable regulations along the entire coast. It therefore seems advisable that this Department be represented at conferences of this group.

The customary meetings with fishermen in the various fishing ports were held to acquaint them with the progress of our several projects. Among the routine duties were the preparation of the minutes of the Board meetings, the writing of a brief to the Fish and Wildlife Service on the 1952 regulations, and preparation of material for the 1950 annual report.

With a background of many years of practical experience, the Director has been able to assist directly in aiding industry and establishing new fishery enterprises in Alaska. Smoking and canning establishments were started at Haines and Yakutat and received assistance from the Director.

SHRIMP AND CRAB EXPLORATIONS

The shrimp prospecting in the vicinity of Juneau, which was sponsored by the Department was given added impetus in 1951. A small grant to defray operating expenses was given to Earl Benitz, operator of the trawler "Baranof."

This year a larger beam trawl of 37 feet was used and landings averaged 15 boxes of 200 pound each per day. The catch was composed largely of pinks, with only a few of the larger "spots" and "side-stripes" commonly called prawns. The catches were processed and frozen by Anchor Fish Co. for shipment to the States, although a few shrimp were sold locally.

Assistance was given to the Olympic Seafood Co. in starting their crab and shrimp operations at Douglas. Crab fishing was conducted in the Icy Straits-Glacier Bay area, while the shrimp came from the area south of Douglas Island, which has been opened up with the aid of the Department. By special arrangements with the Pan American Airways reduced air freight rates were established so that both the shrimp and the crabmeat could be shipped daily to Seattle in a fresh condition thereby eliminating the expense of freezing.

These two operations for shrimp and crab contributed a new payroll to the Gastineau Channel district of approximately $60,000.00 giving employment to 35-40 people during the four and one-half months of operation. In the future, the operators expect to have a longer season, which will increase the payroll.

BIOLOGY DIVISION

With the increased funds furnished by the Legislature it became possible to expand the biological research program in 1951. The troll salmon investigation was continued and an excellent start was made on a study of the king salmon runs of the Taku River. In addition an initial tagging experiment was conducted on blackcod (sablefish).

BIOGRAPHICAL SKETCHES

KENNETH N. THORSEN was born November 14, 1915, in Spokane, Washington. Following graduation from high school he came to Alaska, where he lived for six and one-half years in both the Anchorage and Fairbanks districts. He enlisted in the Seabees, U. S. Navy in August 1942 and served for over a year in the Aleutians before receiving a transfer to the South Pacific Theater.

Upon being discharged from the Navy in January 1946, he entered the University of Washington and received his Bachelor of Science degree in fisheries, June 1950. While attending the University he was employed on a part-time basis by the State of Washington Department of Fisheries. He spent the summer of 1950 at Sitka working on the troll salmon fishery for the Alaska Department of Fisheries. He then returned to the University of Washington for a year of graduate work in fisheries biology.

Upon completion of his graduate studies in June, 1951, he was given a permanent position as junior biologist with the Department, being assigned to the troll salmon investigation.

QUENTIN A. EDSON was born July 12, 1926, at Burton, Vashon Island, Washington. Following his graduation from the Vashon High School, he entered the University of Washington School of Fisheries. His schooling was interrupted by a term of 18 months service in the U. S. Army. Returning to the University he continued his studies and received his Bachelor of Science degree in fisheries in the spring of 1951.

He worked for the State of Washington Department of Fisheries for five summers and part-time while attending school. After graduation he was employed permanently by the Washington agency until he came to Alaska. In addition to research on the salmon runs of Puget Sound and the Columbia River, Edson worked on various species of bottom fish.

Joining the Alaska Department of Fisheries as a junior biologist in November, 1951, he was assigned to the investigation of the black cod (sablefish) fishery. Because of previous training he will also have overall supervision of the reference library.

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The following report on the progress of biological investigations in 1951 represents the combined efforts of all members of the biological staff:

Robert R. Parker, Senior Biologist
Walter Kirkness, Senior Biologist
Kenneth N. Thorsen, Junior Biologist
Quentin A. Edson, Junior Biologist
M. L. MacSpadden, Biological Technician
Carl Weidman, Jr., Biological Aide

BIOLOGICAL INVESTIGATIONS

To manage a fishery it is of prime importance to know certain basic facts which will establish, on a profit and loss basis, the validity of any controls imposed upon the industry. Clearly, the home stream source of the king salmon stocks fished in Southeast Alaska should be established before any restriction is suggested to alleviate a depleted spawning population in any stream. In areas where small fish concentrate, it is important to know the rate of growth, natural mortality, and relative maturity of the stocks present, and to use these factors to calculate the probable effects of restrictions before they are applied. The desire for this type of basic information on the commercially important fishes of Alaska led to the establishment of the Division of Biological Research in February, 1950.

PLANNING THE PROGRAM

Three species of fish, king and silver salmon, and sablefish, were selected for initial study. The results of the 1950 research were published in the Department's Annual Report for that year. The present report summarizes the 1950 king salmon data and supplements it with further information. The 1951 studies are presented briefly in the manner of a progress report and are based only in part on completed research.

Southeast Alaska may be conveniently divided into inside and outside (coastal) waters for the study of king salmon, for the stocks found in these divisions differ in several respects. The outside waters may be further divided into north and south areas separated by Cross Sound—(Figures 1-2). Table 1 gives some of the supporting evidence for this division. In addition to the differences shown in dominant year classes and percentage of stream type fish, the kings to the north of Cross Sound grow slower and are a relatively immature stock compared with the stocks found between Cross Sound and Cape Edgecumbe. These southern fish are estimated to be approximately 70 per cent in the mature year of spawning, as encountered by the troll fishery.

DISTRIBUTION OF KING SALMON

Tables 2, 3, and 4 present the recovery data for the tagging in outside waters. The difference between the first and second year recoveries add to the argument of differences in relative maturity. The returns from fish tagged in the area between Cross Sound and Cape Edgecumbe are very similar to the returns from fish tagged in the area between Coronation Island and Dixon Entrance. No differences are believed to exist between these two groups in respect to maturity and growth.

RECOVERY STATISTICS

As a check upon the apparently dominant southward migration of the king salmon, further tagging was conducted during 1951 in the area immediately to the south of Cross Sound and in the area between Cross Sound and Cape Fairweather. Table 5 presents the essential data for the southern area. No tags were returned from 76 fish tagged and released to the north of Cross Sound. The recoveries from the tagging south of Cross Sound corroborate the belief that the outside troll fishery south of Cross Sound is totally dependent on the production of streams to the south of Alaska for its king salmon. The lack of returns from the tagging to the north of Cross Sound strengthens the argument of a relatively immature stock.

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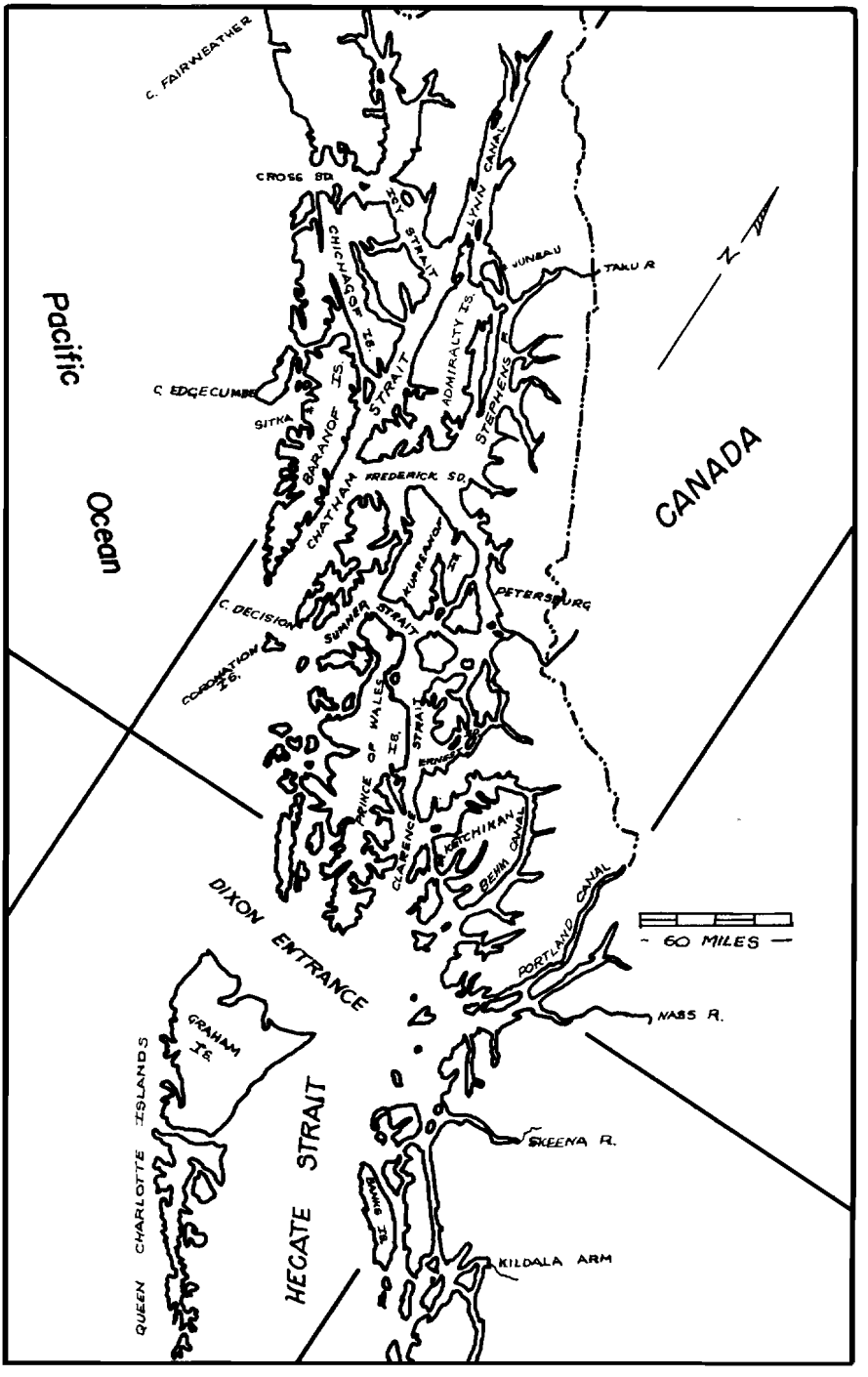

Figure 1. A map of the Pacific Coast of North America from Cape Fairweather, Alaska, to Cape St. James, Queen Charlotte Islands.

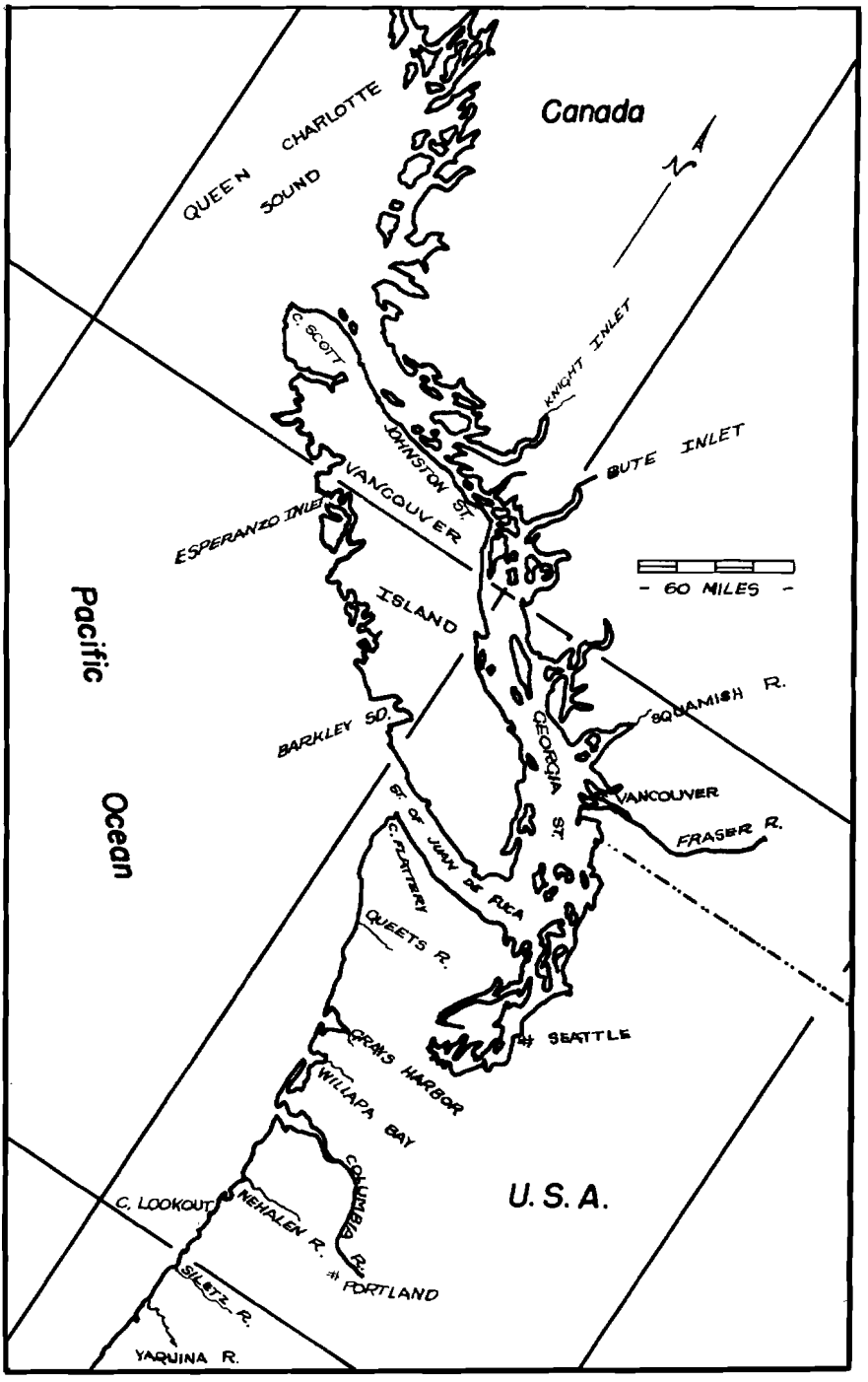

Figure 2. A map of the Pacific Coast of North America from Cape St. James, Queen Charlotte Islands, to the Yaquina River, Oregon. Figure 2 is contingent with Figure 1.

TABLE 1. Contrasting characteristics of king stocks found in the outside waters of Southeastern Alaska, to the north and to the south of Cross Sound.

Area	Number in Sample	Per Cent Stream Type (1)	Dominant Year Classes (2) 1st	%	2nd	%	3rd	%	4th	%
Cross Sound to Cape Fairweather	177	20	4	59	3	29	2	8	5	4
Cross Sound to Cape Edgecumbe	333	10	4	62	5	28	3	7	6	2

(1) Stream type refers to those individuals whose scales indicate a fresh water habitat through the first winter annulus, migrating to sea in their second year.

(2) Dominant year classes are given in order of their importance followed by the percentage each group is of the total sample.

TABLE 2. Recoveries of king salmon tagged in the area between Cross Sound and Cape Fairweather during June and July, 1950. Total number tagged: 149.

Area Recovered	1950 Recoveries	1951 Recoveries
Icy Strait, Alaska	1	0
Northern Hecate Strait, B. C.	0	1
Vancouver Island, B. C.	0	1
Washington Coast, troll	0	1
Willapa River, Washington	1	0
Columbia River	4	6
TOTAL	6	9

TABLE 3. Recoveries of king salmon tagged in the area between Cape Edgecumbe and Cross Sound during May, June, July and September, 1950. Total number tagged: 375.

Area Recovered	1950 Recoveries	1951 Recoveries
Cross Sound to Cape Fairweather	0	1
Tagging Area	3	1
Inside waters, Southeastern Alaska	0	1
Coast of Baranof Island, Alaska	4	0
Chatham Strait to Dixon Entrance	2	0
Queen Charlotte Islands, B. C.	1	0
Vancouver Island, West Coast	7	1
Juan de Fuca Strait	3	0
Nass River, B. C.	1	0
Skeena River, B. C.	4	0
Knight Inlet, B. C.	1	0
Fraser River, B. C.	10	0
Coastal Streams, Washington	4	0
Columbia River	14	1
Coastal Streams, Oregon	4	0
Oregon Coast, Troll	1	0
TOTAL	59	5

TABLE 4. Recoveries of king salmon tagged in the area between Coronation Island and Dixon Entrance during May and June, 1950. Number tagged: 176.

Area Recovered	1950 Recoveries	1951 Recoveries
West Coast Baranof Island	1	0
Area of Tagging	2	0
Queen Charlotte Islands	1	0
Vancouver Island, West Coast	5	0
Juan de Fuca Strait	1	0
Skeena River, B. C.	1	0
Bella Coola River, B. C.	1	0
Johnstone Strait, B. C.	1	0
Fraser River, B. C.	4	0
Washington Coast	1	0
Coastal Streams, Washington	1	0
Columbia River	4	2
TOTAL	23	2

The data are not conclusive enough for management application in the northern area and the investigation will continue on a more substantial basis in 1952.

In the inside waters of Southeast Alaska large concentrations of immature king salmon are found during the summer and fall months. Runs of adult kings are also present, mainly during the spring months, and these furnish the major portion of the king production of the inside fishery. Tagging has been conducted mainly in the Stephens Passage and Behm Canal areas, with minor efforts directed toward other areas, primarily exploratory in nature.

TAGGING PROGRAM

The tagging of king salmon in northern Stephens Passage began with a small experiment in May, 1950, when 53 fish were caught and released at the north and south ends of Douglas Island (Figure 3.). Table 6 presents the recovery data for this group. During April and May, 1951, 467 kings were tagged in Stephens Passage adjacent to Taku Inlet. The recoveries from this group are presented in Table 7. This tagging experiment was restricted in area to obtain a high percentage of mature Taku River fish, yet the presence of adult fish native to the coastal streams of British Columbia is demonstrated and the Columbia River and Fraser River races are apparently absent. The tag returns from both the 1950 and 1951 spring tagging show the stocks encountered to be primarily mature fish. The dominant age groups for the 1951 sample, in order of importance, are as follows: 67 per cent of the sample, fives; 22 per cent, fours; 10 per cent, threes. Fish with stream type scales are almost absent from inside samples.

STEPHENS PASSAGE

During August, September and October, 1950, 497 king salmon were tagged in the area of Stephens Passage adjacent to Douglas Island. Table 8 presents the recovery data from this group. Apparently few of these fish were mature, although all ages between one and six were represented in the sample. The three-year old group comprised 52 per cent of the sample.

FALL TAGGING

The two-year olds were next in importance, 22 per cent, and the four-year olds comprised 20 per cent.

The puzzling and probably significant lack of any Taku River recoveries cannot be explained by the data at hand. The stock had the characteristics of being largely immature even after a year of freedom and further recoveries are expected in 1952.

TABLE 5. Recoveries of king salmon tagged in the vicinity of Yakobi Island, south of Cross Sound, during June, 1951. Number tagged: 22.

Area Recovered	1951 Recoveries
Cape Edgecumbe	1
Fraser River	2
Columbia River	1
Oregon Coastal Streams	2
TOTAL	6

FIGURE 3. A map of northern Stephens Passage and Taku Inlet, Southeastern Alaska.

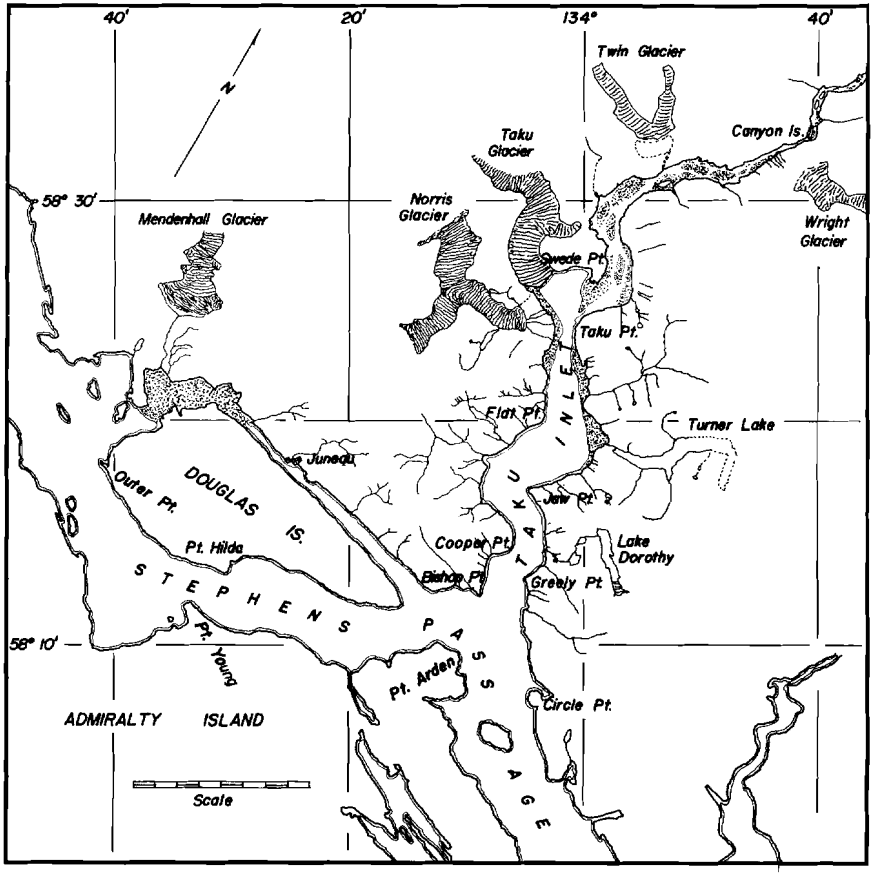

TABLE 6. Recoveries of king salmon tagged in northern Stephens Passage during May, 1950. Number tagged: 53.

Area Recovered	1950 Recoveries (1)
Area of Tagging	1
Northern Chatham Strait	2
Taku River	3
Knight Inlet, B. C.	1
TOTAL	7

(1) No recoveries were received in 1951.

TABLE 7. Recoveries of king salmon tagged in Stephens Passage adjacent to Taku Inlet during April and May, 1951. Number tagged: 467.

Area Recovered	1951 Recoveries
Proximity of Tagging Area	5
Taku River (1)	62
Southeastern Alaska (non-river)	3
Johnstone Strait, B. C.	1
Knight Inlet, B. C.	1
Bute Inlet, B. C.	2
TOTAL	74

(1) Includes gill net fishery, upstream sampling station, and spawning ground recoveries.

BEHM CANAL

Tagging was conducted in the Behm Canal area from October, 1950 to February, 1951. Of the 318 kings released, 14 were recovered in 1951. These data are presented in Table 9. Here a local river is apparently represented, as evidenced by two Taku River recoveries. Again the coastal streams of British Columbia are important and the Fraser and Columbia Rivers, dominant producers of the outside catches, are of no major importance as contributors to the stocks found in the inside waters thus far sampled.

IMPORTANCE OF COLUMBIA AND FRASER RIVERS

The tagging of king salmon in Southeast Alaska has given undisputable proof that a high percentage of the catch is derived from races or stocks using rivers to the south as spawning grounds. The two main river systems involved in these contributions are the Columbia and the Fraser, although all the streams north of California contribute to some extent. The races of king salmon spawning in the Columbia River are in imminent peril of extinction through multiple water uses, primarily hydroelectric projects sponsored by the Federal government. The Fraser River, while improved by the Hell's Gate fishways, faces the loss of a main king salmon producing tributary, the Nechako River, through water diversion by the Kitimat Aluminum project. Other tributaries of the Fraser are also being considered as possible hydroelectric sites.

The apparent conclusion is that Southeast Alaska faces a dwindling supply of king salmon and it is beyond the power of the Board of the Alaska Department of Fisheries to do other than protest.

TABLE 8. Recoveries of king salmon tagged in the portion of Stephens Passage adjacent to Douglas Island during August, September and October, 1950. Number tagged: 497.

Area Recovered	1950 Recoveries	1951 Recoveries
Area of Tagging	1	20
Northern Chatham Strait - Lynn Canal	1	7
Cape Edgecumbe (Outside)		1
Frederick Sound		1
Knight Inlet, B. C.		1
Columbia River		1
TOTAL	2	31

TABLE 9. Recoveries of king salmon tagged in Behm Canal during the period October, 1950 to February, 1951. Number tagged: 318.

Area Recovered	1951 Recoveries
Taku River	2
Ernest Sound	1
Area of Tagging	6
Dixon Entrance	2
Kildala Arm, B. C.	1
Knight Inlet, B. C.	1
Squamish River, B. C.	1
TOTAL	14

As measures to offset such deleterious effects of industrialization two possibilities exist: (1) to make use of streams in Southeastern Alaska as king producers that are at present producing no kings, and (2) to increase production in streams that now contain spawning populations of king salmon. Primary steps have already been taken toward the establishment of new runs and are reported upon in the section on Watershed Management. The Division of Biological Research was directed to investigate a stream that now produces kings with a program designed toward means of increasing the production both through proper management practices and through increased potential of the stream itself.

WHAT ALASKA CAN DO

It is apropos to repeat that proper management, in the sense used, implies the maximum sustained yield for the fishery and not a maximum sustained population of spawning fish. These two concepts have been confused and should be separated, for they connote entirely different principles of fishery management.

TAKU RIVER INVESTIGATIONS

The Taku River, emptying into Stephens Passage, was selected for initial investigation. Other major rivers of Southeast Alaska containing king runs are the Unuk, Stikine, Chilkat and Alsek. All are characterized by having their headwaters in Canada, i.e. originating in the interior, being to a large degree glacier fed, and by having a spring run of kings. A superficial map of the Taku River watershed and waters adjacent to its

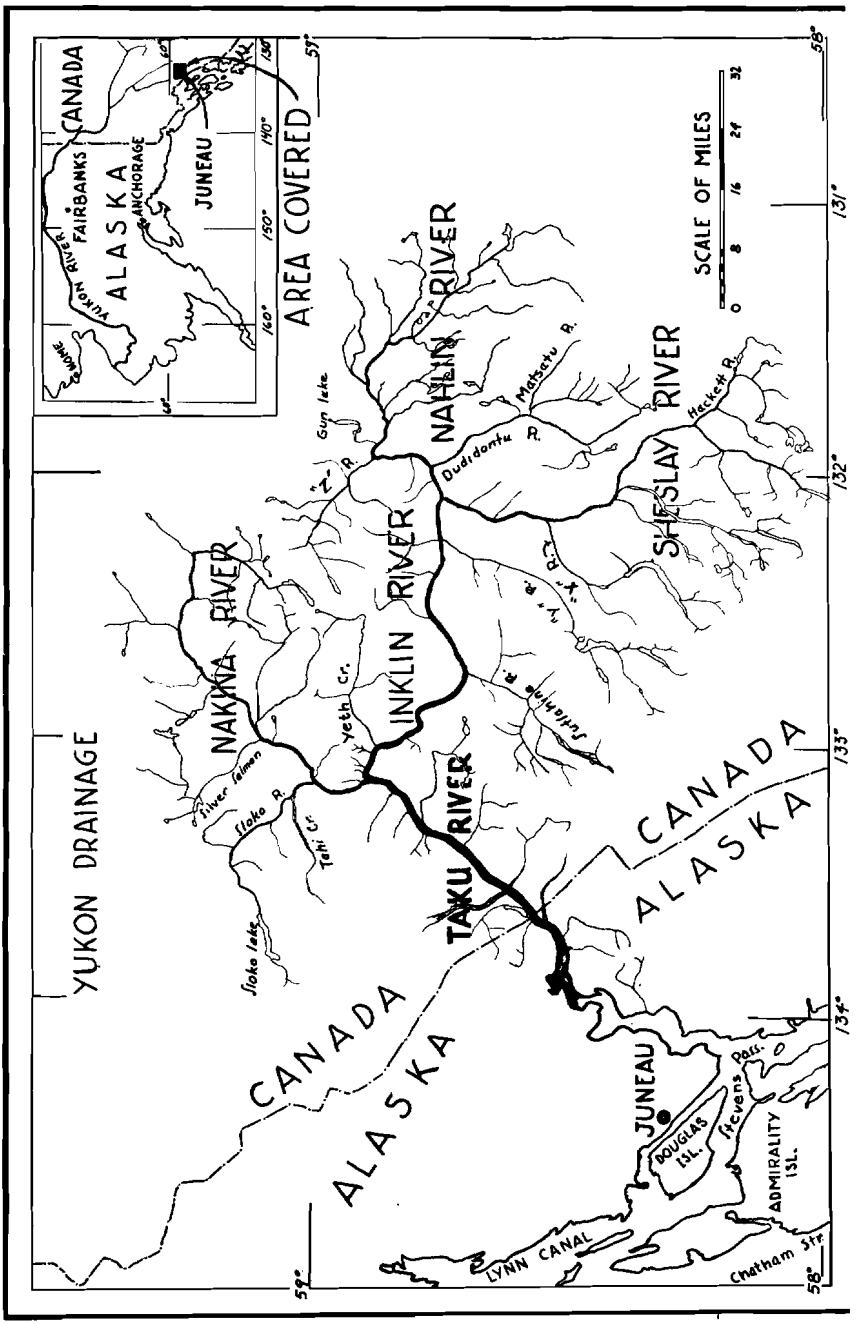

Figure 4. A map of the Taku River watershed and waters adjacent to its mouth.

mouth is presented in Figure 4. The Taku originates in the high plateau country of Northwestern British Columbia with two clear water forks, the Nakina and Nahlin Rivers. Intermeshed with the headwaters of these two tributaries are the headwaters of the Tuya River, flow-

DESCRIPTION OF THE TAKU

into to the Stikine drainage (Southeast Alaska), and the Teslin River flowing to the Yukon River (Bering Sea). The Nahlin, joined by the glacial Sheslay, forms the Inklin River. The Nakina and the Inklin unite into the Taku which penetrates the Coast Range in a narrow canyon and flows into Taku Inlet. Approximately 6,400 square miles are drained by the Taku River. The area is bisected by the historical Telegraph Trail, built in the 1860's, and still used by occasional trappers and prospectors.

TABLE 10. Statistics of the numbers of kings taken by Taku River Gill Net Fishery, 1945 to 1951, month of May only. (1)

Day	1945	1946	1947	1948	1949	1950	1951
1		30	33		S	38	
2		93	48		50	83	
3		172	46	S	81	102	
4		208	S	21	51	107	
5		S	62	99	102	159	
6		137	84	68	204	265	S
7		142	88	136	92	S	183
8		290	87	191	S	165	346
9		340	86	S	74	189	180
10	115	298	86	132	139	264	270
11	108	213	S	364	281	203	345
12	180	S	97	292	263	256	244
13	S	172	101	346	180	287	S
14	178	214	113	282	143	S	37
15	265	223	244	226	S	395	161
16	198	241	258	S	345	477	188
17	253	410	289	124	430	447	163
18	222	878	S	150	311	431	90
19	151	S	105	129	257	172	288
20	S	363	179	133	515	397	S
21	168	461	128	147	234	S	512
22	110	687	112	246	S	220	1031
23	104	324	170	S	220	304	580
24	237	237	327	534	152	271	906
25	270	133	S	468	139	296	940
26	760	S	244	300	432	278	1016
27	S	80	191	316	234	586	
28	307	111	150	246	320		264
29	353	153	130	308		521	377
30	75	94	94		180	267	441
31	55	?	20	59	472	162	497
Total	4109	6704	3572	5317	6001	7342	9059
Maximum Units per day	24	41	33	38	33	29	43

(1) Data taken from Fish & Wildlife Service records.

Although the Taku River gill net fishery is one of the oldest fisheries in Southeast Alaska, little is available in the way of published information concerning its history and development. All five species of salmon of the eastern North Pacific are present in the Taku as spawning runs. The present program, however, deals only with the king salmon. Reliable catch records are unavailable for the period before 1945. The statistics of the May king fishery are presented in Table 10 for the years 1945 to 1951. This record serves only as an index to the magnitude of the fishery. It does not extend far enough to indicate either trend or possible limits of productive capacity. The fishery operates entirely within the muddy waters of Taku Inlet, rarely extending itself as far as Jaw Point (Figure 3). It is limited by regulation to the area outside the actual river, the line being moved almost annually to accommodate the shifting bar at the river's mouth (Plate 1). Gill nets of single wall, floater type are used exclusively. During the May king fishery the mesh size in general usage is $8\frac{3}{4}$ inches stretch measure, including one knot. After May, smaller mesh sizes are used, predominantly 6 inches. For this reason, king catches in June and July cannot be compared with the May catch, nor used as indices of abundance.

GILL NETTING IN THE TAKU

The season, since 1946, has officially opened on May 1. In 1945 the opening date was May 10. The fishery did not begin until May 7 in 1951 because of a cold storage labor dispute. A closed season from June 1 to 25 has been in effect since 1945, presumably to provide escapement to the spawning grounds. A weekly closed period of 36 hours has also been provided. Prior to 1949, gill nets of lengths between 50 and 250 fathoms, hung measure, were allowed. This regulation was changed in 1949 to restrict the lengths to between 50 and 150 fathoms.

REGULATIONS

Plate 1. A view of the mouth of Taku River at low tide, May, 1951. Taku Glacier is in the background.

The extent of contributions of the Taku River king stocks to the troll fishery of Southeast Alaska is not precisely known. Kings tagged at Funter Bay and Auke Bay in May, 1950, were recovered in the 1950 gill net fishery. Two kings tagged in Behm Canal, near Ketchikan, in January, 1951, were recovered at the 1951 Canyon Island sampling station. Adding confusion, however, is the absence of any Taku River recoveries from 497 kings tagged during the period August to October, 1950, in the area between Youngs Bay and Pt. Bishop. It may be accepted, however, that the Taku River contributes heavily to the May troll catches in the general region of Stephens Passage and northern Chatham Strait. Unfortunately, no troll catch records are available.

THE TAKU AS A SPAWNING AREA

No basic discussion on the management of a salmon fishery can be entered without confronting the question, "What is the optimum level of escapement to maintain the highest possible catch?" It is self-evident that a maximum level exists where a greater escapement will provide no increase and possibly a decrease in the return. Further, escapement for any stream, while of sufficient number, may be adjusted in a manner to produce a very low level of return. The escapement may be primarily to one tributary of a stream, with the fishery taking its toll from another. Escapement may be composed largely of "tail-enders", the very early and the very late individuals of the run. The sex ratio may be grossly upset by the removal of one size group with selective gear. All of these factors could produce a very poor return from an apparently satisfactory escapement. These are the phases of the mechanics of the run that were selected for initial study. Some of these questions are relatively simple to determine but the basic question, that of optimum spawning levels, can be answered only through experimentation extending over a long range of time. The lack of information on optimum spawning levels need not invalidate the logical adjustment of the mechanics of the spawning escapement, however, for these are the necessary first steps of the overall problem. This report covers the progress of the study through its initial or exploratory year.

RELATION OF ESCAPEMENT TO CATCH

Of fundamental importance is a knowledge of the numerical levels of catch and escapement. These were obtained by the use of a known population of tagged individuals to estimate the number of untagged individuals in the mature run. Two trollers were chartered to fish in the vicinity of the entrance to Taku Inlet. During the period from April 22 to May 30, 467 king salmon were tagged and released. (Plate 2.) This known population of tagged fish was corrected to a value of 313 individuals to include only unharmed fish and only fish belonging to the mature Taku River run. During the May fishery 46 tagged kings were recovered by the gill nets, six of which were taken as a result of the tags tangling in the nets. The value of that part of the population available during the time of the fishery is computed as falling between 40,000 and 70,000 fish with a maximum likelihood being approximately 57,000 fish. Roughly 9,000 fish were removed by the May fishery giving a ratio of exploitation estimated at 0.16, with small probability of being greater than 25 per cent.

ESCAPEMENT FROM TAKU RIVER

The escapement during the time of the fishery was, accordingly about 48,000 fish. These estimates are affected by two opposing types of systematic error. Deaths due to tagging occurred in the tagged population during the time of tagging and recovery. These cannot be estimated, but data have been treated to minimize this source of error as much as is

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Plate 2. Tagging king salmon aboard a trolling boat. The live box is supplied with fresh sea water through a motor driven pump.

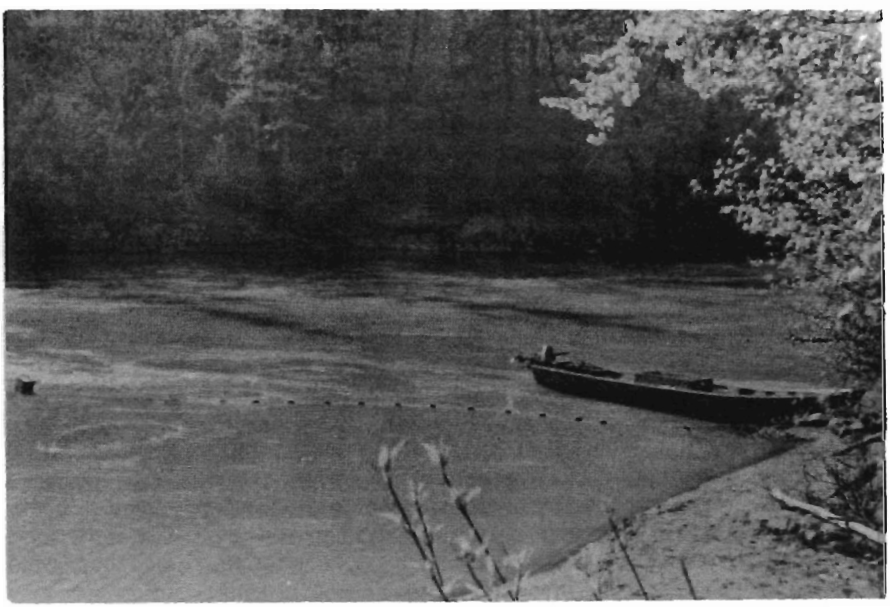


Plate 3. The set net and type of boat used in sampling at Canyon Island, Taku River.

possible. This type of error leads to an estimate that is too high. On the other hand, the fish tagged were of selected sizes, and the smaller sizes present in the population are not accurately represented in either the troll or gill net samples. This type of error leads to an underestimation of the true population. The figures presented may be considered as indicative of the general magnitude of the May run, realizing the possibility of error.

The escapement was sampled at Canyon Island, approximately 17 miles above the gill net fishery and five miles above tidal influence. Here the river is confined to a single channel and affords suitable conditions for study. Sampling was done principally by means of set nets, fished from May 7 until June 28. (Plate 3) A fishwheel was constructed but did not commence operation until the 26th of May and was fished until June 28. (Plate 4, 5) The catches at Canyon Island, unfortunately, cannot be used as indices of daily abundance, for variations in water levels and floating debris necessitated the complete removal of the gear on several occasions. It is apparent from the sampling, however, that the run continued in equivalent numbers during the first 20 days of June.

The purpose of the tagging at Canyon Island was to differentiate the fish escaping from the fishery from those escaping during the closed period June 1 to 25. To facilitate visual identification on the spawning grounds red and white tags were used prior to June 2 and yellow tags after that date. A total of 488 red and white tags and 1,006 yellow tags were used at Canyon Island.

TAGGING METHODS

Red and white tags were also used in troll tagging, of which 48 were removed by the gill net fishery and seven were recovered at Canyon Island. One hundred and twenty-seven red and white tags were used in tagging in the gill net fishery during May, of which 20 were recovered in the gill net fishery and five at Canyon Island. All tags included, roughly a one to one color ratio could be expected on all spawning grounds, provided that no difference exists in the time of appearance of the different races to the river. Referring to Figure 4, red and white to yellow tag

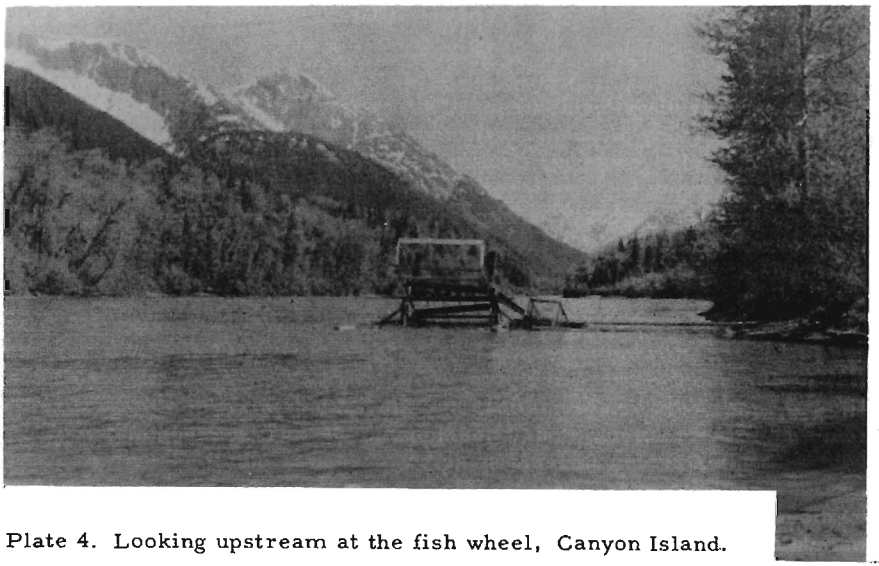


Plate 4. Looking upstream at the fish wheel, Canyon Island.

ratios of 1:1.7 for the Nakina River and 2.2:1 for the Nahlin River were observed. These opposite ratios clearly indicate that the May fishery draws much heavier upon the Nahlin stock than upon the Nakina.

The lengths of mature fish of the Taku River king runs were found to vary between 10.0 and 46.0 inches, fork length. Considering the catches of the troll, gill net, and set net gear the most numerous sizes were of the 34.0 to 37.0 inch range. The fishwheel, conversely, appeared to operate most efficiently upon the smaller sizes, less than 25.0 inches. Original measurements were taken to the nearest 0.5 inch. In Figure 5 the data are grouped in 2.5 inch cells for troll, set net, and fishwheel gear and graphically compared. The true length frequency of the run as it passed through the gill net fishery is not known, but the troll frequency for the size range 20.0 inches and up is considered to be the least selective of the four types of gear employed.

Figure 6 shows a bar graph derived from a series of 127 measurements of kings taken in commercial gill net gear throughout the May fishery. The total length of each column denotes the percentage of the entire sample falling in each one inch size group. Each column is divided into areas representative of the age composition of each group as derived from a microscopical examination of the scales. Obviously the gill nets were largely selective to five year old fish, with four year olds playing a secondary role. A minuscule percentage of three and six year olds were present, not large enough to enter the graph. Table 11 presents the percentage age composition of the catches of the four types of gear used. Little difference is noted between the troll and set net catches. The gill nets show an inefficiency for the second and third age group and the fishwheel data indicate a marked selectivity for the younger and smaller fish. The fishwheel employed was of poor design and selectivity is probably not a failing of such a device if properly used.

SIZES VARY

Very little data were taken on sex ratio. The staff was primarily concerned with tagging fish and only fish too severely injured to tag were killed and examined. The data do indicate that mature fish in their second and third years were primarily precocious males, as might be expected.

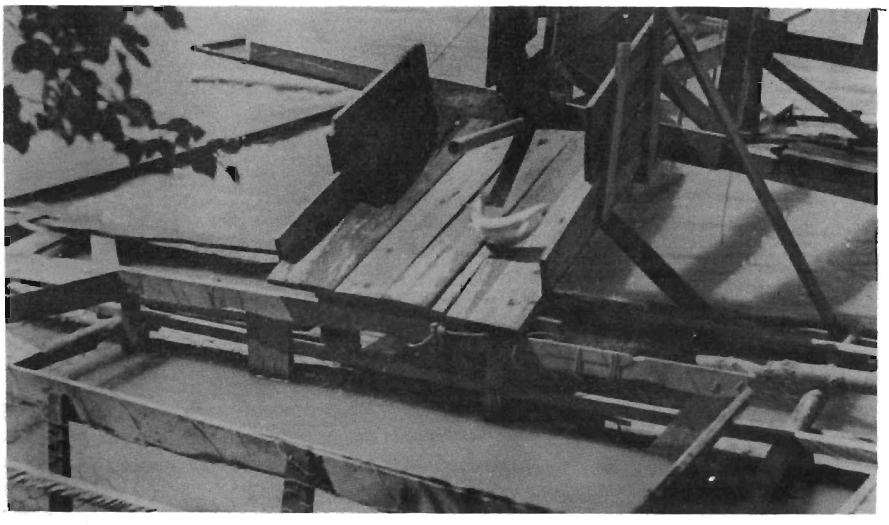


Plate 5. A close-up of the fishwheel showing a sockeye salmon coming off the slide into the live pond.

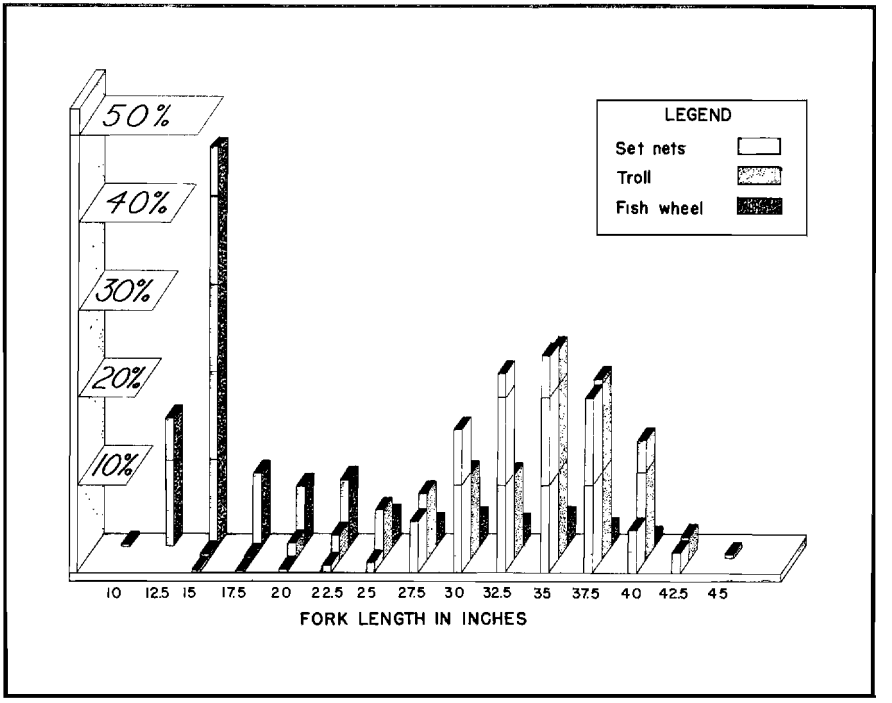


Figure 5. Bar graph comparing the length frequencies of king salmon taken in the set net, troll, and fishwheel samples.

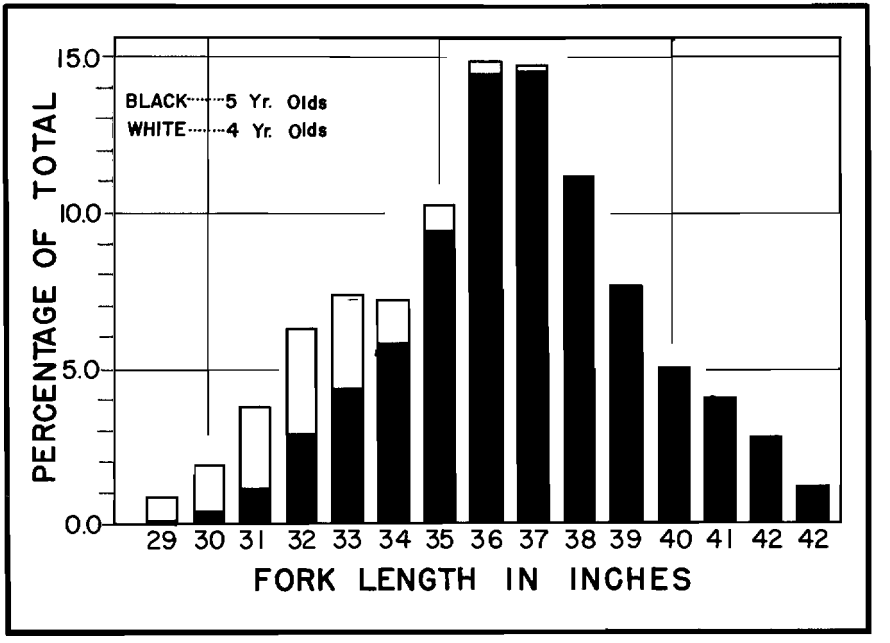


Figure 6. Bar graph showing length frequency distribution of 127 measurments of fish taken in the commercial fishery. The distribution of age within the frequency bars is also shown.

TABLE 11. Age composition of samples of king salmon taken by troll, set net, gill net, and fishwheel gear, in percentage of sample.

AGE	TROLL	SET NET	GILL NET	FISHWHEEL
2	0.7	0.4		56.0
3	9.0	3.3	0.1	29.6
4	21.2	30.6	13.9	6.8
5	67.7	64.4	84.3	7.4
6	1.4	1.3	1.7	0.2
Totals	100.0	100.0	100.0	100.0
	N=522	N=1068	N=127	N=426

Preliminary work on the spawning ground surveys began in early July, with aerial observations on the general character of the Taku River and its tributaries. Aside from lake-fed tributaries, all the streams flowing

Plate 6. A native made fyke device used for taking fish; found near the mouth of the Hackett River.

eastward from the Coast Range were found to be glacier fed and muddy. The Hackett, "X", and "Y" Rivers are the principal tributaries with lakes and these contained considerable suspended materials that fail to settle out. Little time was spent on the Coast Range streams, although their elimination indicates poor prospects of observation rather than the lack of spawning populations. "X" Lake was found to contain a population of spawning sockeye salmon, and the Hackett River was found to contain young silver salmon, but evidence is lacking on the presence of kings in these streams. (Plate 6.) The Nahlin River, above its junction with the muddy Sheslay, and the Nakina River above the muddy Sloko were considered the best prospects for ground observation and for king salmon spawning grounds. Base camps were established at Gun Lake and at Silver Salmon Lake to serve as supply stations for the ground crews. These main camps were supplied by air from Juneau and Atlin, B. C. The ground observations were made by

SPAWNING GROUND SURVEYS

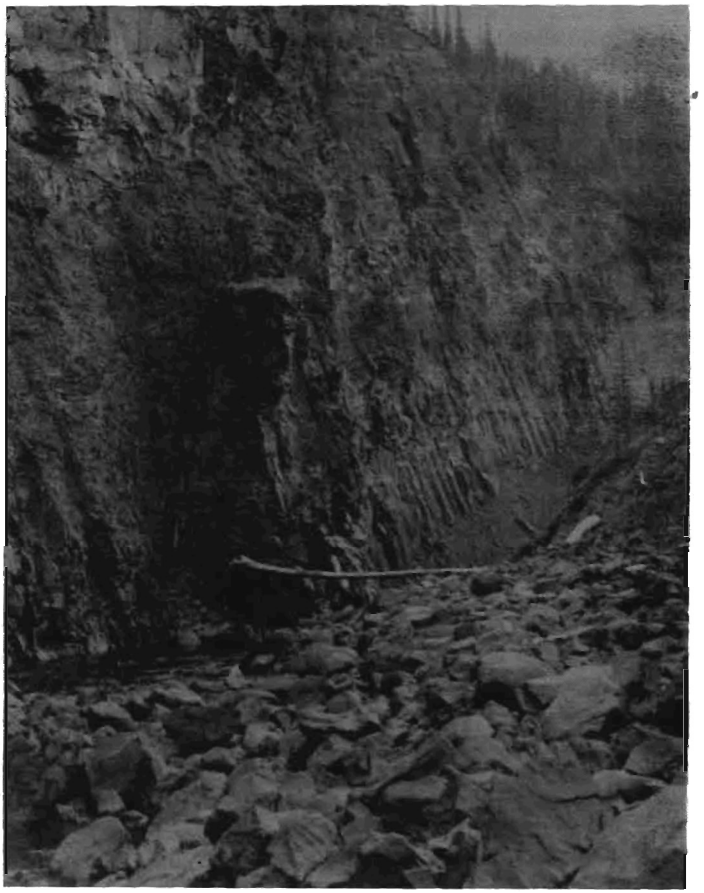


Plate 7. Rock walls on the Nahlin River, approximately ten miles below the Telegraph Crossing. High water marks indicated a severe block in the past.

two parties of two observers each working out of the base camps on 10 to 14 day trips.

NAHLIN RIVER

King salmon were found in almost the entire length of the Nahlin River. In July the ground parties covered the Nahlin and its tributaries from a distance of approximately 8 miles above the Telegraph Trail to its junction with the Dudidontu River. The salmon were lying in the deeper holes in schools of twenty-five to two hundred fish. Actually a very small percentage of the stream in this section is suitable for spawning. A conservatively estimated 1,000 fish were observed. The better spawning ground appeared to be in the area above the Telegraph Trail. In the section below the Telegraph Trail there was much evidence of past blocks due to rock slides. The most prominent of these is shown in Plate 7. In this section the stream is flowing from a high plateau through an area of severe faulting and blocks are possible at any time. The fish were able to traverse the entire length of the stream in 1951.

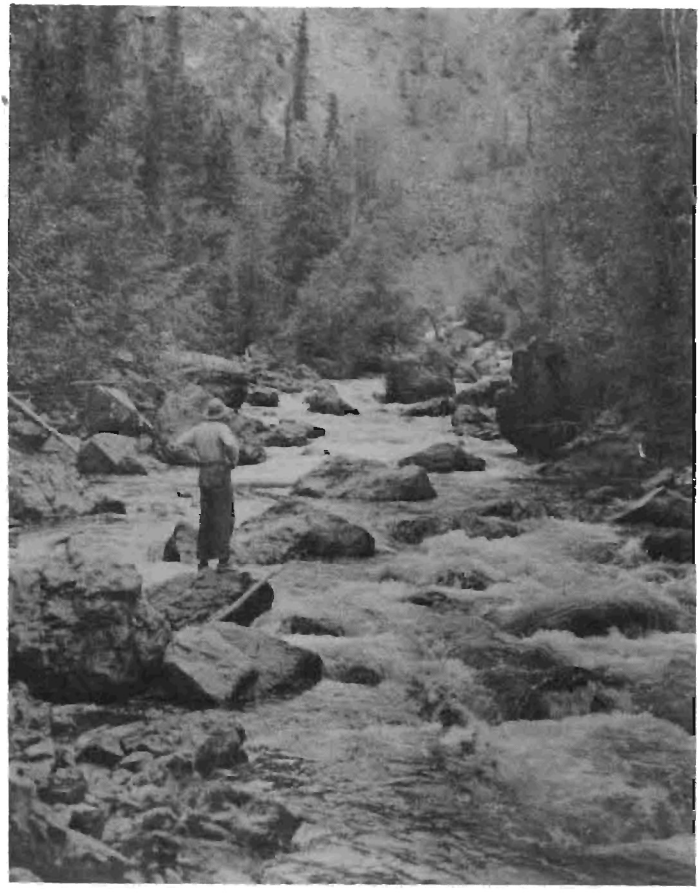


Plate 8. Upstream view of "Z" River from near its mouth.

The "Z" River tributary was observed for an approximate distance of eight miles from its mouth. Here the stream bed is extremely rough and evidence of rock slides and past blocks is abundant. (Plate 8.) Above this section the river drains a wide flat valley and the spawning conditions were considered to be excellent by the observers although no salmon were seen. In the "Z" Canyon approximately 100 kings were seen in the deeper pools. Aerial observation later showed salmon to be present in the upper section but only a very sparse seeding was possible.

"Z" RIVER TRIBUTARY

The Dudidontu River has the same characteristics as the Nahlin and "Z" Rivers in that its lower section, from the mouth to eight miles below its junction with the Matsatu River, lies in a deep canyon with an extremely rough stream bed. (Plate 9.) Less than eight miles of suitable spawning stream is available. Approximately 400 kings were observed in the area between the junction of the Matsatu and Dudidontu Rivers and a point three miles downstream. No kings were observed from this point

Plate 9. The head of the Dudidontu Canyon.

DUDIDONTU RIVER

to the canyon. No kings were observed in the Dudidontu above the junction with the Matsatu or in the Matsatu or Kukuchuya Rivers (middle fork). These streams had an insufficient flow to support king salmon spawning.

Tagged fish were observed with the schools of king and the ratio for the entire Nahlin watershed was about one tag to 100 untagged. Red and white tags and yellow tags were observed in the ratio of 11 to 4 or 2.8:1.

The Nahlin River was visited again in late August and observations were extended to approximately 20 miles above the Telegraph Trail. Spawning was entirely completed by this time and the carcasses were almost entirely devoured or carried off by bear. Two tags were found on bear trails. The upper ten miles is by far the best spawning ground of the entire stream, and appeared to be successfully seeded. No estimates of the spawning population are possible.

The Nakina River is also characterized by flowing off a high plateau and through a deep canyon to its junction with the muddy Sloko River.

Plate 10. Boulder pile in the Nakina River one mile below the mouth of Silver Salmon River.

The canyon starts in the vicinity of the Telegraph Trail Crossing and a total block is present about three miles below this point. As is the case of the Nahlin, the best spawning area is above the canyon but no fish are able to surmount the obstacle. Ground observations were limited to the 12 miles of stream above the mouth of the Sloko. The largest concentration of fish was found in a two-mile section above Silver Salmon River where approximately 3,000 fish were actively spawning in the middle of August. The spawning continued above this point in unknown but suspected large quantity. The field party was unable to ascend the stream because of deep water and the steep walls of the canyon. Below Silver Salmon River, king salmon were observed spawning for approximately seven miles. The total estimated number of spawning kings observed is 5,000 fish. The tagged to untagged ratio was roughly one to one hundred. The observed ratio of red and white to yellow tags was 19 to 33 or 1:1.7.

TAKU RIVER SYSTEM AS SPAWNING AREA

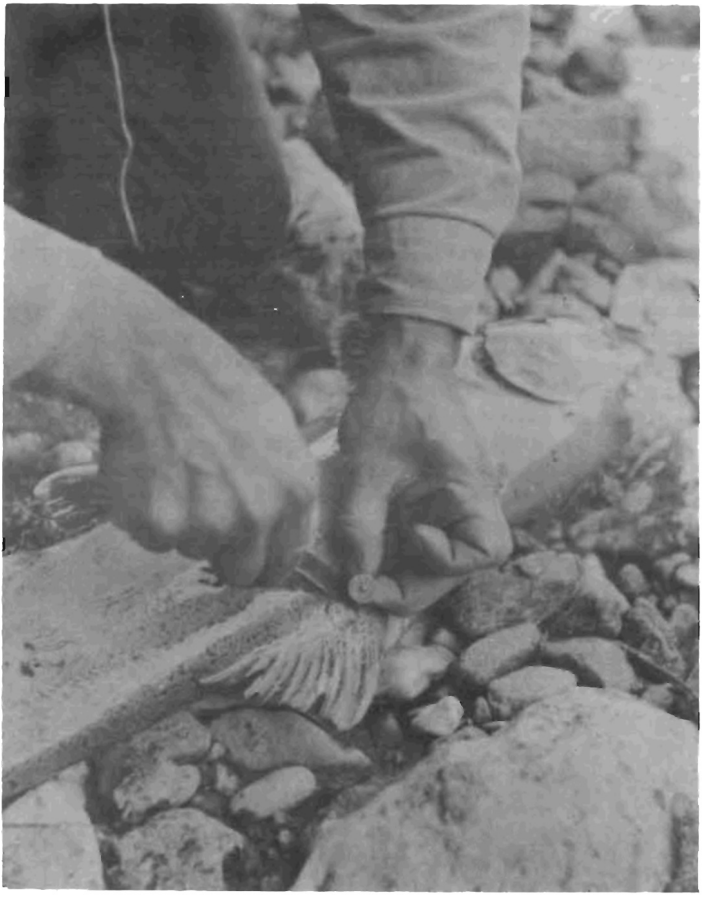


Plate 11. Removing a tag from a spawned-out king salmon on the Nakina spawning grounds.

In the section of the Naking River observed, two rock slides were seen that, while causing difficulty to the passage of fish, are not at the present impassable blocks. Plate 10 shows one of these located approximately one mile below Silver Salmon River. Here the entire river flows through massive boulders. Drift and debris indicates a considerable blockage in the past. The second is located approximately two miles further downstream and is a very effective pink salmon block, but passable to king salmon.

It may be concluded from this first season's work that the Taku gill net fishery derived the major portion of the king salmon catch from the Nahlin River races. The gill net fishery is of a low rate of exploitation, and, speaking of the total run of kings, probably less than ten per cent of the run is removed. Observation of the spawning grounds show the past existence of several blocks, now passable to kings. The Nakina River is entirely blocked to the ascent of salmon at the upper end of the canyon and the region above the block shows substantial potential for king production as well as silver and sockeye salmon. The "Z" River Canyon contains no total blocks at present but does present considerable difficulty to the ascent of salmon. The unstable nature of these geological formations has undoubtedly been a major factor in fluctuations of Taku River king salmon production.

CONCLUSION

SABLEFISH RESEARCH

Research on sablefish or blackcod (Anoplopoma fimbria) had been carried on to a very limited extent until 1950. During that year, Alaska, in cooperation with Canada and the Pacific Marine Fisheries Commission, participated in a coastwise study of this fish to determine racial and migratory characteristics in addition to age and rate of growth.

During 1951, approximately 1,000 sablefish were tagged in the Chatham Strait area. No recoveries have been made to date, but since the majority of the tagging was carried on during the latter portion of the fishing season, returns are not expected until 1952.

Market samples were taken from fish caught in the upper Chatham Strait area to determine the rate of maturity. It was found from these samples that 50 per cent of the males were mature at 23.5 inches and 100 per cent were mature at 26.5 inches. Fifty per cent of the females were mature at 27.5 inches and 100 per cent were found to be mature at 33 inches.

A biologist was hired during the latter part of 1951 to conduct full time research on sablefish. A more intensive program is planned for 1952.

LIBRARY

As the research staff of the Department extends its studies into new phases of the work, so must the library expand to make readily available all material embracing these fields. Considerable progress was made during 1951 toward the formulation of a complete fisheries library. Efforts were devoted primarily toward the classification and cross-indexing of the material now in our possession and establishing an exchange of publications with other fisheries agencies throughout the world.

Classification of the literature is being accomplished by the rules of the Dewey decimal classification to allow for maximum expansion of the library in the future. Complete cross-indexing of the literature is being done not only to serve as a background for initiating a research program but to coordinate the literature so that full benefit from each work can be utilized. This system provides complete reference to the researcher during the progress of investigation.

An exchange of publications has been established with agencies of 32 states and 12 foreign countries, a total of 72 different fisheries organizations. Australia, New Zealand, Norway, India and Japan are some of the countries from which fisheries literature is received. Material collected from these agencies has been of invaluable assistance not only from the standpoint of library collection but also for research work. A great many programs carried out by other agencies directly apply to research being conducted here, and new ideas on application and approach to various problems are gained.

The library now consists of over 3,800 publications and separates and is rapidly growing. When the classification and cross-indexing of this material is completed, it is planned to expand the library to include the phases of engineering and technology that apply to fisheries work. The library is available not only to this Department but to anyone interested in the literature of the field of fisheries.

INSPECTION AND ENFORCEMENT

During the year of 1951 the Alaska Department of Fisheries continued its cooperative enforcement program with the U. S. Fish and Wildlife Service. Eighteen men were assigned to the Federal agency to assist in the enforcement of fishery regulations and for stream inspection. The additional personnel was of material help in improving the efficiency of the enforcement division. Satisfactory escapements of salmon were observed in the streams that were covered.

Ten fishery inspectors, equipped with their own boat and gear, and one stream inspector, using a beach camp, were employed in Southeastern Alaska. Seven stream inspectors using Department boats and motors were located at key red salmon streams in Central Alaska. A total of about 12,000 miles was flown for enforcement purposes using both private charter and Fish and Wildlife Service planes.

PREDATOR CONTROL

A predator control program designed to aid in the reduction of hair seal in the areas where they caused heavy damage to commercial fisheries was inaugurated during 1951. The Copper River delta and the Stikine River were selected as two areas where the greatest damage was done by hair seal. In both these areas the fishermen have reported that many salmon are removed from or damaged in their nets by these animals. Hair seals are also known to catch free swimming salmon in considerable numbers in certain localities.

On the Stikine River, seal first appear in May when the smelt run begins. There is usually an outward migration by at least part of the seal in early June. In the latter part of June in conjunction with the sockeye run the seal again go up-river. The peak of the seal population in the river seems to exist during the coho run.

STIKINE RIVER

Two hunters were engaged by the Department to hunt seal on the Stikine River. A camp was established in May on Browns Island. Two methods of shooting proved to be extremely effective: These were shooting from a blind, and using the prone position with a tripod for a gun rest. It is estimated that 946 seal were killed during the Stikine hunt from May through September.

COPPER RIVER

A different method of killing seal was decided upon for the Copper River area. Instead of hunting with rifles, dynamite depth bombs were to be used as some success with this method had already been attained in this area. This method is successful due to the large concentrations of seal in herds on the various bars.

Preliminary to hunting an aerial survey was made on October 13 to locate the larger herds of seal. Large herds were observed at Castle Slough, Big Softuk Bar and Aukley Spit. On October 16 the chartered boat "Loyal" with the skipper and four hunters aboard left Cordova. The hunting was to be done from two large gill net skiffs using 25 horsepower motors.

The first hunt was conducted at Aukley Spit the following day. The hunting plan adopted and used throughout the period was as follows: The two skiffs were to run abreast at high speed in order to reach the rookery before the herd was able to disperse. As soon as the seal went into the water the dynamite charges, lit from a blow torch, were dropped overboard one after the other. The hunt would usually terminate one-half hour from the time of contact and the seals not killed migrated from the immediate area. In the initial effort at Aukley Spit 50 seals were killed. Later in the day a small herd of 25 seals was located and killed at Edwards River. On October 18 another hunt was conducted at Aukley Spit and an additional 175 seal were killed. The most successful hunt was at the Big Softuk Bar where 250 seal were killed bringing the total estimated kill to 500. At this time severe icing conditions leaving no available anchorage for small boats forced the operation to conclude for the season.

It is planned to expand the seal control program on the Copper River during the 1952 season.

Unusually excellent cooperation was obtained from members of the Cordova District Fisheries Union (Independent), the New England Fish Company, the Whiz Halferty Company, Parks-Western Fisheries, Cor-

ACKNOWLEDGMENT

dova Fish and Cold Storage, and the Copper River Co-op Cannery. At a meeting held at the Cordova Union Hall on September 27, 1951, the various groups pledged financial support for the program in the ratio of one to five, or one dollar for every five dollars the Department spent. A total of $6,000 will be contributed by these groups to match the $30,000 allotted by the Department.

WATERSHED MANAGEMENT

INTRODUCTION

Most people, including some in the fishing industry, fail to realize the importance of the fresh water habitat of our salmon. There seems to be a general impression that all salmon run into the streams in the summer and fall to deposit their eggs; when these hatch in the spring the baby salmon or fry wiggle up through the gravel and descend at once to the sea. While this is substantially true of the pink (humpback) and chum (dog) salmon, it certainly does not hold for the other three species. In general the silver (coho) and red (sockeye) salmon will spend their first year—in some cases two or three years—in fresh water streams and lakes. Likewise the young king (chinook) salmon remain in fresh water for some time—certain races up to a year—before migrating downstream to salt water.

Escapement of mature salmon from the commercial fishery to the spawning streams is, of necessity, important. However, granted sufficient escapement, the production of the first two species is further dependent on several other conditions, including: time of spawning; amount and quality of spawning gravel available; condition of stream flow at time of, and subsequent to, spawning; climatic conditions during the hatching period; and perhaps some other, as yet unknown, factors. To the above must be added predators; both those who prey on the mature salmon as they ascend to the spawning grounds and those who prey on the young as they emerge in the spring and descend to the ocean.

In a similar manner all these factors regulate the production of the other three species. To these basic factors must be added one more—of ranking importance; the amount and quality of feeding or rearing areas available during their fresh water existence. The amount (area) of streams and lakes is naturally of paramount importance, but the abundance of proper food and presence of fish competitors and predators in the waters is closely linked to the overall production.

Certain conditions, such as those due to the vagaries of nature, man can do little about. But with others it seems feasible to exercise a measure of control. Productiveness may be increased by enlarging rearing areas and improving abundance of available food. The Department has already started control measures on certain predators and as circumstances warrant it is hoped to initiate similar programs on others.

In planning the work program for the new division of Watershed Management it was decided that the most tangible results could be achieved by increasing the available fresh water habitat for red and silver salmon. Many streams and lakes in the Territory are not now accessible to salmon because of natural barriers or obstructions. The removal of these or construction of fishways around them, therefore was given first con-

sideration. At the same time it is necessary to plant the desired specie above the obstruction for a full cycle of four or five years.

A fisheries biologist and an engineer were employed and a program instituted on Afognak Island near Kodiak. The following report reviews the first season's work.

BIOGRAPHICAL SKETCHES

CLINTON E. STOCKLEY, JR., was born October 14, 1922, in Seattle, Washington, and attended elementary and secondary school in that city. During World War II he served in the U. S. Army for three years and was stationed on Attu Island in the Aleutians and in the interior of Alaska. He was graduated from the University of Washington in 1950 with a bachelor of science degree in fisheries biology.

Mr. Stockley was employed by Dr. W. F. Thompson, Director of the Fisheries Research Institute, University of Washington, during summer vacations and on a part-time basis during the winter terms. One season he was assigned to the Kodiak area to make studies on pink and red salmon and he spent two seasons in Southeast Alaska making stream surveys and pink salmon studies. Upon graduation he was given a permanent position with the Fisheries Research Institute and was employed by that organization until he transferred in July, 1951, to the Alaska Department of Fisheries.

DETRICK COOTER was born March 31, 1926, in Wichita, Kansas, where he received his early schooling and was graduated from high school. He served for three and one-half years in the U. S. Merchant Marine and is a licensed marine engineer. He also worked as an engineer on vessels of the U. S. Fish and Wildlife Service in Alaska for six months in 1949 and spent the fishing season in the Bristol Bay area.

Mr. Cooter attended the University of Texas for one year and then transferred to the University of Washington. Upon receiving a bachelor of science degree in engineering in August, 1951, he came to Alaska to enter the employ of the Alaska Department of Fisheries.

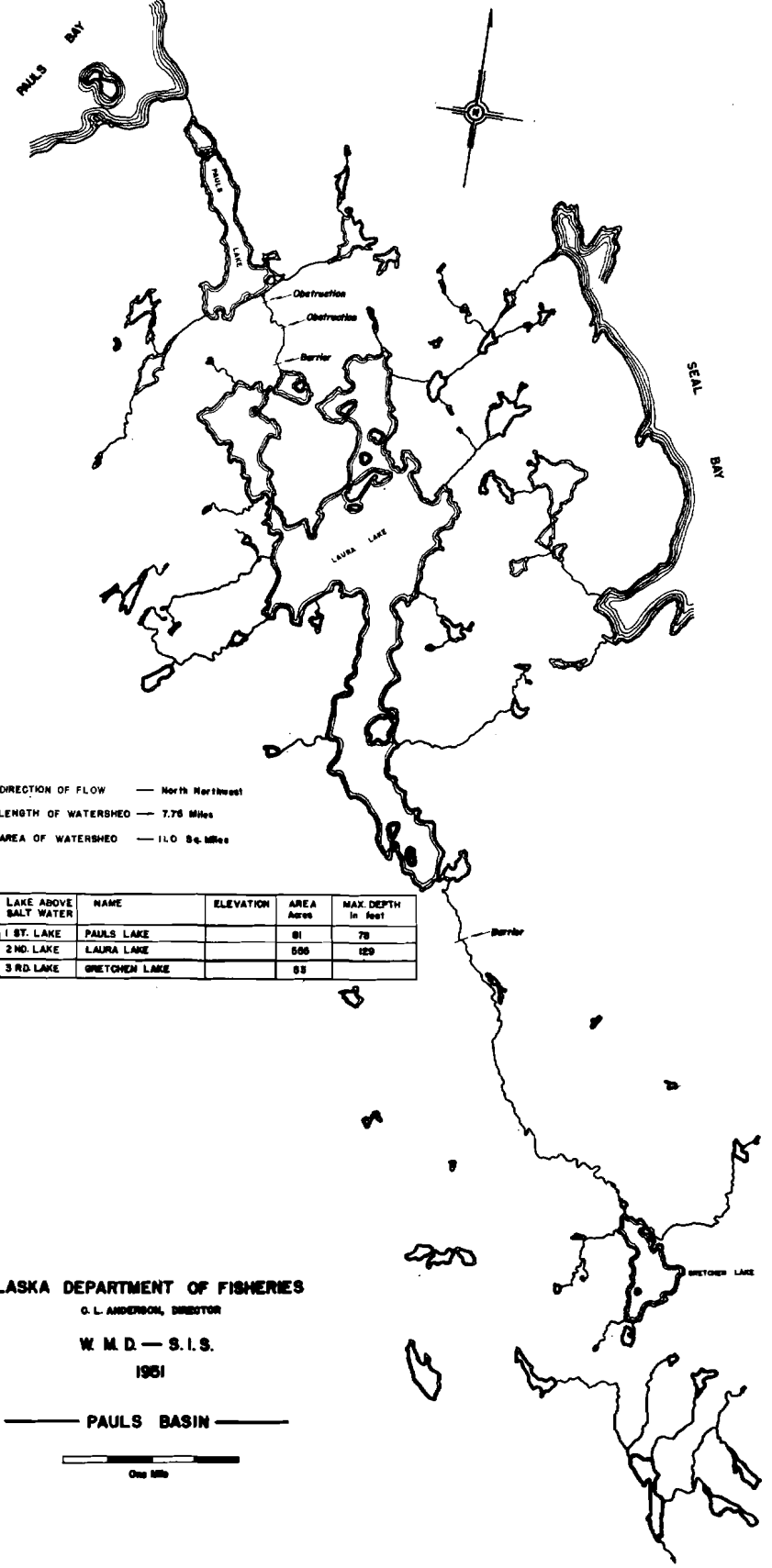
PAULS LAKE FISHWAYS

by Detrick Cooter, Engineer; Clinton Stockley, Biologist

The watershed management program was initiated in July in the Afognak district of the Kodiak area. The site for the initial project was selected by the Alaska Fisheries Board after careful deliberation. Two major factors influenced the selection: (1) there has been a critical depletion of the fishery in the Kodiak region and (2) reports from both the U. S. Fish and Wildlife Service and the Fisheries Research Institute indicated that there were a number of potential sites for stream improvement in the Kodiak region. In July, 1951, an aerial survey was made of the entire region and the Pauls Bay drainage system, located on the northeast coast of Afognak Island on the east arm of Perenosa Bay, was selected as the site for further study. Following a ground survey, the Pauls Lake system was selected as the most desirable watershed for initial stream improvement work. (Figure 1)

SITE SELECTED

The Pauls Lake System comprises three lakes: Pauls, Laura and Gretchen with their connecting and tributary streams offering additional spawning area. Pauls Lake has a stock of sockeye, pink and coho salmon. A barrier of four falls between the lakes present major obstructions which prevent the ascension of salmon to the potential spawning grounds of



DIRECTION OF FLOW — North Northwest

LENGTH OF WATERSHED — 7.75 Miles

AREA OF WATERSHED — 11.0 Sq. Miles

LAKE ABOVE SALT WATER	NAME	ELEVATION	AREA Acres	MAX. DEPTH in feet
1 ST. LAKE	PAULS LAKE		81	78
2 ND. LAKE	LAURA LAKE		586	129
3 RD. LAKE	GRETCHEN LAKE		65	

ALASKA DEPARTMENT OF FISHERIES

O. L. ANDERSON, DIRECTOR

W. M. D. — S. I. S.

1951

PAULS BASIN

One Mile

Laura Lake and its tributaries, including Gretchen Creek and Gretchen Lake.

GEOGRAPHICAL DESCRIPTION

Pauls Lake, located one-eighth mile from the head of Pauls Bay, has an area of 81 acres and a maximum depth of 63 feet. Laura Creek, which flows into the south end of Pauls Lake, is a swift stream with a depth of one foot and a width of 20 feet. The first barriers occur two-thirds of a mile upstream from the lake. Natural obstructions are a seven foot falls (Figure 2), a six foot cataract (Figure 3), a 12 foot falls (Figure 4), and a 10 foot cataract. Four hundred feet upstream from the upper cataract is located Laura Lake (Figure 5), which at the present time has no population of spawning salmon. Laura Lake, with an area of 555 acres, is three miles long, a mile wide, and has a maximum depth of 128 feet.

The main tributary stream of Laura Lake is Gretchen Creek, which flows into the south end of the lake. The creek, which is 15 feet wide and one foot deep, has excellent spawning riffles, extending three-eighths of a mile before it is blocked by a 10 foot falls, located at the mid-point of a short bedrock canyon. Beyond the canyon, Gretchen Creek flows two and one-half miles through a flat valley and this section has excellent riffles, offering an immense spawning potential. At the head of the valley is located Gretchen Lake, which is five-eighths of a mile long and one-fourth mile wide with a total area of 53 acres. Several tributary streams, offering additional spawning area, flow into Gretchen Lake.

There are four major obstructions which prevent the ascension of salmon to the potential spawning grounds of Laura Lake and its tributaries, including Gretchen Creek and Gretchen Lake. Due to the prohibitive cost of constructing the conventional reinforced concrete fish ladders, which are in standard use in the surmounting of similar barriers elsewhere in Alaska and in the United States, it has been necessary to devise a type of low cost construction. This will be accomplished with a series of fish-

Figure 2. The First Barrier.

ways utilizing blasted pools and low dams in the streams. Topographical maps of the obstructions and barriers and a study of the rate of flow to determine the quantities of water which would be required to handle during the time of salmon migration were made by field engineers prior to the designing of the fishways. The field work was completed on September 15, 1951, and work was started at once on the design of the fishways.

The fishways design drawn by the Department engineer is the application of several low cost types of fishway. The fishways are to be constructed

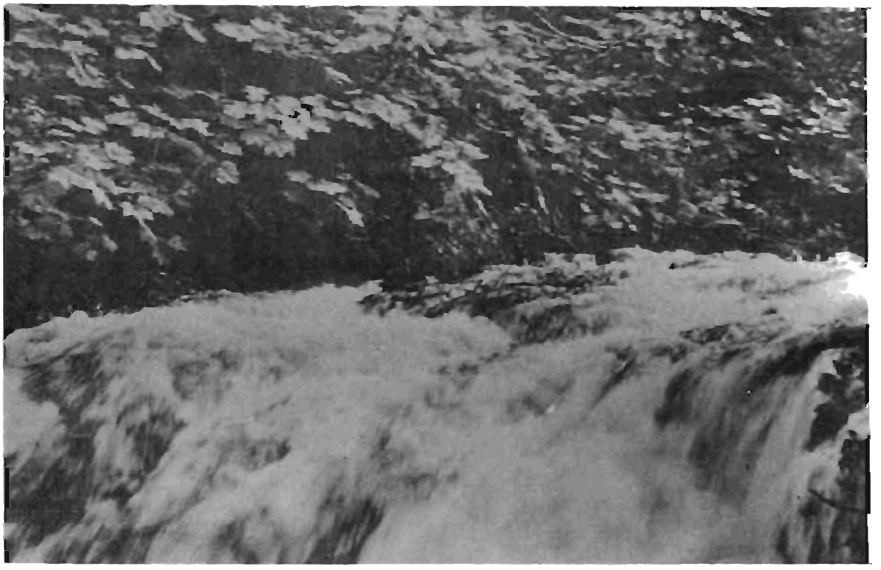


Figure 3. The Second Barrier.

Figure 4. The Third Barrier.

by blasting a series of stepped pools in the bedrock of the major barriers. The lesser barriers will be partially drowned out by the erection of low dikes. The first barrier, the seven foot falls in Laura Creek, is to be modified by erecting a dike in the pool below the falls. This will create two small falls in the place of the one high falls, and will also provide an intervening resting pool for the fish. The second obstruction, occuring in Laura Creek, is the six foot cataract. This cataract will be blasted to make it passable for salmon. It is proposed that the third barrier, a combination of a 12 foot falls and a 10 foot cataract, will be blasted out to form a series of stepped pools in the bedrock.

MAJOR ENGINEERING PROBLEMS

The fourth, and last obstruction occurs in Gretchen Creek. The 10 foot falls are to be made surmountable for salmon by a combination of drowning out the lower third through erection of a dike and by blasting away the upper third of its height in a channel cut through bedrock.

This system as devised by Department engineers will provide a more natural passage for the salmon than the conventional concrete ladder as well as reducing the cost of construction.

Past experience has demonstrated that as a general rule it is more economical for any government agency to contract for construction rather than perform the work themselves. By putting work on a contract basis, the agency is not required to maintain construction crews and equipment. In view of this the Department will follow this policy wherever possible. With this in mind the engineering section completed the plans for the fishways and drew up a contract. Advertisements for bids were published as the year drew to a close.

STOCKING PROGRAM

Because the commercially valuable sockeye salmon are not inclined to extend their natural range into newly opened areas, a stocking program was initiated in Laura and Gretchen Lakes. A substantial run of sockeye salmon was located in the adjacent Perenosa Lake system during the course of the summer. The mature fish were seined at the mouth of their spawning stream. The female salmon were dispatched with a bludgeon, bled by severing the ventral artery, incised from vent to pectoral fins, and then the eggs were extruded into a pan. Milt or sperm from the mature male salmon was extruded into the pan containing the eggs. (Figure 6) The mixture of eggs and sperm was gently stirred and then rinsed in water to stimulate fertilization, thus completing the artificial spawning. To arrest further development the eggs were drained and packed in moss padded baskets for transportation. Experiments have shown that retarding of water hardening at this stage will permit transporting of the eggs with a minimum of mortality.

Eighty-four thousand of the green (freshly spawned) eggs were transported to Gretchen Creek and immediately planted. The remaining green eggs were transported to the Port Williams temporary salmon egg incubator where they were developed to the eyed stage. Incubating the eggs until the eyes of the larvae become apparent concludes the delicate period of development. Eyed eggs are quite resistant to shock and can be easily transported and planted without undo mortalities. A third lot of 107,000 green eggs taken from Karluk Lake sockeye salmon was also placed in the incubator for eyeing. It required 30 days for the two lots of eggs to develop to the eyed stage, after which the eggs were planted in upper Gretchen Creek. (Figure 7) Two hundred thousand green eggs from Kar-

Figure 5. Laura Lake.

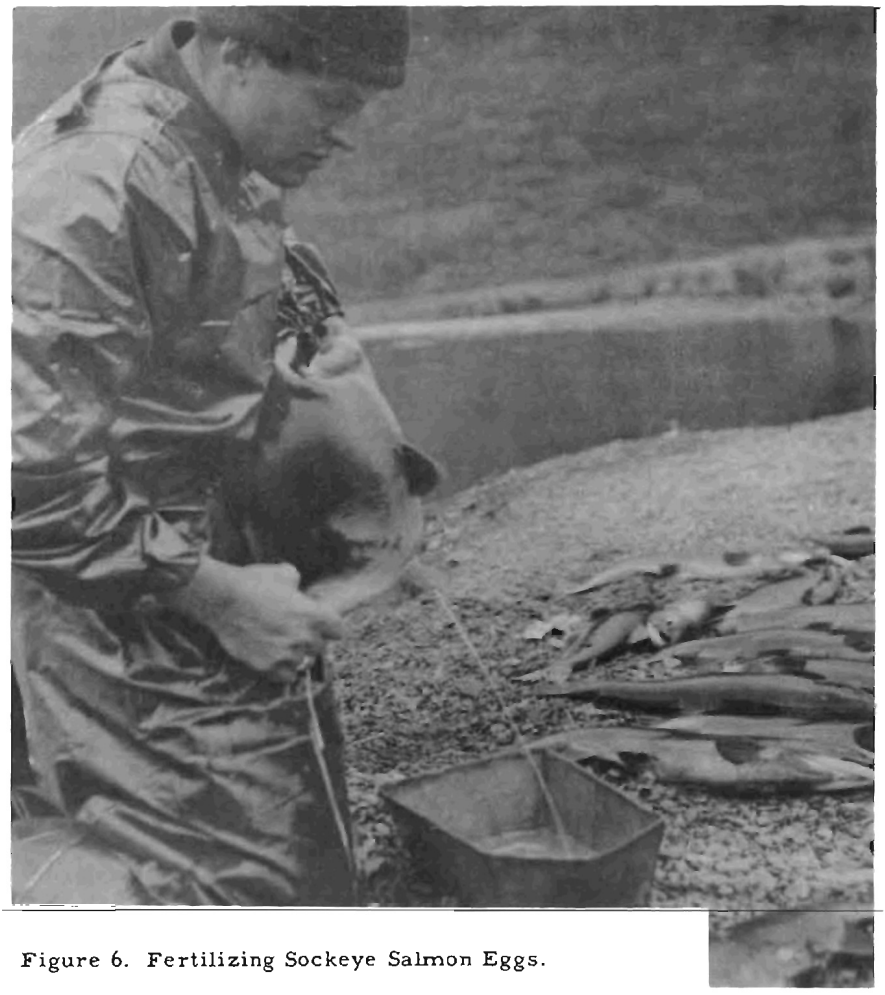


Figure 6. Fertilizing Sockeye Salmon Eggs.

luk Lake were planted in a northwest tributary stream of Frazer Lake, where the Department plans to eventually make stream improvement developments.

The removal of the four barriers and the introduction of sockeye by transplanting and cohoes by natural extension to the new areas in the upper Pauls Bay Watershed, should usher in a run of salmon comparable to the adjacent Perenosa system, which supports a seine fishery for sockeye and cohoes. As a measure of value it may be pointed out that the 1951 escapement to Perenosa Creek and Lake was estimated at 25,000 sockeye and about 20,000 coho salmon.

CONTRIBUTION

PRELIMINARY SURVEYS OF OTHER POTENTIAL PROJECTS IN THE KODIAK DISTRICT

BROWN'S RIVER: An aerial survey was made in this area on July 14, 1951. Laddering of the 20 foot cataract in this large stream will open some six miles of salmon spawning area and provide a small lake for rearing.

FRAZER LAKE: An aerial survey was made in this area on July 15, 1951. Present information indicates that laddering of the 40 foot barrier falls will create an immense spawning and rearing potential in this major system.

FALLS CREEK: This stream was visited on August 24, 1951. It is a tributary to O'Malley Lake, which is south of Karluk Lake on Kodiak Island. This is a potential rehabilitation project to increase the spawning area by re-routing Falls Creek into its former channel. Altering the channel will be only a small project involving the construction of a 30 foot wall to divert the flow into the old channel.

LITTLE WATERFALL CREEK: A ground survey was made on the lake-stream system in Little Waterfall Bay, which is a southwest tributary to Perenosa Bay on Afognak Island, on September 9, 1951. A five foot cataract, an eight foot falls and a 20 foot falls in the first half mile prevent the fish from ascending to the lake which is about three miles upstream and has an area of approximately 200 acres. There is an excellent pink salmon run in the stream to the first falls.

KITOI LAKE: This lake is tributary to Kitoi Bay on southeast Afognak Island. It was flown over on October 3, 1951. The lake is approximately 100 acres in area. The stream from the lake to Kotoi Bay is about a quarter mile long and is reported to have three small falls in it.

Aerial photographs of Afognak Island have been obtained and maps of all the potential areas have been drawn from them.

The Department would like to extend its appreciation to Mr. E. L. Stout and Mr. John J. Clark of the Washington Fish and Oyster Company, Mr. Roy Lindsley of the U. S. Fish and Wildlife Service, Mr. Donald Bevan and Mr. Wallace Noerenburg of the Fisheries Research Institute, for their cooperation and assistance in the field in the Kodiak area.

ACKNOWLEDGMENT

The Falls Creek Project, which was described in the 1950 report as a cooperative venture of the U. S. Fish and Wildlife Service and the Alaska Department of Fisheries, was completed in time for the 1951 salmon run. The ladder was a complete success with an escapement of 2,280 pink, 303 chum, 9 red, and 2,467 coho salmon passing through the fishways without difficulty and ascending the stream to spawn. The return of the progeny of this escapement of pink

SOUTHEAST ALASKA STREAM IMPROVEMENT

and chum salmon, where there were none before, will be the proof of the value of this fishways.

Sockeye salmon were taken from the Lake Creek run, which is a tributary of Auke Lake near Juneau. These eggs were incubated at the Department eyeing station in Juneau. On October 20, 1951, the eyed eggs were planted in the tributary creeks to Dredge Lake and Duck Creek dredging ponds. Gravel dredging along these creeks in the Mendenhall Valley has created a series of small lakes that are believed to be suitable for the stocking of sockeye salmon.

STOCKING IN THE JUNEAU DISTRICT

On January 5, 1952, the second shipment of eyed king salmon eggs arrived from Washington State. These fall run kings are from the Soos Creek Hatchery, which is located on a tributary of the Green River near Seattle. The 66,000 eggs were planted in artificial nests in Montana Creek, a tributary of the Mendenhall River near Juneau. (Figure 8) The method used for planting these king salmon eggs was essentially the same as that which was developed for planting the sockeye eggs on Afognak Island. A five foot length of two inch tubing was used to introduce the eggs into the gravel. A basin was first dug 20 inches deep and about three feet in diameter in the stream bed. Then the downstream end of the tube was placed in the bottom of the basin so that there was a gradual slope to the tube providing a rapid flow of water through the tube. Coarse gravel was heaped over the lower end of the tube until the basin was well filled. The eggs were poured into the upper end of the tube, which was placed at the surface of the stream, and the flow of the stream distributed the eggs into the spaces in the gravel, thus completing the operation.

KING SALMON EXPERIMENT

Figure 7. Planting Eyed Sockeye Salmon Eggs in Gretchen Creek.

PLANTING RECORD

Afognak Island:
August 11, 1951 - Gretchen Creek - 84,000 green sockeye salmon eggs
Sept. 10, 1951 - Gretchen Creek - 22,873 eyed sockeye salmon eggs
Sept. 30, 1951 - Gretchen Creek - 106,177 eyed sockeye salmon eggs
Kodiak Island:
August 29, 1951 - Frazer Lake Tributary - 200,000 green sockeye salmon eggs
Juneau District:
October 20, 1951 - Mendenhall Valley Creeks - 25,986 eyed sockeye salmon eggs
January 5, 1952 - Montana Creek - 66,000 eyed king salmon eggs

SPORTS FISH DIVISION

INTRODUCTION

The average sports fisherman, who is dependent upon his automobile for transportation, is finding it increasingly difficult to enjoy his favorite sport. The lakes and streams adjacent to centers of population, such as Fairbanks and Anchorage, show unmistakable signs of depletion. It therefore seemed proper that first attention should be directed to waters readily available to the majority of fishermen.

Experience in the States has definitely shown that stream fishing in easily accessible areas can only be maintained by annual plantings of legal size trout. Such a procedure is extremely expensive and certainly beyond the province of this Department with the limited budget at its disposal. On the other hand the rehabilitation of lakes with restocking on an annual basis has proven entirely feasible and relatively inexpensive.

The State of Washington pioneered in a program designed to restock their lakes with trout fry. The first step in the program was that lakes were cleared of all undesirable species of fish, removing them by the use of rotenone, before any trout fry were planted. When it was decided to inaugurate a sport fish program for the Territory, every effort was made to employ a biologist who had had experience with the program pioneered in the State of Washington. The Alaska Department of Fisheries was indeed fortunate in securing the services of Mr. Edward S. Marvich, formerly with the Washington State Department of Game, as chief of the Department's Sport Fish division.

The entire sport fish program is being made possible by the funds received from sports fishermen through their purchase of the Territorial sport fish license stamp. While it is true that this license money does not go into a special or "earmarked" fund, nevertheless the appropriation by the Legislature for this work is predicated on the anticipated revenues from the sale of the stamps.

BIOGRAPHICAL SKETCH

EDWARD S. MARVICH was born April 5, 1917, in Carbonado, Washington. Following graduation from high school he entered the University of Washington and in 1941 was graduated with a Bachelor of Science degree in fisheries. His vacation periods were occupied in fishery work including employment with the U. S. Fish and Wildlife Service, handling trout and grayling in Yellowstone National Park.

Upon receiving his degree he was employed by the Washington Department of Game, Sport Fish Division. After preliminary training in trout

hatchery management and techniques, he was made a district biologist. The modern lake rehabilitation program of that agency was just getting underway at that time, so it can be said he was truly a pioneer in modern trout management policies.

Prior to his transfer to the Alaska Department of Fisheries in June 1951, he was in charge of the Seattle-Everett district and was responsible for all rehabilitation and restocking of waters in that heavily populated area. The fact that trout fishing in the lakes of this district is better today than it was 25 years ago attests to the success of the program.

During World War II he served four and one-half years in the U. S. Navy and was discharged with the rank of Lieutenant-Commander.

SPORT FISH

by

E. S. Marvich

The stocks of sport fish in Alaska have shown marked declines during the last decade, due to the tremendous population surge and the increased accessibility of watersheds to population centers. This has been particularly true in the Fairbanks and Anchorage areas. The building of additional roads has facilitated transportation to lakes and streams heretofore fished to a limited extent, and the increased use of float-equipped aircraft has made vast watersheds readily accessible to the angler. Fishing for grayling, rainbow trout, and other sport fish is beyond belief in waters that remain relatively inaccessible. Excellent fishing can be had for grayling in the more remote regions of the Tanana and Yukon River drainages in the interior of Alaska. The use of aircraft and river boats necessary to reach these areas however, is limited because of their expense. Where waters are readily available to the large population centers, the sport fishing is poor; the Department, therefore, has concentrated its efforts to those waters.

GENERAL PROBLEM

One man worked on the sport fishery problem during the year. It was deemed advisable to concentrate the early work in one locality rather than to spread out over a broad area. Fairbanks was selected as the center of operations as there had been an alarming decrease in sport fishing stocks in this area during the last few years.

The interior of Alaska is roughly divided into two broad valley areas of the Tanana and Yukon Rivers. These rivers are characteristically silt-laden during the thawing, summer months, and frozen over during the winter months. There is no significant sport fishery in these two large rivers.

There are three types of tributaries to the Yukon and Tanana River systems. The first type is glacial fed and carries a great amount of silt. These are poor fish producers. The second type is run-off and spring fed; these tributaries are frozen over all winter, are subject to variations in rate of flow, and have a wide range of temperature. Water temperature in this type varies between 65° Fahrenheit in the summer to just above freezing during the winter months, Species found in this second type of stream include: grayling, salmon, whitefish, ling, suckers and pike, with the last named limited largely to the backwaters and sloughs.

INTERIOR WATERWAYS

The third type is the spring fed tributaries. The majority of these are short streams with little variation in their rate of flow or their temperature. They are clear and remain open all winter in spite of air temper-

ature as low as 65° below zero. These spring fed tributaries contain, for the most part, grayling and whitefish. The fish are reputed to migrate out of these streams into the Tanana and Yukon Rivers during the winter months.

LAKES

The broad valleys of the Tanana and Yukon River drainages are dotted with myriads of lakes. Most of the lakes are shallow and are populated with northern pike. The lakes may also contain lake herring, fresh water ling, whitefish, suckers and, in some rare instances, grayling and lake trout. Many lakes, of considerable size, are found on the valley floors but are of insufficient depth to sustain fish life during the long cold winters. The lakes in the interior of Alaska are frozen over from October until the following May.

Surface temperatures, taken in 12 inches of water, were obtained from a number of small lakes during the summer of 1951. The afternoon temperatures recorded for Lost Lake, a 94 acre lake with a maximum depth of 39 feet, are tabulated below.

Date		Temperature in Degrees Fahrenheit
June	10	62
	15	60
	20	61
	27	68
July	9	69
	14	70
	20	73
	31	68
Aug.	8	63
	15	72
	26	60
Sept.	6	57
	10	53
	14	50
	23	53
	24	44
Oct.	6	36

LAKE REHABILITATION

The northern pike is not a desirable fish in the interior Alaska. It has been found that if pike over five pounds in weight are available in a lake, the lake will support a sport fishery; however, as soon as the larger pike have been removed the fishery drops off to trifling proportions. Small pike, under 20 inches in length, are undesirable as a sport or food fish. Most of the lakes readily accessible to Fairbanks are populated with small northern pike; as a result, they support an insignificant sport fishery. Unproductive lakes of this nature must be managed so they will produce game fish. These lakes have the production potential necessary for highly desirable game fish. Stocking the aforementioned pike lakes with desirable game fish, such as trout and grayling, would be foolhardy. The northern pike, a notorious predator, would make short work of the introduced fish. This can be substantiated by the fact that grayling are not found in these lakes although they may be found in the outlet streams and have ready access to the lakes.

With the intention of attempting to improve the sport fishing in these

interior lakes, the Department undertook the rehabilitation of a lake using rotenone. Rotenone is a fish toxicant; it kills the fish by causing the blood vessels in the gills to shrink to a diameter which will not allow the passage of the oxygen-bearing red blood cells, and they therefore suffocate. Rotenone is not harmful to mammals; numerous city reservoirs have been treated without harmful effect to the thousands of people using the water. Fish that have been killed by rotenone are edible. Rotenone is one of the most powerful tools at the disposal of the management biologist; it enables the biologist to completely eradicate undesirable fish populations from a lake.

USE OF ROTENONE

REHABILITATION OF LOST LAKE

Lost Lake, 55 miles southeast of Fairbanks on the Richardson Highway, was selected for the initial experiment in lake rehabilitation by the use of rotenone. The lake was selected for rehabilitation for the following reasons: it supported an insignificant sport fishery, being populated with northern pike from four to 17 inches in length; it was readily accessible from Fairbanks by traveling over a surfaced highway; it had the necessary production potential for game fish; and it was isolated from adjacent waters and thus afforded an opportunity to observe the results under controlled conditions.

INITIAL EXPERIMENT

Lost Lake lies in a shallow basin and drains across a flat, slightly inclining shelf to the Tanana River, about one-half mile away. There is one inlet that flows through a muddy channel during the spring run-off; the inlet is dry during the remainder of the year. Lost Lake has 94 surface acres and has a maximum depth of 39 feet; the lake has an average depth of 25 feet. The lake bottom consists of decomposed granite covered over, for the most part, by a fine layer of silt.

DESCRIPTION OF LOST LAKE

In order to compute the correct quantity of toxicant required, Lost Lake was surveyed during the summer of 1951. An accurate engineering survey from which computations can be made enables the biologist to determine the quantity of toxicant necessary to insure a lethal dosage. The addition of more than the required amount is expensive and wasteful. The cost of rotenone was 37 cents a pound.

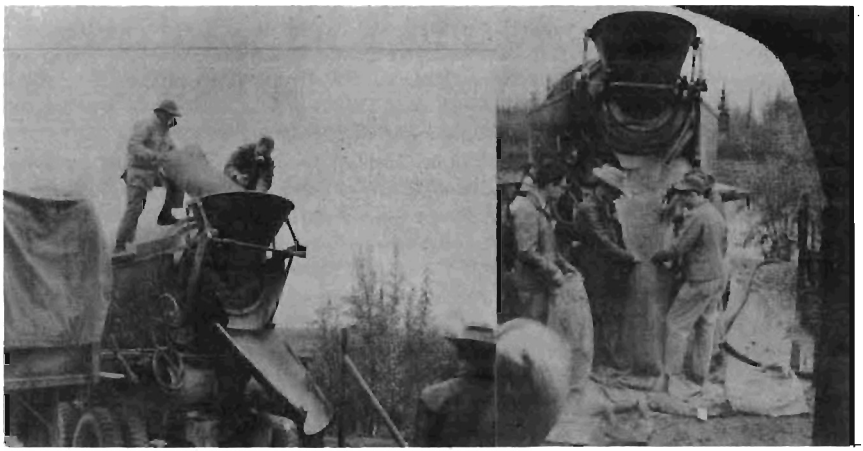
Lost Lake was sectioned into six sections prior to toxicant application; this insured a more even distribution of the rotenone bearing material. Sectioning of the lake was accomplished by the erection of large numbered markers on the shore; these markers were connected across the open water by yellow buoys. The sections could be considered as fenced in portions of the entire lake. The correct quantity of toxicant necessary to treat each section was carefully calculated and that quantity was placed in the section.

NECESSARY PREPARATIONS

Lost Lake was treated with finely ground cube root containing 5.4% rotenone in order to kill the undesirable pike. The cube root, as purchased, was too dry to leach out of the porous burlap bags and into the water. It was necessary to pre-mix the root with water to a wet sawdust consistency. Mixing was done by using a truck type concrete mixer. Mixing the powdered cube root was a mean, dusty, uncomfortable job. (Figure 1 and Figure 2.) The men handling the root wore respirators; the dust clogged up the nasal passages and throats of the men working with

it. There was no toxic effect from the rotenone but the dust caused physical irritation. 3,200 pounds of cube root was mixed in the concrete mixer. After mixing, the cube root was sacked into porous burlap bags, and the correct quantity of toxicant was placed on the shore of each section of the lake.

The conventional manner of toxicant distribution was used. The burlap bags, containing the cube root, were towed through the water immediately behind the propeller wash of an outboard motor driven boat. The marginal areas of the lake, as well as the inlet and outlet sump holes, were sprayed



Figures 1 and 2. Mixing rotenone in cement mixer as a preliminary to distribution in the waters of Lost Lake.

Figure 3. Using power pump to spray rotenone in marsh area.

with a concentrated solution of toxicant simultaneously with the toxicant application in the six sections of the lake. The toxicant did not spread in the weedy or marshy areas; hence, toxicant application in those areas was made by spraying with a power pump and thus complete coverage was insured. (Figure 3.) Killing the fish in open water areas is relatively simple since the toxicant will dissipate over a considerable area; however, in marshy areas the toxicant does not disperse readily. In order to attain a complete kill, it is necessary to cover these marshy areas.

METHOD OF DISTRIBUTION

The northern pike started to die 90 minutes after the start of toxicant application. Pike from four to 17 inches in length were dying in all areas of the lake within two hours, and by nightfall most of the fish were dead. No fish were killed in the inlet or outlet sump holes, indicating that those areas were not frequented by pike.

The Department would like to acknowledge the invaluable assistance of the Tanana Valley Sportsmen Association which provided men, boats and motors for the work at Lost Lake. Members of the organization aided in surveying, sounding and preparing the lake for new game fish.

ACKNOWLEDGMENT

Scales were removed from the northern pike eradicated in Lost Lake to read to determine the rate of growth of these fish. Scales have long been used by fisheries research workers in age determination. The scale grows in size in direct proportion to growth in length of the fish. The scale is first formed as a "platelet"; as the fish grows, proportional amounts of material are deposited on the surface of the scale. These appear as concentric rings or "circuli" and a number are formed during each year's growth. During periods of fast growth the circuli are widely spaced; during periods of slow growth the distance between circuli are narrow. The zones of slow growth occur normally during the late fall and winter months and are referred to as "annuli" or winter checks. By September 23rd, the date of toxicant application, the growing season for the northern pike had terminated for the year. The following table shows the rate of growth of the northern pike eradicated in Lost Lake:

SCALE STUDY IS MADE

Average Length in Inches Tip of Nose to Fork in Tail	Age in Years	Number of Samples
5.0	1	49
8.8	2	28
11.3	3	10
13.5	4	5
16.5	5	1

From the slow rate of growth of the northern pike in Lost Lake, it can readily be seen why the lake failed to support a sport fishery. As soon as the larger older fish had been harvested by the angler, the lake ceased to be an attraction. The rate of recruitment of the large fish was slow; hence the lake failed to provide enough sizeable pike to keep the angler interested.

The duration of rotenone toxicity to fish is dependent upon a number of variables; these variables have been narrowed down to three that have the most effect. They are as follows: the pH (acidity-alkalinity) of the water, the temperature of the water, and the amount of suspended material pre-

DURATION OF TOXICITY

sent. The higher values of any of the three variables decreases the toxic period. Unless the water is very acid, the temperature is low, or the water is crystal clear, the lake will be free of toxicant in approximately six weeks' time. Lost Lake was covered over with a layer of ice on October 10th. It is assumed that the toxic effects of the rotenone will have dissipated by the early summer of 1952; at this time it is planned to stock the lake with rainbow trout fry (about one inch long).

Lost Lake is the first attempt at lake rehabilitation, using rotenone, in Alaska. No figures for the productivity of a lake are available for Alaskan waters. It is generally believed by biologists that a lake is capable of producing a fairly constant number of pounds of fish per surface acre. The

POTENTIAL PRODUCTION

number of pounds of fish produced per acre, within certain limits, remains constant regardless of the number of fish stocked; as a result, fewer fish planted means larger fish in a given length of time. Since Lost Lake rehabilitation is a venture into the unknown, it is planned to understock Lost Lake with rainbow trout fry—by comparison with stateside standards. If the fish grow to a large size, sportsmen certainly will not criticize; however, if the lake is overstocked and the fish stop growing after attaining a length of five inches, the program could be justly criticized.

Lake rehabilitation, using rotenone, necessitates the development of a source of fish supply in order to stock the lake. Preliminary plans were drawn up to build a trout hatchery in the vicinity of Fairbanks. Rainbow trout eggs will be shipped in from the states to the hatchery; these eggs will be hatched at the installation and held there through absorption of the yolk sac. The rainbow trout fry will be fed for a short period and then be planted in Lost Lake and other suitable waters in the Fairbanks and Anchorage areas.

Hatcheries enjoy an elevated position with the laymen. In a hatchery,

FISH HATCHERY

the layman can see tangible evidence of fish production. To the fisheries biologist, the hatchery represents a tool that can be effectively used in fisheries management. Too much emphasis has been placed, in the past, on the hatchery's role in fisheries. The criterion of successful fish production should be based on the number of fish harvested rather than the number stocked. Many states have taken great pride in the millions of fish produced by hatcheries with little emphasis placed on the actual harvest of the stocked hatchery fish. Alaska should not make that error. A hatchery should be used as an effective tool; the hatchery should not be considered an overall solution for fish production.

GRAYLING

The most abundant and valuable game fish in interior Alaska is the grayling. The grayling is without a peer for the fly fisherman. The grayling takes a fly, wet or dry, with reckless abandon; it may burst out of the water, arch its body, and take a dry fly as it enters the water. The grayling is indigenous to the North American continent; the last stronghold of the grayling is in northern Canada and Alaska.

At one time grayling were native in several sections of the United States. Today, the grayling is a rare angling prize in the states. Many reasons have been offered for disappearance of the grayling. Grayling are easy to catch; they cannot stand encroachment of civilization and they cannot compete with other species of introduced fish. These are the major reasons given for the depletion or extinction of the grayling in the states.

Some of the rivers and streams in the interior of Alaska have supported a heavy fishing pressure for grayling with a resultant decrease in the grayling stocks. Scale samples were collected from one stream in order to ascertain the rate of growth of the grayling. The sample taken was too small to obtain an accurate rate of growth curve. From a sample of 20 grayling taken from the Clearwater River near Big Delta, it was determined that the grayling rate of growth was as follows:

Forked Length in Inches (Tip of Nose to Fork in Tail)	Age in Years
12.3	4
13.3	5
14.3	6
15.5	7
17.0	9

Grayling are reputed to migrate out of the tributaries and into the Tanana and Yukon Rivers in the fall of the year; it is assumed the grayling spend their winters in these rivers and migrate back into the tributaries in the spring. These observations have been made by trappers and fishermen in the interior of Alaska. The writer has observed the spring migrations in several clearwater streams.

A graduate student at the University of Alaska was conducting a study on the grayling at the time of this report. Information on the life cycle and habits of the grayling will be available from this study.

STATISTICS

In presenting a statistical section in the 1951 annual report, the same three tables appearing in the 1949 and 1950 reports are being repeated in an abbreviated form. In each case the figures for the last available year have been added to the preceding nine years, thus making a workable table covering the latest ten-year period. Readers interested in previous years are referred to the 1949 and 1950 annual reports of the Department.

In addition, Table IV has been incorporated to show, by districts, the numbers of each species taken by the various types of gear. Readers interested in previous years are referred to the 1950 annual report of the Department.

In this report, Southeastern Alaska includes the area from the southern boundary of Alaska north to Yakutat; Central comprises the area west of Yakutat including all south of the Alaska Peninsula; Western includes the northern shore of the Peninsula, Bristol Bay and the Kuskokwim and Yukon Rivers.

The following statistics were compiled from records of the Fish and Wildlife Service, Pacific Fisherman, and other sources. Use of this material is hereby gratefully acknowledged.

TABLE I - NUMBER OF OPERATING SALMON CANNERIES AND TOTAL PACK IN CASES (48 one-pound cans) BY DISTRICTS FOR ALL ALASKA.

YEAR	PACK SOUTHEAST	NO. CAN.	PACK CENTRAL	NO. CAN.	PACK WESTERN	NO. CAN.	PACK TOTAL	NO. CAN. TOTAL
1942	2,648,707	48	1,954,154	44	473,005	8	5,075,866	100
1943	1,892,868	34	2,167,306	35	1,368,095	14	5,428,269	83
1944	1,972,552	36	1,877,381	43	1,043,126	15	4,893,059	93
1945	1,549,543	41	2,091,739	44	713,287	11	4,354,569	96
1946	1,476,326	45	1,772,318	51	711,966	20	3,960,610	116
1947	1,056,878	32	1,786,629	43	1,414,895	15	4,260,394	90
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	29	4,363,471	107
1950	1,190,174	39	1,439,029	54	643,889	15	3,273,092	108
1951	2,028	39	1,067,687	59	388,519	24	3,484,468	122

TABLE II - COMPARATIVE VALUES OF CANNED SALMON GIVING INITIAL PRICE PER CASE, APPROXIMATE TOTAL VALUE PER SPECIES, AND TOTAL FOR ALL SPECIES.

YEAR	COHO	CHUM	PINK	KING	RED	TOTAL VALUE
	11.48	7.56	7.94	15.18	15.33	
1942	4,162,571	7,123,196	22,358,651	682,432	13,972,063	48,298,913
	11.94	7.54	7.90	15.44	15.04	
1943	2,006,841	6,878,028	18,225,882	844,440	29,868,438	57,823,629
	12.05	7.37	8.00	15.75	15.23	
1944	2,258,738	7,525,672	16,749,448	583,009	24,079,273	51,196,140
	12.12	7.68	8.04	16.70	15.51	
1945	2,457,242	5,312,270	18,007,700	720,196	18,260,272	44,757,680
	17.30	10.53	10.67	21.25	19.55	
1946	3,250,249	6,421,647	21,895,235	805,199	20,784,864	53,157,194
	18.24	17.95	18.72	21.08	24.19	
1947	2,689,888	8,229,464	32,210,755	1,112,539	35,739,285	79,981,931
	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

Total Value All Species, 1905 - 1951 . . $1,737,266,899

TABLE III — NUMBER OF SALMON TAKEN IN 1950 BY APPARATUS AND SPECIES IN EACH GEOGRAPHIC SECTION OF ALASKA.

Apparatus and Species	Southeast Alaska	Central Alaska	Western Alaska	Totals
SEINES: Number of	380	560	32	
% of Catch	45	50	4	
Coho or Silver	127,943	114,227	71	242,241
Chum or Keta	3,255,509	1,380,782	262,132	4,898,423
Pink or Humpback	3,951,886	7,557,714	43	11,509,643
King or Spring	12,905	3,224	728	16,857
Red or Sockeye	127,138	1,567,004	75,854	1,769,996
Total	7,475,381	10,622,951	338,828	18,437,160
GILLNETS: Number of	710	3,510	1,154	5,371
% of Catch	3	20	96	
Coho or Silver	152,826	399,790	83,193	635,809
Chum or Keta	58,748	495,240	184,370	738,358
Pink or Humpback	44,332	550,153	30,276	624,761
King or Spring	12,288	99,051	93,841	205,180
Red or Sockeye	322,892	2,828,884	7,191,095	10,342,871
Total	591,086	4,373,118	7,582,775	12,546,979
TRAPS: Number of	247	145		392
% of Catch	44	30		
Coho or Silver	435,774	238,208	--	673,982
Chum or Keta	1,459,975	639,188	--	2,099,163
Pink or Humpback	5,377,894	3,870,023	--	9,247,917
King or Spring	408	34,360	--	34,768
Red or Sockeye	101,655	1,551,209	--	1,652,846
Total	7,375,706	6,332,988	--	13,708,694
LINES: % of Catch	8			28,600
Coho or Silver	935,362	9,454		944,816
Chum or Keta	4,510	--		4,510
Pink or Humpback	49,712	--		49,712
King or Spring	353,071	22		353,093
Red or Sockeye	517			517
Total	1,343,172	9,476		1,352,648
TOTAL:				
Coho or Silver	1,651,905	761,679	83,264	2,496,848
Chum or Keta	4,778,742	2,515,210	446,502	7,740,454
Pink or Humpback	9,423,824	11,977,890	30,319	21,432,033
King or Spring	378,672	136,657	94,569	609,898
Red or Sockeye	552,202	5,947,097	7,266,949	13,766,248
Grand Total	16,785,345	21,338,533	7,921,603	46,045,481

TABLE IV — Covering the years 1942 to 1951 inclusive, shows the poundage and values of 24 fishery products taken in Alaskan waters. Salmon has been the backbone of the Alaska fishing industry but other products, such as fish livers and viscera, reflect changing demands.

FISHERY PRODUCT		1942	1943	1944	1945
Salmon	Lbs.	430,867,000	457,306,800	393,318,474	402,635,233
	Val.	$ 50,793,594	$ 60,363,015	$ 53,875,717	$ 48,917,141
Trout	Lbs.	44,175	21,089	38,588	45,382
	Val.	$ 6,676	$ 2,859	$ 5,919	$ 7,385
Herring	Lbs.	43,833,350	32,404,362	39,628,462	47,444,544
	Val.	$ 901,454	$ 1,829,491	$ 2,458,170	$ 2,973,500
Halibut*	Lbs.	8,444,189	13,666,500	22,208,230	20,544,885
	Val.	$ 1,044,971	$ 2,277,975	$ 3,122,568	$ 2,869,808
Livers	Lbs.	101,053	290,933	427,485	329,278
	Val.	$ 81,506	$ 343,437	$ 271,984	$ 390,960
Viscera	Lbs.	160,019	160,290	846,640	1,122,016
	Val.	$ 31,337	$ 28,020	$ 117,423	$ 265,007
Cod	Lbs	24,075	12,003	510,000	543,680
	Val.	$ 3,371	$ 1,443	$ 56,000	$ 80,255
Ling Cod*	Lbs.	4,147	31,434	172,199	243,440
	Val.	$ 104	$ 1,921	$ 12,998	$ 17,415
Livers	Lbs	268	468	2,931	5,573
	Val.	$ 268	$ 1,303	$ 6,444	$ 11,163
Sablefish (Black Cod)	Lbs.	3,969,316	4,084,545	5,164,254	5,839,950
	Val.	$ 330,249	$ 485,378	$ 572,694	$ 636,613
Livers	Lbs.	91,123	142,323	147,557	165,070
	Val.	$ 96,604	$ 168,266	$ 242,719	$ 263,941
Viscera	Lbs.	169,386	153,121	289,671	256,184
	Val.	$ 30,468	$ 27,370	$ 73,386	$ 63,798
Rockfish*	Lbs.	154,770	188,663	666,879	997,743
	Val	$ 8,962	$ 16,669	$ 54,549	$ 77,590
Livers	Lbs	583	518	4,314	6,182
	Val.	$ 431	$ 515	$ 3,130	$ 4,475
Flounder	Lbs.	40,892	83,636	32,317	85
	Val.	$ 3,992	$ 4,105	$ 2,217	$ 17
Shark Livers	Lbs.	590	342,174	542,245	124,260
Liver oil below	Val.	$ 48	$ 76,757	$ 150,481	$ 26,133
Skate Livers	Lbs.			4,561	7,607
	Val.			$ 411	$ 839
Misc. Fish Livers	Lbs.	218,018	19,091	19,841	
	Val.	$ 42,433	$ 9,546	$ 2,335	
Misc. Fish Viscera	Lbs.	19,425	361,839	8,903	
	Val.	$ 3,456	$ 63,695	$ 2,145	
Misc. Liver Oil	Lbs.			19,807	28,553
	Val.			$ 96,778	$ 275,577
Shellfish—					
Crab	Lbs.	195,748	194,078	316,416	480,749
	Val.	$ 149,582	$ 156,392	$ 252,206	$ 352,222
Shrimp	Lbs.	303,356	114,120	140,620	214,806
	Val.	$ 153,789	$ 57,256	$ 118,439	$ 177,400
Clams	Lbs.	590,121	795,900	947,210	926,899
	Val.	$ 426,273	$ 503,756	$ 576,607	$ 543,865
Oysters	Lbs.		4,617	4,248	3,780
	Val.		$ 2,052	$ 1,888	$ 1,680
TOTAL	Lbs.	589,231,604	510,378,504	465,461,852	481,965,899
TOTAL	Val.	$ 54,109,568	$ 66,421,221	$ 62,077,208	$ 57,956,784

*Includes fish landed in Canadian ports by Alaska halibut fleet.

Misc. Liver and Viscera Oil — 1948 8,790 lb. $131,808

Misc. Viscera Oil — 1949 6,125 lb. $ 27,690

Abalone — 1940 40 lb. $11

Smelt — 1945... 17,851 lb. $ 2,162

The largest take in pounds of all fish during this 10-year span was in 1942—but the total value was greatest in 1948, mirroring inflation trends.

TABLE IV

Summary of Alaska Fishery Products by Approximate Poundage and Values, 1942-1951 Inclusive

1946	1947	1948	1949	1950	1951
391,689,076	381,807,676	210,608,877	232,616,358	174,765,212	189,100,990
$ 59,090,973	$ 93,143,961	$101,193,919	$ 86,112,666	$ 87,091,068	$ 85,887,641
41,504	12,587	49,351	14,249	28,382	20,658
$ 8,558	$ 2,435	$ 15,892	$ 3,481	$ 11,096	$ 4,391
63,883,821	63,249,923	58,388,893	15,081,412	52,106,111	30,333,795
$ 6,573,416	$ 6,533,778	$ 5,694,889	$ 944,106	$ 3,819,994	$ 2,127,964
21,985,095	21,293,309	27,566,134	26,249,173	26,490,182	22,951,786
$ 3,598,808	$ 4,316,087	$ 6,615,876	$ 4,566,739	$ 5,802,381	$ 3,965,272
362,850	416,893*	408,479	447,658	421,786	272,926
$ 509,481	$ 587,484	$ 892,537	$ 570,295	$ 218,831	$ 159,071
743,640	796,439*	818,141	804,534	489,826	382,386
$ 188,739	$ 244,918	$ 791,853	$ 211,602	$ 60,684	$ 74,199
921,114	819,822	786,931	660,664	519,035	--
$ 152,660	$ 163,498	$ 85,389	$ 74,680	$ 65,347	$ --
311,617	40,056	65,837	125,038	14,133	10,152
$ 20,659	$ 17,568	$ 9,823	$ 4,641	$ 486	$ 763
4,814	8,190	3,319	4,885	273	--
$ 9,823	$ 16,621	$ 7,736	$ 7,690	$ 82	$ --
6,306,172	934,435*	4,943,507	3,995,153	667,993	3,958,929
$ 744,510	$ 143,250*	$ 968,100	$ 316,639	$ 46,697	$ 476,694
190,916	32,358	149,055	109,507	12,308	120,063
$ 324,688	$ 55,463	$ 324,719	$ 161,196	$ 4,882	$ 59,271
344,895	43,443*	240,119	174,851	--	91,300
$ 83,827	$ 13,771	$ 106,994	$ 40,930	$ --	$ 12,461
779,600	27,937	50,389	9,338	128	8,053
$ 59,678	$ 1,759	$ 3,122	$ 391	$ 4	$ 684
1,452	817	658	488	70	--
$ 1,080	$ 449	$ 658	$ 490	$ 17	$ --
60	180	124,237	--	200	2,088
$ 24	$ 72	$ 11,170	--	$ 100	$ 723
136,500	153,695	60,762	125,146	2,023	1,321
$ 31,834	$ 58,412	$ 17,046	$ 35,751	$ 117	$ 155
11,816	10,581	10,615	7,995	81	--
$ 1,266	$ 1,160	$ 1,086	$ 800	$ 8	$ --
28,857	138,819	1,237	17,528	--	--
$ 5,287	$ 36,283	$ 124	$ 2,891	--	--
13,981	60,373	7,677	86	--	--
$ 3,996	$ 21,130	$ 1,974	$ 26	--	--
31,867	992	1,172	14,155	--	--
$ 63,734	$ 9,363	$ 131,808	$ 63,803	--	--
590,701	541,016	875,079	875,029	1,757,699	2,530,798
$ 649,080	$ 495,465	$ 977,810	$ 622,598	$ 1,603,688	$ 1,881,036
346,811	350,375	493,271	521,703	500,566	511,936
$ 323,372	$ 326,467	$ 523,750	$ 473,790	$ 443,410	$ 531,103
945,857	622,412	442,003	621,828	805,276	670,706
$ 928,424	$ 250,939	$ 502,053	$ 683,960	$ 869,819	$ 813,031
3,159	2,691	1,026	1,584	--	--
$ 2,106	$ 1,796	$ 684	$ 934	--	--
389,676,175	471,365,019	306,213,266	282,478,362	258,581,284	250,967,892
$ 73,376,023	$106,441,769	$119,074,818	$ 94,900,099	$100,038,711	$ 95,994,459

Shark liver oil — 1945 ..... 118,447 lbs., value $53,150
1946 ..... 128,722 lbs., value 45,056
1947 ..... 59,723 lbs., value 35,384
1949 ..... 20,636 lbs., value 5,468

Albacore — 1948 132,039 lbs.
$ 34,935
1950 27,059 lbs.
$ 5,412

EXPENDITURES, APRIL 1, 1951 — MARCH 31, 1952

FUNDS ALLOTTED — BIENNIUM APRIL 1, 1951 — MARCH 31, 1953:

ADMINISTRATION	$ 48,200.00
FISHERIES BOARD	10,000.00
INSPECTION	120,000.00
WATERSHED MANAGEMENT	59,200.00
BIOLOGY	121,300.00
FEDERAL O. A. tax, employees wages	972.00
SPORT FISH PROPAGATION	50,000.00
	$409,672.00
PREDATOR CONTROL	$ 50,000.00

ADMINISTRATION		Allotted biennium April 1, 1951- Mar. 31, 1953	Balance Mar. 31, 1952
Salary of Director, Administration		$20,000.00	$10,000.04
Other Salaries of Administration		12,000.00	6,317.00
Other Expenses of Administration		16,200.00	9,295.88
		$48,200.00	$25,612.92
	Expenditures		
Salaries and Wages	$15,682.96		
Transportation	1,666.50		
Subsistence and lodging	728.80		
Office Expense	209.55		
Telephone and Telegraph	216.20		
Postage, freight and express	169.42		
Printing	909.95		
Rent	2,059.56		
Industrial Insurance	254.18		
Other General Expense	267.34		
Operating Expense	19.87		
Office Equipment	402.75	22,587.08	
		$25,612.92	
FISHERIES BOARD		10,000.00	
Transportation	$ 1,279.50		
Subsistence and lodging	2,136.30		
Office Expense	8.00		
Telephone and telegraph	86.21		
Postage, freight and express	37.33	3,547.34	
		$ 6,452.66	
INSPECTION			
Salaries and Wages, Inspection		$79,570.00	$48,209.64
Other Expense of Inspection		40,430.00	33,598.28
		$120,000.00	$81,807.92
Salaries and Wages	$31,360.36		
Transportation	2,827.17		
Subsistence and Lodging	747.00		
Office Expense	36.68		
Telephone and Telegraph	16.63		
Other General Expense	23.00		
Operating Expense	1,451.04		
Office Equipment	395.00		
Floating Equipment	1,335.20	$38,192.08	
		$81,807.92	

EXPENDITURES, APRIL 1, 1951 — MARCH 31, 1952 (cont)

WATERSHED MANAGEMENT		Allotted biennium April 1, 1951- Mar. 31, 1952	Balance Mar. 31, 1952
Salaries & Wages, Watershed Management		$19,200.00	$10,674.17
Other Expenses of Watershed Management		40,000.00	24,847.94
		$59,200.00	$35,522.11
	Expenditures		
Salaries and Wages	$ 8,525.83		
Transportation	1,780.47		
Subsistence and lodging	1,825.00		
Office Expense	74.34		
Telephone and Telegraph	12.63		
Postage, freight and express	88.39		
Other General Expense	6,140.42		
Operating Expense	3,730.02		
Office Equipment	292.75		
Floating Equipment	253.00		
Utility Equipment	955.04	$23,677.89	
		$35,522.11	
FALLS CREEK PROJECT — (To be paid from "other expenses of Watershed Management") TOTAL AMOUNT ALLOTTED FOR PROJECT COMPLETION		$10,000.00	$ 2,022.97
Salaries & Wages (only)	6,010.02		
Other Expenses (gravel, cement, plane fare, etc)	1,967.01	7,977.03	
		$ 2,022.97	
BIOLOGY			
Salaries & Wages, Biology		$62,730.00	$33,350.64
Other Expenses of Biology		58,570.00	37,042.27
		$121,300.00	$70,392.91
Salaries and Wages	$29,379.36		
Transportation	6,370.15		
Subsistence	4,301.25		
Office Expense	199.04		
Telephone and Telegraph	4.01		
Postage, freight and express	30.65		
Printing	13.10		
Other General Expense	627.40		
Operating Expense	8,313.12		
Office Equipment	816.87		
Floating Equipment	404.00		
Utility Equipment	511.14	$50,907.09	
		$70,392.91	
FEDERAL OLD AGE TAX ON EMPLOYEES WAGES		$ 972.00	$ 327.78
Matching funds vouchered	$ 644.22	644.22	
		$ 327.78	
SPORT FISH PROPAGATION			
Allotted for general expenses		$50,000.00	$38,207.85
Salaries and Wages	$ 6,479.83		
Transportation	1,099.20		
Subsistence and lodging	1,260.00		
Office Expense	25.00		
Telephone and Telegraph	13.32		
Postage, freight and express	78.72		
Other General Expense	110.13		
Operating Expense	2,256.23		
Office Expense	168.65		
Floating Equipment	174.50		
Utility Equipment	126.57	$11,792.15	
		$38,207.85	

EXPENDITURES, APRIL 1,1951 — MARCH 31, 1952 (cont)

PREDATOR CONTROL		Allotted biennium April 1, 1951- Mar. 31, 1953	Balance Mar. 31, 1952
Allotted for general expenses		$50,000.00	$42,592.06
	Expenditures		
Salaries and Wages	$ 6,058.05		
Postage, freight and express	113.82		
Other General Expenses	138.10		
Operating Expense	1,097.97	7,407.94	
		$42.592.06	

SUMMARY - MARCH 31, 1952

DIVISION	Allotments	Expenditures	Balance
ADMINISTRATION	$ 48,200.00	$ 22,587.08	$ 25,612.92
FISHERIES BOARD	10,000.00	3,547.34	6,452.66
INSPECTION	120,000.00	38,192,08	81,807.92
WATERSHED MANAGEMENT	59,200.00	23,677.89	35,522.11
BIOLOGY	121,300.00	50,907.09	70,392.91
FEDERAL OLD AGE MATCHING FUND	972.00	644.22	327.78
SPORT FISH PROPAGATION	50,000.00	11, 792.15	38,207.85
	$ 409,672.00	$ 151,347.85	$ 258,324.15

LOOKING FORWARD

The year 1951 witnessed substantial progress for the Alaska Department of Fisheries. Two new divisions, Watershed Management and Sport Fish, were established; predator control measures on the hair seal initiated; and some expansion was possible in the Biology and Inspection divisions. The programs started in 1951 will be carried forward in 1952 with such expansion as the allotted funds will allow.

BIOLOGY

A general pattern of southward migration has been established already for the king salmon off the coast of Southeast Alaska. However, no such generalization can yet be made for the inside kings. Tagging will therefore have to be continued in the inside areas until sufficient information is accumulated to establish the streams of origin of these fish. Until such is determined, intelligent regulations cannot be formulated or steps taken to increase production.

Greater stress must be placed on our investigation of the sablefish (blackcod). This is made imperative because the United States is now in the process of negotiating a fisheries convention with Canada and Japan. The draft of this convention or treaty was assembled at the Tripartite Fisheries Conference, which included representatives of the United States, Canada and Japan, and which met in November 1951. Agreement was reached on only three species—salmon, halibut and herring—whereby the Japanese would abstain from fishing these three off the coast of North America.

Alaskan fishermen believe that the treaty should have been more inclusive in order to cover other varieties of fish and shellfish, especially king crab and sablefish. Some of these are the basis of present fisheries; others are still in the potential stage. All efforts to include additional species were of no avail, largely due to our lack of knowledge of these other species and to the general overall United States policy of freedom of the seas.

However, under the terms of the proposed treaty, machinery is set up for the addition of other species if:

1. "Evidence based on scientific research indicates that more intensive exploitation of the stock will not provide a substantial increase in yield which can be sustained year after year.

2. "The exploitation of the stock is limited or otherwise regulated through local measures by each party which is substantially engaged in its exploitation, for the purpose of maintaining or increasing its maximum sustained productivity; such limitations and regulations being in accordance with conservation programs based on scientific research, and

3. "The stock is the subject of extensive scientific study designed to discover whether the stock is being fully utilized and the conditions necessary for maintaining its maximum sustained productivity." 1/

Many fishermen, both American and Canadian, along the coast from California to Alaska feel that the stock of sablefish is now being exploited to its maximum and that any further expansion, especially by outside nations, could only lead to disaster. In view of this an extensive research

1/ Article IV, Proposed International Convention for the High Seas Fisheries of the North Pacific Ocean.

program on this species has been outlined by the fishery scientists of the coast. California, Washington, Oregon and British Columbia have their studies well under way and a start has been made in Alaska. With the employment of a biologist assigned to the sablefish fishery on a full time basis, substantial progress should be made by the Department in 1952. Plans call for an extensive tagging program on the several fishing grounds along the Alaska coast from Dixon Entrance to Middleton Island in the Gulf of Alaska.

WATERSHED MANAGEMENT

From the field data gathered in 1951, the engineering section of the division has prepared plans and specifications for the correction of the fish barriers in the streams of Pauls Basin on Afognak Island. Bids will be called for and the contract let in the spring. Construction work is scheduled for completion by early fall.

A small run of silver salmon have, in the past, been ascending the first stream (Laura Creek) to the main barrier. Here a 12 foot falls has completely stopped further ascent. Since silvers are inclined to keep going upstream as far as possible, it is expected that this species will negotiate the fishways and utilize the upper reaches. No artificial methods of stocking should be necessary then for this species. Since there is no run of red salmon in Laura Creek and because this variety is less apt to wander or stray, artificial stocking of this species must be undertaken. Initial plants were made in 1951 and will be continued for a full cycle of five years.

SPORT FISH

With the completion of the preparation of Lost Lake in 1951 for restocking, the primary concern of the Sport Fish division in 1952 will be the erection of a small trout hatchery adjacent to Fairbanks. A site has been selected on the outlet stream of Birch Lake, some 55 miles by highway from town. Construction will start as soon as weather permits.

Initially, eyed rainbow eggs will be purchased from Idaho and Montana trout farms. These will be shipped by air to Fairbanks and transferred to the hatchery. As soon as they hatch and develop sufficiently to feed naturally they will be planted in Lost Lake and other suitable waters. Eventually it is planned to locate a source in Alaska where wild rainbow trout eggs may be taken.

With the funds presently appropriated it will be possible to hire one additional sport fish biologist for the Anchorage area. If sufficient eggs can be handled in the new Fairbanks hatchery, some of the resulting fry will be flown to Anchorage for planting in lakes adjacent to that large center of population. A second departmental hatchery near Anchorage will soon be a necessity.

OTHER DEPARTMENTS

The hair seal predator program will be centered again on the Stikine and Copper River deltas, with added emphasis on the latter, where the seal herds are the most numerous. It may also be possible to make a start in other sections.

Cooperation with the Enforcement Section of the Fish and Wildlife Service will be continued. It is expected that a few additional men can be provided that agency in 1952.

The Department of Fisheries will continue to offer its facilities for the direct aid and promotion of local industries.

CHRONOLOGICAL HISTORY OF SALMON CANNERIES IN CENTRAL ALASKA

Compiled by Lewis G. MacDonald from records of the Bureau of Fisheries, Fish and Wildlife Service and other sources.

The histories of salmon cannery operations in Southeastern and in Western Alaska were compiled for the 1949 and 1950 Annual Reports, respectively. In this, the 1951 Annual Report, a study is made of cannery operations in Central Alaska from the year 1882 when the Alaska Packing Company built the first cannery on Cook Inlet at Kasilof.

One hundred and forty-seven canneries have been built in Central Alaska in the last 69 years—investments in the "silver horde" by men of foresight and courage. Ninety-three canneries have been abandoned, burned or moved to different sites leaving a row of piling, pilfered buildings and rotting timbers, often sad reminders of lost hopes, standing against the dark timber of the wild Alaska coastline. Throughout the years numerous canneries have consolidated. At the present time 59 plants are operating in Central Alaska.

The early history of cannery operations is a story of over-expansion, tremendous investments in the new frontier. In 1889, the peak year in the establishment of canneries, 12 canneries were built in Central Alaska. None of them are in operation today, and few operated beyond the turn of the century. Such over-expansion resulted in serious price declines, and many owners went bankrupt.

Because of the dangers of bankruptcy if over-production continued, a movement to unify control of production and marketing began. The first attempts at unified control were cooperative working agreements between a limited number of individual cannery owners. The movement grew and by 1891 almost all the operators in Central Alaska were included. Marketing pools were formed, quotas were assigned to individual plants, and many canneries were closed in order that expenses might be saved and the mounting output, which was demoralizing primary markets, might be restricted.

An outgrowth of the early movement, the Alaska Packing Association, was formed in 1892. Essentially a profit-sharing organization, it included 31 canneries, nine of which continued to operate. The cannery owners were given shares in the pool. The number of shares given to each operator in the association was in proportion to the size of his pack of the previous year. The reported output was reduced by one-half; and therefore, the measure acted as an early tool of conservation in addition to stabilizing the market.

In 1893 the Alaska Packing Association was incorporated into the Alaska Packers Association. The pooled canneries were valued at $1,033,850; and the individual owners received stock proportionate to the value of their properties. Led by San Francisco interests this first important consolidation included 90% of all the plants operating in Alaska. Their combined pack equalled 72% of the Territorial output of 653,654 cases.

In 1901, the second important merger took place when the Pacific Packing and Navigation Company was formed. The new merger was a complete financial failure; and the assets were taken over in 1904 by the Northwestern Fisheries Company, a subsidiary corporation of the Booth Fisheries. Numerous acquisitions of plants were made during these early years by the well-known packing firms of Libby, McNeill & Libby and the

Pacific American Fisheries, Inc.

Following is a chronological list of the canneries built in Central Alaska in the last 69 years, from 1882 to 1951. Their location is given and the story of their operations is told:

1882 The Alaska Packing Co. of San Francisco built the first cannery on Cook Inlet at Kasilof on the right bank of the Kasilof River near the mouth. Machinery was salvaged from the Old Sitka cannery which had been erected by the Cutting Packing Co. in 1878. The Alaska Packing Co. cannery was sold to the Arctic Fishing Co. in 1885. It operated for five years when the loss of its cannery ship forced it to close for the season. In 1893, it was merged with the Alaska Packers Association and continued operations until 1905 when the plant burned during the height of the fishing season. It was rebuilt the next spring and operated until 1922. Finally, in 1938, the Kasilof plant was dropped from the active list of canneries.

The first cannery on Kodiak Island was built by Smith and Hirsh who had been engaged in salting salmon on Karluk Spit. Smith & Hirsh operated the cannery until 1884 when it was reorganized as the Karluk Packing Co. In 1893 the Karluk Packing Co. joined the Alaska Packers Association. It continued in operation until 1911 when canning operations were transferred to a new cannery in Larson Bay.

1888 Five canneries were built in Central Alaska in 1888. Four of them became members of the Alaska Packers Association in 1893 and ceased operations before the turn of the century. The Alaska Improvement Co. cannery did not join this original merger, but was later sold to the Alaska Packers Association and continued in operation at that location until 1911.

The Northern Packing Co. built a cannery on the eastern shore of Cook Inlet at Kenai near the mouth of the Kenai River. The cannery operated through the 1891 season and merged with the Alaska Packers Association in 1893.

A cannery was built on the eastern side of the Karluk Spit by the Kodiak Packing Co. The plant operated from the spring of 1888 to the fall of 1891. The Kodiak Packing Co. joined the Alaska Packers Association in 1893, and the cannery at Karluk did not operate again.

The Aleutian Fishing and Mining Co. built a cannery 500 yards west of the Kodiak Packing Co. In 1892, it consolidated with the Hume Packing Co. and in 1893 the consolidation became a member of the Alaska Packers Association. The plant operated through the 1900 fishing season.

On the south bank at the outlet of the Karluk River, facing Shelikof Strait, across from the point of the spit, a cannery was built by the Alaska Improvement Co. The cannery was ready for operation in the spring of 1888, but because of the loss of the cannery ship "Julia Ford" it remained inactive. The Alaska Improvement Co. was sold to the Alaska Packers Association in 1897 and continued packing until 1911 when all canning operations by the Packers were ceased on Karluk Spit because of the difficulty of handling pack and supplies. The Karluk catch was later put up at Larson Bay.

The Arctic Packing Co. built a cannery immediately within the entrance of Larson Bay on the north shore and operated until 1890. The company joined the Packers in 1893, and it was dismantled in 1896.

1889 The Chignik Bay Co., a consolidation of three canneries, is the only one of the 12 canneries built in Central Alaska in 1889 that is still

operating today. The Arctic Packing Co. on Kodiak Island was dropped from the active list in 1936. The old Orca cannery operated until 1945 when the plant was torn down. The Odiak cannery operated until 1906. The remaining canneries ceased operations before 1900.

The Chignik Bay Co. built a cannery on the eastern shore of the Chignik Lagoon two and one-half miles from the entrance of Chignik Bay. The Shumagin Packing Co. and the Chignik Bay Packing Co. built canneries near the Chignik Bay Co. but both canneries ceased operating in 1891. The three firms reached a working agreement in 1892 when machinery and buildings were consolidated. In 1893 they joined the Alaska Packers Association. The Chignik Bay Co. is operating today.

The Arctic Packing Co. built a cannery on the north central shore of Olga Bay which is a branch of Alitak Bay on Kodiak Island. The company joined the Alaska Packers Association in 1893, and it continued in operation until 1932. It was dropped from the active list in 1936 and it is not likely that it will operate again.

The Kodiak Packing Co. built a cannery at Snug Cove, a harbor in the narrows which connect Olga Bay with Alitak Bay on Kodiak Island. The plant operated two seasons and in 1891 the Arctic Packing Co. handled their catch. The Kodiak Packing Co. was dismantled in 1893 when it joined the Alaska Packers Association.

The Hume Packing Co. built a cannery on Karluk Spit 400 yards west of the Kodiak Packing Co. cannery (1888). In 1892 the Hume Packing Co. consolidated with the Aleutian Islands Fishing and Mining Co. which had built a cannery 100 yards west of the Hume cannery in 1888. The consolidated firm did not operate after the 1892 season, and in 1893 it became a member of the Alaska Packers Association.

The Royal Packing Co. built a cannery at the head of Afognak Bay and operated it through the 1892 fishing season. It became a member of the Alaska Packers Association in 1893.

The Russian-American Packing Co. built a cannery adjacent to the Royal Packing Co. and operated it for two seasons. The cannery merged with the Packers in 1893.

In accordance with an Act of Congress approved March 3, 1891, the President, by Proclamation of December 24, 1892, set aside Afognak Island and within one mile from the shores thereof as a fish-culture reserve for the use of the United States Commission of Fish and Fisheries. As a result, the two canneries were forced to move from the island.

The Central Alaska Co. built a cannery at Wingham (Little Kayak Island) 15 miles west of Cape Sucklin, in the spring of 1889. The cannery made a fairly successful pack in the 1889 season, but the location was not ideal. The cannery was moved to Thin Point on the southern side of the Alaska Peninsula the following spring.

The Peninsula Trading & Fishing Co. built a cannery on Wingham Island. In 1891 the cannery was moved to the Coquenhena Slough of the Copper River delta. It operated during the 1891 fishing season, but it remained closed during the 1892 and 1893 seasons. The Pacific Steam Whaling Co. operated the plant until 1897 when it was abandoned.

The Pacific Steam Whaling Co. established a cannery near the present site of Cordova in 1889. In 1895 the canning equipment was moved to the location known as Orca, three miles from Cordova. Six years later the plant was taken over by the Pacific Packing & Navigation Co. When the latter's assets were sold in 1904, the cannery was under lease to Captain

Omar J. Humphrey who sold it in 1908 to the Northwestern Fisheries Co. which bought most of the plants belonging to the defunct Pacific Packing & Navigation Co. The plant closed in 1919. It was re-opened in 1928 and operated until 1932. In 1933 it was sold to the Pacific American Fisheries Co. After a four year closure the cannery was leased and operated by the Pioneer Sea Foods Co. In 1940 the plant was leased to J. N. Gilbert who packed under the name of the Orca Packing Co. After the Cordova cannery fire of 1944, which destroyed the New England Fish cannery, the New England Fish Co. leased the old Orca cannery. In 1945 the old plant was torn down.

The Pacific Packing Co. owned by Louis Sloss and Co. of San Francisco built the Odiak cannery near the present site of Cordova. The cannery operated two years, remained closed during the 1892 season, and joined the Alaska Packers Association in 1893. The Packers operated the cannery through the 1905 season and sold it in 1906 to the Copper River & Northwestern Railway Co., which was preparing to build a railroad from Odiak to the headwaters of the Copper River.

1890 George W. Hume of San Francisco built a cannery at Kasilof near the Alaska Packing Co. cannery (1882). The Hume cannery operated through the 1892 season. In 1893 it joined the Alaska Packers Association and was consolidated with the plant of the Arctic Fishing Co.

1893 The Hume Canning & Trading Co. built a cannery on the beach near Karluk Head three-fourths of a mile southwest of the Alaska Improvement Co. It was operated in 1893 and 1894 and in 1895 it was sold to the Alaska Packers Association which operated it until 1911 when the catch was transferred to Larson Bay.

1896 The Hume Bros. & Hume Co. built a cannery on the eastern side of Anchorage Bay in the Chignik area and made a pack in 1896 and 1897. In 1901 it joined the Pacific Packing & Navigation Co. which failed in 1904. The property was thrown on the market and was purchased by the Northwestern Fisheries Co. which permanently closed the plant in 1905.

The Pacific Steam Whaling Co. built a cannery one-fourth mile south of the Hume cannery in the Chignik Bay area. It made a successful pack in 1896 and 1897. In 1901 it joined the Pacific Packing & Navigation Co. When the latter failed, the cannery was purchased and operated by the Northwestern Fisheries Co. All Northwestern Fisheries plants were leased by the Pacific American Fisheries in 1933 with option to buy; but none of the canneries were operated. The Pacific Steam Whaling Co. cannery was last operated in 1932. It was dropped from the list of operating canneries in 1938.

The Alaska Packers Association built a cannery in Uganik Bay on Kodiak Island and made packs in 1896 and 1897. The plant was abandoned in 1900.

1897 The Pacific Steam Whaling Co. built a cannery at Kenai in 1897, but it did not install machinery or operate the plant until the following season. In 1901 the cannery was taken over by the Pacific Packing & Navigation Co. The cannery was destroyed by fire two years later. The site passed to the Northwestern Fisheries Co. in 1905. The San Juan Fishing & Packing Co. used the site as a mild-curing establishment in 1907 and 1908. The Northwestern Fisheries built a new plant in 1910 which operated until 1931 except for a two year period beginning 1921. The plant burned down a second time just before the season opened in 1916; but it

was rebuilt in time to operate during the 1917 season. The cannery was used for the last time in 1931. It was sold to the Pacific American Fisheries in 1933, and it was eliminated from the list of active canneries in 1940.

The Pacific Steam Whaling Co. erected a cannery at Uyak Anchorage on Kodiak Island. The Hume Bros. & Hume Co. built a cannery nearby. In 1901 the two canneries merged into the Pacific Packing & Navigation Co. In 1905 the Uyak plants were purchased by the Northwestern Fisheries Co. In 1905 the Hume Bros. & Hume Co. plant burned, and it was not rebuilt. The remaining plant ceased operations in 1931. It was purchased by the Pacific American Fisheries in 1933, and it was dropped from the active list of canneries in 1936.

1899 The Alaska Salmon Association purchased C. D. Ladd's saltery at the mouth of the Chuitna River six miles above Tyonek. They built a cannery at this location in 1900. The cannery was operated two years and abandoned.

1910 The Columbia River Packers built a cannery at Anchorage Bay in the Chignik Bay area. In 1941 this plant was purchased by the Alaska Packers Association. It is still in operation.

1911 The Seldovia Co. built a cannery at Seldovia and operated it until late 1915, When the Seldovia Salmon Co. discontinued business by sale of its cannery at bankruptcy proceedings held in Seattle in March, 1916, the Columbia Salmon Co. incorporated to take over and operate the cannery. The plant closed in 1919. In 1922 it was succeeded by the Seldovia Packing Co. In 1923 the Alaska Year-Round Canneries operated jointly at the Seldovia plant. The Seldovia plant is still operating.

The Alaska Packers Association built a new cannery at Larson Bay at the old location on the spit. Because several ships were lost while engaged in loading and unloading at the anchorage off Karluk, the plant was moved to the new cannery at the spit site at Larson Bay. The Larson Bay cannery packed the entire Karluk catch for the association until 1939 when it ceased operations. It was modernized and reopened in 1946, but closed again in 1950. The Alaska Packers Association catch is now packed at the new Port Bailey cannery.

1912 The Fidalgo Island Packing Co. built a cannery at Port Graham on the southwest tip of the Kenai Peninsula. A pack has been made each season since 1912.

A cannery, which has been in operation since 1912, was built by Libby, McNeill & Libby at Kenai.

The Kadiak Fisheries Co. built a cannery at Kodiak. In 1938 a modern plant, constructed and operated at Port Bailey, replaced the Kodiak plant.

1915 The Canoe Pass Packing Co. built a cannery at Canoe Pass in Southeastern Alaska in 1912 but it did not operate at that location. In 1915 the machinery was moved to Cordova where it was installed in a rented building. In 1917 the company built a cannery at Shepard Point near Cordova. It consolidated with the Carlisle Packing Co. in 1924 and continued in operation at Shepard Point. The plant was last operated in 1942 by the Central Alaska Packing Co. It burned in 1945.

The Copper River Packing Co. built a cannery on the Copper River at

Mile 55 and put up a successful pack the same year. The cannery used no run boats, but it had an arrangement with the Copper River & Northwestern Railroad Co. to haul fish from the fishing stations to the cannery and to bring the finished product to Cordova for shipment by steamer. In 1918 the name was changed to the Abercrombie Packing Co. The plant was abandoned in 1920.

The Deep Sea Salmon Co., which operated a cannery in Southeastern Alaska, built a plant near Knik on the west side of Cook Inlet and made a small pack. The plant was abandoned at the end of the 1917 season, and part of the equipment was sold.

1916 The Hoonah Packing Co. built and operated a cannery on Bering River. The cannery last operated in 1928 when it was leased to the Pacific American Fisheries Co. It was dropped from the list of operators in 1936, and it is not probable that this plant will operate again.

The Clark-Graham Co. built a cannery at Eyak a few miles from Cordova. The plant was sold to the Eyak River Packing Co. in 1919 and sold again to the Pioneer Sea Foods Co. in 1924. It was destroyed by fire in November, 1935.

The Carlisle Packing Co. built a cannery at Cordova. In 1922 the Carlisle plant consolidated with the Canoe Pass Packing Co. In 1927 the New England Fish Co. purchased and operated the plant which burned in 1945. The consolidated company was rebuilt and operated by the New England Fish Co.

1917 The Sockeye Salmon Co. built a new cannery at Morzhovoi Bay near False Pass on the Alaska Peninsula. In 1920 the cannery was leased to P. E. Harris & Co. who changed the name of the location to Isanotski Strait. P. E. Harris & Co. finally purchased the plant which is still in operation.

The Northwestern Fisheries Co. built and operated a new cannery at Kenai. The cannery was sold to the Pacific American Fisheries in 1931 when it ceased operations. It was dropped from the list of active canneries in 1940, and by all indications this plant will not operate again.

A cannery was built at Cordova by the Lighthouse Canning Co. It was sold to the Hillery-Scott Co. in 1919. In 1922 it was transferred to the Cordova Packing Co. which is primarily a clam canning company.

The Moore Packing Co. built a cannery at Cordova and operated it until 1927 when they sold it to the Premier Salmon Packing Co. The plant was last operated in 1936; it was dropped from the active list of canneries in 1942.

The San Juan Fishing & Packing Co. opened a cannery in Seward. The plant was moved to Evans Bay (Port San Juan) near Latouche, which is located in Prince William Sound, in 1924. The cannery is still in operation.

The Valdez Packing Co. opened a plant at Valdez. In 1921 the cannery was leased to Joseph Emel. In 1922 the Valdez Packing Co. cannery was operated by the Emel Packing Co. The Pacific American Fisheries purchased the plant in 1930 and operated it until 1931. The operation was dropped from the active list of canneries in 1936.

A cannery built by the Copper River Packing Co. at Port Nellie Juan is in active operation today.

1918 The Alitak Packing Co. built a cannery on Alitak Bay. In 1929 the Pacific American Fisheries operated the plant as the Alitak Fish Co. In

1934 direct ownership was acquired by the Pacific American Fisheries. The plant is operating today.

The Kenai Packing Co. built a cannery at Drier Bay near Latouche. In 1924 Gorman & Co. leased the plant which had not operated since 1920. In 1929 the Alaska Pacific Salmon Corporation acquired and operated the plant. The San Juan Fishing & Packing Co. purchased and dismantled it in 1938.

The Alaska Sea Food Co. started a cannery at Cordova. In 1924 it consolidated with the Canoe Pass Packing Co., and the cannery no longer operated. The plant was purchased in 1935 by a new organization, the W. R. Gilbert Co. which operated it until 1935. In 1945 the plant was torn down and machinery and materials were moved to the old Strand-Jensen Fisheries plant at Cordova where it was operated by the Gilbert Co.

1919 A cannery was started by the Franklin Packing Co. at Sawmill Bay-Port Ashton in Prince William Sound. In 1919 the Alaska Pacific Salmon Corporation leased and operated the plant. In 1920 it was taken over and operated by the Shepard Point Packing Co. The plant engaged solely in the manufacture of herring oil and meal in 1937, but it began packing salmon again in 1938. Since 1942 this plant has operated as the Port Ashton Packing Co.

The Surf Packing Co. started a cannery at Snug Harbor in western Cook Inlet. In 1922 the Polar Fisheries Co. operated this plant. In 1923 it was purchased by G. P. Halferty who carried on operations in Cordova under the name of The Pioneer Canneries Inc. In 1927 the Snug Harbor Packing Co. took over and operated the cannery which had been closed since 1923. It is in operation today.

1920 The Arctic Packing Co. built a cannery at English Bay near Seldovia. In 1927 the plant was moved to Port Graham where it put up a small pack and was closed in 1930.

The Bainbridge Fisheries Co. started a new cannery on Evans Island in Prince William Sound. The company was reorganized in 1923 and the plant was moved to Flemming Island which is approximately 10 miles north of the first location. One pack was put up at the new location before the cannery closed.

The Central Alaska Fisheries Company started a new cannery at Drier Bay near Latouche. In 1927 th Gorman Packing Corporation purchased the cannery which had been used as a herring plant. When the New England Fish Company's lease with the Prince Packing Co. terminated in 1928, the Drier Bay cannery was leased by the New England Fish Co. which operated it until 1931.

The King Salmon Fisheries Co. started a cannery at Zachar Bay on Kodiak Island. In 1924 this plant was sold to the Unakwik Packing Co. which in turn leased it to the Pacific American Fisheries; 1928 was the last year the plant operated. In 1929 the Pacific American Fisheries Co. purchased the plant as the Alitak Fish Co. It was dropped from the active list in 1938.

The Shumagin Packing Co. built a cannery at Squaw Harbor in the Shumagin Islands. In 1934 the Pacific American Fisheries Co. purchased the plant. It is still operating.

1921 The Katmai Packing Co. started a cannery at Uzinki near Kodiak which they later sold to the International Packing Co. The cannery ceased operation in 1930 and was dismantled three years later.

1922 The Anchorage Packing Co. built a new cannery at Anchorage. In 1924 Gorman & Co. purchased the plant but did not operate it. Last operated in 1928, it was dismantled in 1930.

The Kamishak Canning Co. built a cannery at Kamishak Bay, but it put up only one pack. The plant was not used again.

The Kodiak Island Fishing and Packing Co. started a new cannery at Seward. It ceased operating in 1924, and it was dropped from the list of active canneries in 1930.

The North Coast Packing Co. built a cannery at Ninilchik in Cook Inlet. It closed in 1938 and was dropped from the list of active canneries. It is unlikely that it will operate again.

The Hopp & Danielson Co. started a new cannery at Uganik Bay and operated one year.

The Pioneer Packing Co. built a cannery at Cordova. In 1941 the plant operated under the name G. P. Halferty & Co. In 1950 this company merged with the Whiz Fish Products Co. and was renamed the Whiz Halferty Co.

1923 The Kodiak Island Fishing and Packing Co. built a cannery in Uganik Bay. In 1930 the firm name was changed to Uganik Fisheries, Inc. In 1945 the San Juan Fishing & Packing Co. purchased the plant which is now operating.

Pajoman & Trout built a cannery on Raspberry Island and operated it one year. In 1927 the company completed a new cannery nearby. Two years later Charles W. Pajoman purchased Roy Trout's interest and carried on the operation. The cannery was leased to Apex Fish Co. in 1933 and 1934 as a herring saltery. It was sold to Southwest Fisheries in 1935 and was operated as a herring reduction plant until 1949 when a modern one-line cannery was installed. The plant was burned in the fall of 1951 but the pack was saved.

The Northern Light Packing Co. built a cannery at Mountain Slough and operated it until 1932. In 1934 the plant was taken over and operated by Mr. W. Utness. In 1939 it began operating as the Crystal Falls Fish Co. It is now in operation.

The Alaska Year-Round Canneries Co. started a joint operation with the Seldovia Packing Co. In 1924 the operating name was changed to Alaska Year-Round & Cook Inlet Packing Co. to cover joint operation of the Alaska Year-Round Canneries and the new Cook Inlet Packing Co. It operated independently in 1925.

1924 The Hemrich Packing Co. built a cannery at Kukak Bay and leased it the following year to the Seashore Packing Co. The Hemrich Packing Co. operated the cannery in 1928, but they leased it again in 1929 to the Seashore Packing Co. In 1932 the cannery was taken over and operated by the Pioneer Packing Co.; the lease was terminated in 1933 and the plant was closed.

Henry J. Emard built a cannery at Moose Point in Cook Inlet. In 1925 the machinery was set up in the Gorman & Co. plant in Anchorage and the cannery at Moose Point was no longer operated.

1925 The Cook Inlet Packing Co., independent of the Alaska Year-Round Canneries, built a small one-line cannery at Seldovia which it has operated up to the present time.

W. A. Keller opened a small hand plant at Deep Creek on Cook Inlet. In

1929 the company was succeeded by the Anderson Mercantile Co. which operated for the last time in 1932. The plant was closed permanently in 1938.

1926 A new cannery, the Alaska General Fisheries, was built by J. A. Magill at Anchorage. The plant was sold to the Farwest Fisheries Co. Inc. in 1930. The property was purchased by the General Fish Co. in 1934 but it remained idle during the 1934 season. The Snug Harbor Packing Co. put up one pack at the plant, but the cannery was last used in 1933 and it was dropped from the list of active canneries in 1938.

The Cordova Packing Co. prepared a pack of salmon in its clam cannery which had been operated as a slamon cannery by the Hillery Scott Co. at one time. The plant was purchased and operated by the Strand-Jensen Fisheries for a five year period beginning in 1932. In 1945 the plant was remodeled and operated by the W. R. Gilbert Company which transferred machinery from the Point Whitshed cannery. The Whiz Fish Products Co. merged with G. P. Halferty, and the cannery is now operated by the new firm which is known as the Whiz Halferty Co.

The Kadiak Fisheries Co. built a cannery at Shearwater Bay, Kodiak Island. The plant was wrecked by a windstorm in 1926 and it was completely rebuilt in 1928. It is still operating.

The San Juan Fishing & Packing Co. put in a line of salmon canning machinery in its herring plant at Uganik Bay. It is not operating today.

The Strawberry Point Packing Co. enlarged its clam cannery at Boswell Bay and installed salmon canning machinery. The cannery was burned October 13 and was not rebuilt.

1927 Nordin and Wik put up a small pack at their hand cannery at Nikishka in Cook Inlet. John Wik carried on the operation in 1928. The cannery was last operated in 1933 and it was dropped from the list of active canneries in 1938.

The Kenai River Packing Co. built and operated a one-line cannery on the Kenai River. In 1941 the cannery was reorganized and operated as the Standard Packing Co. The Berry Packing Co. operated the plant in 1942. Operations discontinued in 1942 and the plant was dismantled.

O. L. Grimes, the Grimes Packing Co., installed a one-line outfit on his dock at Uzinki on Spruce Island near Kodiak. It is still operating.

1928 W. G. Culver put up a small pack in a hand cannery at Point McManus in the Cook Inlet area. The cannery operated only one season and was dropped from the cannery list in 1938.

George Valair put up a small pack in a hand cannery at Nikishka Bay in the Cook Inlet area. In 1929 the plant was taken over by a new firm, the Spur Fish Corporation, which operated it through the 1931 season.

Jake Young put up a small pack in a hand cannery at Portlock on the Kenai Peninsula, operated two seasons and closed.

H. J. Emard, who had sold his holdings at Moose Point to Gorman & Co. started a new one-line cannery at Anchorage. It is in operation.

Edward Gustan put up a pack of salmon in his plant at Point Possession in Cook Inlet. The plant was operated by a partnership, Gustan & Hartley, in 1929, and by a new partnership, Gustan & Vogel, in 1930. The plant was last operated in 1931, and it was dropped from the active list seven years later.

The San Juan Fishing & Packing Co. installed machinery in the saltery buildings at Tutka Bay, Cook Inlet, and operated for three years. The

property was sold to the Fidalgo Island Packing Co. in 1934. They dismantled the cannery.

The Sunset Packing Co. started a one-line cannery at Otter Creek, Cook Inlet, and operated it in 1928 and 1929. They closed permanently at the end of the 1929 fishing season.

A one-line cannery was started at Anchorage and operated by J. F. Toman until 1930. H. C. Bennett purchased the plant in 1932. It was sold to the Kustatan Packing Co. in 1934. The plant was purchased in 1937 by the General Fish Co., Inc., which is operating it today.

Nordin & Sandvik started a one-line cannery at Swanson's Creek, Cook Inlet. In 1929 the operation was carried on by E. Sandvik. The cannery was last operated in 1932, and it was dropped from the list of active canneries in 1938.

The Trinity Packing Co. purchased buildings from the Caw Packing Co. and established a cannery at Three Saints Bay in the Kodiak area. In 1931 the plant was destroyed by fire and was not rebuilt.

The Anchorage Sanitary Hand Packers put up a small pack at Anchorage.

At Zachar Bay on Kodiak Island the Robinson Packing Corporation erected a new shore plant to replace the floater, Azalea, which had been sold. In 1929 the plant was taken over by the Pacific American Fisheries Co. and was operated under the name of Alitak Fish Co. Direct ownership of the cannery was acquired by the Pacific American Fisheries in 1934. They did not operate the cannery again, and it was dropped from the list of active canneries in 1938.

1929 The Ninilchik Packing Co. started a small hand cannery which operated until 1926.

The Point Possession Fish Co. at Point Possession on Cook Inlet started a hand cannery which operated until 1931.

Harvey Smith started a hand cannery at West Foreland on Cook Inlet and operated until 1930.

The West Coast Canning Co. started a hand cannery at Kustatan on Cook Inlet near West Foreland. In 1934 the Kustatan Packing Co. moved to Anchorage and took over the Toman Packing Co. plant. The plant was sold to General Fish Co. in 1937. It is now operating.

The Blue Island Packing Co. installed machinery and operated a cannery in its herring saltery building at Blue Fox Bay on Afognak Island. They packed salmon one year.

The Shelikof Packing Co., a firm organized by Roy Trout (formerly of the partnership, Pajoman & Trout), operated a one-line plant at Zachar Bay on Kodiak Island. The plant was leased in 1937 to the Kodiak Fisheries Co. In 1939 the plant was purchased by the Chatham Strait Fish Co., remodeled and used as a herring reduction plant.

Seward Fisheries, Inc. packed salmon at Seward until 1935. The plant was reopened and operated by Hagen & Co. in 1937. In 1946 the Resurrection Bay Co. purchased and operated the plant.

1930 The business belonging to A. N. Nilson of Portlock, who had prepared small packs of salmon in 1929, was included in the list of canneries. The cannery burned during the winter of 1937-1938. It was rebuilt in 1940. The cannery has been operated since 1942 by the Port Chatham Packing Co.

The Port Williams Packing Co. took over the herring saltery formerly operated by S. Sklaroff & Son on Shuyak Island and converted it into a modern one-line cannery. In 1934 the plant was leased to the Washington

Fish & Oyster Co. after being closed since 1930. It is operating today.

The Redoubt Bay Packing Co. (Wik & Berg) on Cook Inlet, which had put up a small pack in 1929, expanded its business. It was included in the 1930 list of active canneries. The plant operated one season.

1931 Albert and Josie Sandvik started a cannery at Uganik Bay on Kodiak Island. The plant had packed in 1929, but because of its small output, it had not been included on the list of active canneries. The West Point Packing Co. purchased the holdings of the plant in 1948. It is now operated by Herbert C. Domenici.

1932 Harry W. Crosby (Chignik Packing Co.) built a cannery on the west side of Chignik Lagoon and operated until 1942. In 1943 the plant was sold to C. J. Sebastian, Roy Trout and J. T. Jones (Chignik Salmon Co.) who reopened the plant in 1945. The cannery is operating today.

1933 The Enterprise Seafood Co. started a cannery at Ninilchik and canned salmon one year. Clams have been canned since.

The Alaska Pacific Salmon Corporation built a cannery at Sand Point on Popof Island in the Shumagin Islands. The cannery was last operated in 1942. The cannery buildings burned and have not been rebuilt.

A. S. Day started a cannery at Fort Liscum near Valdez. In 1934 the operation was carried on by the North Pacific Sea Foods Co. The cannery burned in 1936.

1934 The Cordova Fisheries Co. started a hand cannery at Cordova and packed salmon one year. The cannery has been used for packing clams since 1934.

The Puget and Alaska Canning Co. started a salmon cannery at Seldovia in a plant leased from the North Pacific Packing Co. The plant had formerly been used for canning clams. The plant was taken over by a new organization, the Kodiak Island Fishing, Trading & Packing Co. in 1940, and by a new company, the Seldovia Packers, in 1945. In 1947 the cannery operated as Alaska Seldovia Packers. It is operating today.

Herbert T. Domenici started a small cannery at Uyak and operated it until 1937. The plant was taken over and operated by a new organization, the Great Northern Packing Co., in 1938. In 1940 the newly organized Parks Canning Co. purchased and operated the cannery which is operating today.

1935 Scotty's Packing Co. established a cannery at Hartney Point in the building which had been used for clam canning operations by S. E. Smith. Salmon was packed the one season and after 1936 clams were canned in the plant.

The Alaska Icepak Corporation at Cordova, which had been engaged in canning crabs, packed salmon during the 1934 season. In 1936 the plant was engaged only in the production of canned crabs and clams. It went into receivership in June and was sold to satisfy judgment of the court.

The Glacier Sea Foods Co. erected a modern cannery at Cordova to replace the floating plant which it had operated there, but work was not completed in time for operation during the 1935 season. In 1936 the plant was completed and put into operation. In 1940 the Pioneer Sea Food Co., whose lease expired on the Pacific American Fisheries cannery at Orca, purchased and operated the Cordova cannery which had been idle since

1935. In 1945 the operating name was changed to the Western Fisheries Co., and the shore plant was operated by Western Fisheries Co. and James W. Parks & Sons. It is now operating.

The Alaska Native Cooperative cannery was operated by a group of natives at Sand Point Village in the Shumagin Islands. The cannery was last operated during the 1942 fishing season. In 1947 the plant was purchased by G. W. Skinner, but it has never been used by the new owner and it is possible that it will never operate again.

1936 The Aleutian Fishing & Packing Co. built a single line cannery at Sand Point and equipped it with modern high speed machinery. The cannery operated one season. After the company put out a fish trap during the season of 1947, all operations were discontinued.

The Halibut Bay Packing Co., which had been engaged in packing clams at Carmel on the west coast of Kodiak Island, reorganized and incorporated as the Alaska Red Salmon Packers, Inc. Equipment was transferred from the dismantled Pacific American Fisheries plant at Uyak (1897). In 1946 the cannery was purchased and operated by the Orcas Canning Corporation. The Kodiak Fisheries Co. acquired control of the Orcas Canning Corporation in 1946. The Carmel plant is now closed.

1937 The Phillips Canning Corporation, which had put up a hand pack since 1934, started a cannery at Valdez. The plant was not operated after 1937. The Standard Salmon Co. leased the buildings and put up a pack in 1948.

The Gulf Packing Co., a crab cannery at Cordova, put up one pack of salmon.

The North Pacific Sea Foods Co. built and operated a new cannery at Swanport near Valdez, one-half mile from the old cannery which was destroyed by fire in 1936. In 1942 Herman J. Sontag canned salmon in this plant under his own name. After 1943 the plant operated as the Dayville Packing Co. It is operating today.

Frank McConaghy Co. operated a floater at Zachar Bay. In 1938 the plant was moved to Kodiak where it operated as a floater until 1941 when a shore plant was erected. In 1948 Whiz Fish Products purchased the plant which is in active operation.

1938 The Kadiak Fisheries Co. completed construction of a modern cannery at Port Bailey, 40 miles northwest of Kodiak. The plant was built to replace the company's cannery at Kodiak.

The Shepard Point Packing Co. used its plant at Port Ashton in Prince William Sound both for salmon canning and herring operations, although it did not operate the cannery at Shepard Point. In 1942 the Port Ashton plant was operated by the Port Ashton Packing Co. The cannery is operating today.

The Anchor Line Packing Co. established and operated a small shore cannery on the Kenai River. In 1941 the company reorganized and operated as the Standard Packing Co. In 1942 the Berry Packing Co. operated the plant. In 1943 operations were discontinued and the plant was dismantled.

1940 The Ellamar Packing Co. built and operated a one-line cannery at Ellamar near Valdez on Prince William Sound. It is now operating.

The Far North Packing & Shipping Co. beached its floating cannery, Commander, at Moser Bay on Kodiak Island and built shore installations.

In 1946 Libby, McNeill & Libby purchased the plant which is in active operation.

1941 Alfred Jones operated a hand pack cannery at Homer. Operations were not continued after 1943.

1943 The Trading Bay Packers began operations in a small cannery at Trading Bay in Cook Inlet. The cannery is operating today.

The Nikishka Bay Packing Co. put up a small pack at Nikishka Bay near East Foreland on Cook Inlet. In 1945 the packing name was changed to Seater Packing Company. The plant is now in operation.

The Polar Seafoods put up a small hand pack at Ninilchik.

1945 The New England Fish Company built and began operations in a large new cannery at Cordova. The cannery is a modern, electric, three and one-half line plant valued at one and a half million dollars.

1946 The Acme Packing Co. put up a small pack at Kenai (Kalifonsky Beach) in 1946 but they did not operate in 1947.

Machinery salvaged from the Balcom Payne plant in Southeastern Alaska was used to complete a new cannery at Kenai. In 1947 the company was reorganized and packed under the name of the Anderson-Kenai operation.

The Cordova Packing Co. put up a small pack at Cordova in a cannery which was destroyed by fire in 1949.

1947 Cronk Bros. took over the shellfish plant of Tapley & Cronk at Cordova and canned salmon in 1947.

Gilbert A. Vanborg hand packed smoked salmon in small quantities at Cordova.

The Buck Canning Co. hand packed smoked salmon at Cordova in a plant which is primarily a clam cannery.

The North Pacific Packing Co. put up a few cases of salmon, salmon loaf, and rock cod at Cordova. The company is in active operation.

The Alaska Shellfish Company, which previously processed only shellfish, canned salmon at Seldovia in 1947. The plant is now operating.

The Kasilof Canning Co. put up a hand pack at Kasilof on Cook Inlet. The plant was operated by the Polar Sea Foods Co. for a time and it discontinued operations in 1950.

The Bear Cove Packing Co. put up a small hand pack at Bear Island in Cook Inlet. In 1950 the plant discontinued operations.

The Kester Packing Co. put up a small hand pack at Polly Creek in Cook Inlet. The plant was last operated in 1949.

1948 The Mainland Fisheries started operations at Kukak Bay, the site of the old Hemrich Packing Co. plant. The Mainland Fisheries Co. purchased the holdings of the Cape Douglas Canning Co. plant at Suikshak Lagoon. They moved the machinery to Kukak because they considered it a better location. The company went into the hands of receivers in 1951.

The Roman Malach Canning Co. organized a small hand pack cannery at Ninilchik and operated only the one year.

The B. & G. Canning Co. started a small cannery near Seldovia. This cannery discontinued operation in 1950.

1949 The Kadiak Fisheries Co. completed construction of a modern two-line cannery at Port Bailey. It replaced the plant which was destroyed by fire August 17, 1948.

The Ace Trading Co. acquired the old Army sawmill at Kasakof Bay, Afognak Island and started a cannery which is operating today.

1950 A small plant was installed at Kasilof by J. H. Hoekzena of Anchorage.

SUMMARY Operators closed the 1951 season with serious concern for the future of the salmon resources in Central Alaska. Kodiak Island runs were very poor during the 1951 season. Prince William Sound provided an accute disappointment to packers. Cook Inlet, however, sustained its production.

The 1951 salmon pack of 1,115,175 cases was the smallest annual total since 1925. The average pack each year since 1941 has been 1,679,056 cases of salmon packed in Alaskan waters from False Pass to Yakutat.