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PACIFIC BIOLOGICAL STATION
NANAIMO, B.C.

for

1950

of the

PACIFIC BIOLOGICAL STATION

by

J. P. TAIT, Director

(With Investigators' Summaries as Appendices)

NANAIMO, B.C.

December, 1950

INDEX TO SUMMARY REPORTS FOR 1950

K.V. Aro

The conversion factors for the six species, as calculated from the data by Mr. D.B. Mundy of the Department of Fisheries, are shown in the following table:

Conversion Factors

	Jun 27-28	Jun 29 -Jul 7	Jul 11-15	Jul 18-22	Jul 25-29	Aug 1-5	Aug 8-11
Sockeye	88.93	89.09	88.95	89.36	88.79	88.90	88.34
Pinks	83.27	82.89	83.07	82.16	82.37	80.42	81.80
Chums	-	81.15	81.54	82.54	82.29	79.18	79.46
Springs	86.60	87.94	87.65	87.77	87.46	85.77	86.92
Coho	86.61	86.27	85.46	85.82	86.68	85.79	87.28
Steelhead	89.97	88.39	90.29	90.14	91.23	90.10	89.88

Each figure represents the average dressed weight as a percentage of the average round weight.

These figures show that the relationship of dressed to round weight, though exhibiting some fluctuation, is relatively constant within a species but differs significantly between species.

K.V. Aro

Appendix No. 4

SOCKEYE SAMPLING - SKEENA AND NASS GILL-NET AREAS

The commercial catches of sockeye salmon taken in the Skeena and Nass gill-net areas were sampled randomly throughout the sockeye season to obtain scale samples, length and weight measurements, and sex data. To obtain sufficient samples four per cent of the Nass sockeye landed at North Pacific cannery and one per cent of the Skeena sockeye landed at Sunnyside cannery were sampled. Due to the low catches in the Skeena area it became necessary in mid-season to alter the sampling ratio of Skeena-caught sockeye to two per cent. A total of 2,340 and 1,430 samples was obtained of Nass and Skeena sockeye respectively.

As yet, time has not permitted analysis of the data. When analyzed the data will provide valuable information on the ages, sex ratios, average lengths and weights, and length-weight relationships of the sockeye taken in the commercial sockeye fisheries of the two areas. This sampling continues a series of studies started originally by the Provincial Fisheries Department in 1911 and conducted by Dr. C.H. Gilbert (1911-1924), Dr. W.A. Clemens (1925-1948) and since then by the Fisheries Research Board.

K.V. Aro

Appendix No. 5

RETURN OF MARKED SOCKEYE SALMON IN 1950

The last large recoveries of marked sockeye salmon from the marking of yearlings by fin clipping at Babine and Lakelse lakes were expected

in 1950. Considerable numbers of V- and IV-year-old fish were anticipated from the 107,650 and 103,906 yearling salmon marked at Babine lake in 1947 and 1948 respectively and from the 100,019 and 4,709 marked at Lakelse lake in the same years. Some VI-year-old fish were also expected from the 1946 markings of 88,972 sockeye at Babine lake and 100,967 at Lakelse lake. The yearling sockeye had been marked each year at Babine lake by removing the adipose and both ventral fins and at Lakelse lake by removing the ventral fins only.

In 1950, as in 1948 and 1949, an observer was stationed at each of the six operating Skeena canneries to examine all of the sockeye caught in the Skeena gill-net area and as many sockeye from other areas as possible. Fish counted through the counting weirs on the Babine river at Babine lake and on Williams and Scully creeks at Lakelse lake were also examined for marked individuals.

Because of the great variation in the condition of the fins they were graded, as in previous years, into four groups depending on the size of the appendage. After the legitimate Babine and Lakelse marks had been segregated, many doubtful marks remained. These were from individuals on which only one of the ventrals was damaged. Some of these doubtful marks were very probably due to natural causes but it is felt some are Lakelse marks in which the fin was incompletely removed and which had undergone some degree of fin regeneration.

From approximately 480,000 sockeye examined from the Skeena gill-net area, 957 Babine, 253 Lakelse and 359 doubtful marks were recovered. The recoveries of marked fish in 1950 are compared with the 1948 and 1949 recoveries in the following table:

	1948	1949	1950
Number of sockeye examined	800,000	670,000	480,000
Babine marks	327	345	957
Lakelse marks	72	140	253
Doubtful marks	83	114	359

The return of Babine marks in general followed the trend of the commercial catch. The greatest concentration of recaptures occurred during the second and third weeks of July. The largest landings of the commercial fishery were also made during these weeks. The Lakelse marks were recorded in greatest concentration during the third week of June. Seventy per cent had been recovered by mid-July, similar to the 1948 season. Both these seasons are in contrast to 1949 when only 45 per cent of the Lakelse marks had been taken by mid-July.

From 180,000 sockeye examined from the Nass gill-net area, 57 Babine, 30 Lakelse and 64 doubtful marks were obtained. This shows a much greater concentration of marked Skeena sockeye in the Nass catches than in previous years. The following number of marked sockeye were obtained from areas other than the Skeena and Nass: Rivers inlet (148,000 fish), one Babine and two doubtful marks; Mink Trap bay (1,400 fish), one Babine and one Lakelse mark; Banks island (19,300 fish), two Lakelse and five doubtful marks; and in Wright sound (1,400 fish), no marks were found.

At the Babine fence 693 Babine, 25 Lakelse and 3 doubtful marks were obtained from 543,237 sockeye examined by October 7. As in 1947 and

K.V. Aro

1949 most of the marks were recovered at the Babine fence in the first half of the adult run. On August 23 when 50 per cent of the run had been counted, 94 per cent of the marks had been accounted for. When the yearlings were marked the marking tended to be heavier at the beginning of the migrant run. Thus it appears that the early-running migrants return early from the sea.

At Lakelse lake a total of 95 marked sockeye was recovered from a counted escapement of 2,083 sockeye to Williams and Scully creeks.

Though the number of marked sockeye recovered this season is greater than in previous years the per cent recoveries are still smaller than in similar experiments conducted elsewhere. The recoveries, however, have been valuable not only in demonstrating that the majority of the sockeye returned to their home-stream area but also in showing when the Babine and Lakelse fish were prominent in the commercial catch. As 60 per cent of the Babine marks were recovered from the commercial fishery, it would appear that the IV- and V-year-old runs to Babine lake underwent 60 per cent exploitation by the fishery. For the Lakelse lake run the catch to escapement ratio, based on marked sockeye secured, was roughly 70 to 30.

V.H. McMahon

Appendix No. 6

LAKELSE LAKE STUDIES

In 1949, following a five-year study of the Skeena river salmon situation (sockeye salmon in particular) it was decided to establish Lakelse lake as a base for special fundamental studies of sockeye propagation. By means of special counting weirs in the outlet river the total "in-go" of adults and "out-go" of seaward-migrating smolts could be determined. Thus the efficiency of natural propagation up to the smolt stage could be revealed. With special studies made in the lake itself to determine the variations in lake conditions, the relationship of environmental factors to survival of young sockeye could be ascertained. With studies made of other fish populations in the lake, - predators and/or competitors - the relationship of these also to sockeye survival could be learned.

Furthermore, with an adult and fry counting fence in one of the tributary sockeye spawning streams - Scully creek - the production of fry could be determined and the relationships of climatic and stream conditions to successful hatch and downstream migration into the lake revealed.

The Williams creek adult counting fence which has been used to enumerate the sockeye proceeding to the major spawning grounds above Lakelse lake "went out" during the fall flood of 1949. It had to be replaced.

Therefore to prepare for the research work above outlined the 1950-51 season has been largely one of construction. Nevertheless certain lake work has been continued as reported in the summary reports that follow.

Fence repair and construction

Williams creek fence

Toward the latter part of June, the remains of the Williams creek fence were salvaged and during July a new fence was erected in its place.

V.H. McMahon

The new structure is approximately 76 feet long and 14 feet wide and has the upstream portions of the A-frames at an angle of 30 degrees with the bottom. This latter feature gives the pickets a more gradual slope than is the case in the Scully or old Williams creek fences, and thus provides the advantage of a greater screening area for the water.

The work was completed on August 3 and this fence along with those in the two adjacent mouths was immediately made ready to receive the adult salmon migrants.

Lakelse river fence

During the spring high water, in June, an engineer from the Fish Culture Branch of the Department of Fisheries visited the lake and surveyed a portion of the Lakelse river with a view to selecting a suitable location for the construction of a Wolf-type smolt-adult fence. No feasible position being found it was decided that a conventional trap type of fence be built instead. A suitable spot was located about three-quarters of a mile downstream from the lake where the river widens to about twice its normal width and the current and depth are greatly reduced.

The new fence is to be approximately 390 feet long, it will be 16 feet wide and the upstream portions of the A-frames will be set at a slope of 30 degrees. The screens to sit between the A-frames will be of galvanized iron, of a mesh size large enough to pass fry but small enough to hold the sockeye smolts.

A fence of such proportions requires a great deal of preparation. Immediately upon completion of the construction work at Williams creek, the work crew was transferred to the river. Banks were cleared and space was made available for the stacking of lumber, piles, pile-caps, bulkhead logs and pile-driver equipment. The lumber was ordered (approximately 43,000 B.F. in all) and work was started on the cutting of 150 piles, 40 bulkhead logs and 45 pile-caps. The pile-driver equipment was transported to the site and work on the cabin, adjacent to fence site, was commenced. The lumber was transported across the lake in a barge rented from a local resident. The loads were then split up, rafted down the river to the fence site, pulled up and piled on the banks.

Work on the fence itself has not as yet been commenced but it is hoped that favourable water levels will allow a start in the near future.

Meteorology and lake levels

Daily records of rainfall, minimum and maximum air temperatures, cloud coverage, wind velocity and direction, and lake-level changes were kept throughout the seasons from March 1. In addition, hours of sunshine were recorded this year as well as snowfall and ice conditions early in the season.

Plankton collections

Approximately bi-monthly collections of plankton were made at the deep-hole station throughout the year since the beginning of March. Whenever possible samples were gathered also from the five other stations established last year.

V.H. McMahon

Chemical analyses

Samples from the lower, central and surface waters of the northern deep-hole station and from the surface of the southern shallow station were analyzed approximately weekly, starting June 12, for total phosphate and nitrate content. Samples from Lakelse river and Williams creek, the main incoming water, were collected and analyzed every second week. The analyses were much simplified this year by the use of an Evelyn Photoelectric Colorimeter.

Bi-monthly analyses were done for the dissolved oxygen content of the lake waters using the Winkler method.

Netting

Nine net sets were made in March under the ice at two positions on the lake, each gang of nets being made up of 3 nets ($1\frac{1}{2}$", $2\frac{1}{2}$" and $3\frac{1}{2}$" meshes), 50 yards in length. The nets were pulled into the water by a rope which was first run out under the ice with the use of an "ice-jigger". A total of 22 fish was caught in these sets - 17 cutthroat trout, 4 Dolly Varden char and 1 squawfish. No whitefish, peamouths or sculpins were taken from the under-the-ice sets. A subsequent set at one of these positions on May 3, following ice break-up, yielded a total catch of 20 fish of which 6 were cutthroat trout, 3 Dolly Varden, 1 squawfish, 1 Rocky Mountain whitefish, 7 peamouth chubs and 2 sculpins.

There were three net sets made in May, seven in June and one in July. Netting was discontinued following July 7 because of pressure of work elsewhere. Also it was felt that ample netting had been carried out in previous years to provide sufficient data for the summer season.

T.H. Bilton

Appendix No. 7

CREEL CENSUS STUDIES AT LAKELSE LAKE

From May 1 to September 15 a creel census was in operation at Lakelse lake, as part of the predator fish study, one phase of the general Skeena river sockeye investigation. Fishermen were contacted while fishing on the lake or on Lakelse river.

The following data from each fisherman were recorded on a card: number of fish caught, species, number of hours fished, time of day fished, type of bait or lure used, area in which fish were caught, weather and remarks. When time permitted all the fish in a catch were sampled for length, weight, sex and scales. Stomach samples were taken from 10 per cent of the fish considered to be predacious on young sockeye salmon; e.g. cutthroat, Dolly Varden and squawfish. In order to obtain greater co-operation from the fishermen all the fish in each catch were cleaned for the information received.

T.H. Bilton

Total Number of Fish Caught and the Total Number of Hours Expended by the Anglers Contacted at Lakelse Lake and Lakelse River for the Months of May to September, 1950, together with the Average Catch per Fisherman Hour.

		Lake and River			Lake			River		
Month	Total No. of Fishermen Contacted	Total No. of Fish Caught	Total No. Hrs. of Fishing	Catch per Hour	Total No. of Fish Caught	Total No. Hrs. of Fishing	Catch per Hour	Total No. of Fish Caught	Total No. Hrs. of Fishing	Catch per Hour
May	47	287	152.0	1.888	85	47.0	1.808	202	105.0	1.921
Jun	126	483	392.0	1.232	326	278.5	1.159	157	113.5	1.383
Jul	198	535	400.0	1.337	336	277.0	1.212	199	123.0	1.617
Aug	56	147	112.0	1.312	61	43.5	1.402	86	68.5	1.255
Sep	1	2	1.0		2	1.0				
Totals	428	1,454	1,057.0		810	647.0		644	410.0	

The data for the past fishing season are summarized in the above table. Monthly catches by fishermen, and the yield per-unit-of-effort based on the number of fish caught over the number of hours expended were highest in both lake and river during the month of May. The greater availability of fish at this time may have been dependent upon the downstream migrations of the sockeye, coho and pink fry.

During June the yield per-unit-of-effort decreased in both lake and river. This decrease in availability may have been the result of the completion of the salmon migrations and thus a dispersion of the predacious fish from the creek mouths to other areas of the lake and Lakelse river.

In July the catch per-unit-of-effort increased again in both lake and river. It is felt that profuse hatching of mayflies in certain areas at this time probably accounted for this greater catch.

The catch per-unit-of-effort in August increased on the lake and decreased on the river. It is probable that the adult sockeye migrations into the streams were responsible for the increased catch of fish in the lake while the lower catch per-unit-of-effort in the river may have been due to a decrease in available food, and a resulting migration into the lake.

Throughout the first two weeks in September fishing had decreased to a minimum, only one contact being made during the whole period.

From May 1 to September 15 there were 428 fishermen contacted on the lake and in the Lakelse river. Their total catch throughout this period was 1,454 fish. Of these, 928 were sampled. Stomach content material has not yet been analyzed.

R.E. Lindsay — Appendix No. 8

WILLIAMS CREEK COUNTING FENCE - LAKELSE LAKE

The main adult counting fence at Williams creek was completely rebuilt this year, using salvagable materials available from the old fence, and a power pile driver assembled on the site. The main fence was constructed just upstream from the old fence and "A" frames were used instead of rock-filled pylons. The panels were placed at a 30 degree angle with the floor, with the upstream faces of the panels and the "A" frames flush. The reaction of the fence to drifting debris was much more satisfactory than in the past.

The west channel fence remained unchanged. The east channel fence of old Lakelse river panels of screening also remained unchanged except for minor modifications and repairs. Unfortunately the east fence was rendered inoperative during a freshet and could not be repaired adequately for several days.

Peaks of salmon runs were recorded at times when the creek levels were high due to heavier rains. Numerous "jacks" were noted on the spawning grounds but none was caught in the traps, and it is considered that they had no difficulty in passing through the pickets of the fence and traps.

Length samples were recorded and 12 representative redds were marked for later survival studies. The run was considerably lower than the 1949 run of 5,707 sockeye and, of the 1,471 sockeye counted through the traps, 1,003 were males and 468 females. It is estimated that approximately 36 salmon passed through the east channel while it was inoperative of which 24 would be male and 12 females. The grand total thus amounted to 1,507 sockeye composed of 1,026 males and 480 females. The sex ratio was approximately two males to one female.

	Males			"Jacks"		Females			
Year	No.	% of Total	Av. Length in Cm.	No.	% of Total	No.	% of Total	Av. Length in Cm.	Totals
1939	12,350	51.3	64.8	--	--	11,735	48.7	59.7	24,085
1949	2,685	47.0	65.5	22	0.4	3,000	52.6	58.8	5,707
1950	1,026	68.15	63.6	--	--	480	31.85	57.3	1,507

J.G. McDonald — Appendix No. 9

NATURAL PROPAGATION OF SOCKEYE SALMON AT SCULLY CREEK, LAKELSE LAKE

Fry Migration, 1950

Investigations into the natural propagation of sockeye salmon continued at Scully creek in the 1950 season. Spring work, under the direction of Mr. G.C. Broadhead, formerly of this Station, included a count of the fry migrants and studies of predation.

By June 3, 242,346 sockeye fry, 10,157 coho fry, and 1,445 coho yearlings had been counted and passed through the fence. At this date the fence was removed. The count of 242,346 sockeye fry resulting from the

deposition of 1,766,370 eggs from the adult run of 1949 established for the stream phase a survival of 13.7 per cent in the year under question.

Extensive studies of predation on the fry migrants by other fishes were also made. A large number of fry were marked by inserting a short length of coloured thread immediately beneath the dorsal fin. These fish were released at certain distances upstream and the majority recaptured at the fence the same night. Returns of the marked fry were as high as 29.5 per cent and as low as 3.0 per cent, depending upon the distance released above the point of recapture and the total number of migrants the night of the investigation. In relation to the above, stomach samples of cutthroat trout, coho yearlings, and sculpins were taken to indicate the number of fry eaten by each species. The rates at which the fry were digested were also found.

Adult run, 1950

The adult fence was put into operation on August 12; by October 2 a total of 462 sockeye had been passed through. Of this total, 195 or 42% were males, 121 or 26% were females, and 146 or 32% "jacks". As the counting fence is situated approximately 400 yards from the mouth of the creek, an estimate was made of the number of spawners below the fence. For 1950 a minimum of 150 was estimated, making a grand total of 612 sockeye in the creek. This is extremely low when compared with the count of 1,230 in 1949 and the stream estimates of previous years which averaged 1,700.

Every twenty-fifth female was taken for an egg sample and the average egg content was found to be 3,285. Thus the total possible egg deposition of the 121 females spawning above the fence is 374,532. For purposes of assessing the mortality at various stages of development of these eggs, 19 redds were marked for possible examination during the winter and early spring.

A tagging programme was carried out in order to investigate the distribution of spawners above the fence and the relationship between this distribution and the time of arrival at the fence. This programme was also utilized to indicate the preferred ratio of tagged to untagged fish for stream estimates made in this manner. Every tenth sockeye was tagged and baffles of yellow, cerise, red, cerise, and black cross were used in that order. As yet these data are to be evaluated.

Predation

Among the factors limiting survival from time of deposition to hatch, the one of predation was given fullest attention. Estimates of the number of adult trout in the stream at the time of salmon spawning range from 2-300. Stomach samples of 29 cutthroat trout were taken along with sex, scale samples and fork length. A preliminary analysis indicates an average of 20 sockeye eggs eaten per trout. From studies of digestion rates made, approximately 75 hours are required for complete digestion of the eggs at a temperature range of 9.5-11.0°C.

Predation by bear was found to be very heavy. Of the total number of sockeye observed in the creek, only a small percentage of dead recoveries was made. In one instance 41 carcasses were found along 500 feet of bank.

J.G. McDonald

Whether the fish taken by bear were in a spawned or partly spawned-out condition will require further investigation.

Fertilization: Sockeye eggs

The effect on egg fertilization of varying periods of exposure to water prior to addition of milt was also investigated. A female was stripped, using the expression and incision method. The eggs obtained were divided at random into eight nearly equal portions. These portions were kept in running water and fertilized by milt, all from one male, at intervals of 0, 5, 15, 25, 65, and 80 minutes. The eggs were then placed in hatchery trays for a period of 10 days. At the end of this time, 93.5 per cent of the eggs fertilized at 0 time were found to be fertilized and developing normally, while no fertilization was found to be apparent at all other time intervals. Because of the difficulty of obtaining a male and female in the required condition at the time required, along with a shortage of essential equipment, this experiment was of necessity limited. A more extensive study is hoped for in 1951.

F.C. Withler

Appendix No. 10

SAMPLING OF SMOLT MIGRANTS FROM BABINE LAKE IN 1950

In order to obtain samples of migrant smolts for age and growth studies of sockeye during the lacustrine stage of their life history, a crude sampling technique was employed at the Babine fence. This consisted of an ordinary adult fish dip-net fitted with one-half-inch seine netting held in open sections of the fence. By this method it was possible to obtain samples of 100 smolts daily from May 26 until June 23. The samples will be examined during the winter at the Station.

The unexpected good results from a simple method suggest that modified but similar techniques might be employed to obtain indices of the sizes of the smolt runs in different years. The method, used in conjunction with a small marking programme, might allow calculations of the total smolt run using the same approach as in experiments involving estimates of total population through tagging. It is intended to expand the experiment in 1951 to determine the feasibility of such an operation.

F.C. Withler

Appendix No. 11

ENUMERATION OF THE RUN AT THE BABINE FENCE

As in past years, the adult counting weir in the Babine river was operated in 1950 to enumerate the five species of Pacific salmon entering the Babine area of the Skeena. Because Babine lake is known to support 50 per cent or more of the Skeena sockeye escapement, the Babine fence affords an excellent opportunity to evaluate the number of fish reaching the major spawning ground of the Skeena.

F.C. Withler

The panels were installed by July 7. The first sockeye appeared in the traps on July 10. The fence will be operated this year until October 15, by which time the runs of all species, with the possible exception of cohos, will be over.

Enumeration

The following table compares the runs of the five species through the Babine fence in 1950 with those recorded in previous years. The figures for 1950 are those obtained by October 5, which is the approximate time of fence removal in other years.

	1946	1947	1948	1949	1950
Sockeye	475,705	522,561 (47.7% "jacks")	560,000[x]	509,132 (9.4% "jacks")	543,009 (Approx. 35% "jacks")
Spring	11,528	15,614		7,433	6,791
Pink	28,161	55,421		13,663	38,728
Coho	12,489	10,252		11,938	10,820
Chum	18	7		5	7
Total	526,901	603,855		542,171	599,355

[x]Estimated from comparison of stream survey counts and fence counts of previous years.

The total sockeye run is the largest ever counted through the Babine fence. Due to the large percentage of "jacks", which will be approximately 35 per cent, the effective spawning population, however, will be close to 350,000 sockeye, an escapement midway between the escapements of larger fish in 1947 and 1949. The first sockeye passed through the fence on July 10; on August 27 the peak run of 21,238 passed; and by October 5 the run had declined to 122 sockeye per day. In conjunction with the "jack" sample of the sockeye run, records of the proportions of netted, gaffed and injured fish were kept.

Spring salmon counts are the lowest of four years of operation of the fence. Since 1947, the population of spring spawners passing the fence has declined yearly from approximately 16,000 to 7,000. Spring salmon spawn almost exclusively in the lower Babine river, above and below the counting fence, so that the fence figure is not an accurate measure of the absolute escapement in this area.

Pink salmon produced the second highest count since fence installation, the previous large run to the Babine occurring in 1947. Like the springs, pink salmon spawn above and below the Babine weir, so that the count given is not a final figure for the size of the run to the Babine, but merely an indication of the size.

Coho salmon have maintained a constant run for the four years of fence operation. Since the coho continue to pass upstream after fence removal, the counts given indicate only the magnitude of the first portion of the run.

F.C. Withler

A few chum salmon appear each year at the Babine fence.

Sampling of the run

A one per cent daily sample of the sockeye run through the Babine fence for length and sex was maintained in 1950. No figures are yet available but the general size of fish other than "jacks" indicates that the run will be composed largely of V-year-old fish. The overall sex ratio will tend to favour male fish because of the high "jack" count. The data on sex proportion in fish four years or older awaits computation.

Egg samples in the ratio of one to every 10,000 fish counted through the fence were taken. These will be enumerated this winter at the Station.

Scale samples have been taken every five days from the fish sampled for length and sex. Thus the scales from over 1,000 sockeye will be available for reading to determine the proportion of one- and two-year-in-the-lake types in the returning adults. These figures will be compared to those obtained from migrant smolts taken at the Babine fence in May and June.

Water levels and maximum-minimum water temperature readings were maintained at the Babine fence as in previous years. No tagging programme to test the speed of passage of sockeye through the fence in 1950 was carried out because a summary of previous tests shows that little delay in the passage of fish upstream is caused by the present fence.

F.C. Withler

Appendix No. 12

SIX-MILE CREEK FRY-ADULT FENCE

In order that information on the stream survival of sockeye from egg to fry be available for the spawning grounds of the great central plateau, where the vast majority of Skeena river sockeye spawn, a site was chosen in June of 1950 at Six-Mile (Gullwing) creek on Babine lake. Survival figures from Six-Mile, when compared with those from Port John and Scully creek, will complete the stream-survival picture for sockeye from extreme coastal to extreme interior conditions.

Construction

Clearing and excavation of the site commenced on July 1. Carpenters started construction of the fence on July 17 and finished the adult portion by August 3. Sockeye began to enter the creek on August 5. Construction of the fry portions of the fence was complete by September 16, and by September 23 a two-room cabin, suitable for winter use, was ready for occupancy.

The fence is 54 feet long, consisting of nine sections six feet wide. For adult operation there are conventional picket panels on a slope of 30 degrees. Upstream migrants are guided through a lead into a large trap from which they are dipped for measurement and sexing. The fry portion of the fence is of the "Wolf" type, in which water is passed through horizontal screens and the fry collected in troughs and pens.

F.C. Withler

Operation

A total of 1,237 adult sockeye passed through the fence from August 5 until September 11. Of these, 691 were males. On the basis of average egg counts of sockeye passing the Babine fence, the remaining 546 females carried approximately 1,800,000 eggs into the stream. The ovaries of every twenty-fifth female were taken for later enumeration to determine the potential deposition in the stream. All fish were measured and examined for marks. Because the spacing of the trap boards was too wide, a small but unknown number of kokanee entered the stream.

Surveys of the spawning fish were made every four days. The proportion of live to dead, the distribution of sexes on the stream, the apparent effect of water level on spawning and the number of predators were noted. Over 400 dead females were opened and examined to determine the number of eggs retained. Redds have been marked for later sampling of the developing eggs to discover the mortality at each stage.

In the spring of 1951 the resultant fry will be enumerated at the fry fence. It is hoped that it will be possible to check survival figures at Six-Mile with those on other streams of the lake. Attempts will be made to set up in different streams small enclosed sections where the progeny of a known number of adults may be counted. Experiments designed to elucidate the role of environmental conditions in the stream phase of the sockeye will also be carried out at Six-Mile creek, as in other areas.

W.P. Wickett

Appendix No. 13

OPERATION OF NILE CREEK FIELD STATION, 1950

A severe flood in November, 1949 washed out both the main fences. These were replaced this spring with a modified design in which all superstructure was eliminated and the horizontal pickets lengthened. The hope that large increases of flow 1000 c.f.s. could be handled was not realized as the fences were again destroyed on Thanksgiving Day, 1950. The lower fence is being replaced.

The water pipes and pumping engine have been repositioned with insulation and arrangements for drainage provided so as to avoid a repetition of the procedure required last winter to keep water flowing in the hatchery.

Six-inch logs had been set into the gravel, staked and buttressed with boulders to hold spawning gravel during floods but these have been swept out like match sticks. Much more rugged construction is required to improve spawning conditions in the lower portion of the stream.

Electric power has been a decided improvement, enabling experimental work to be carried on by summer workers from the University of British Columbia.

The competent work of the technical staff, Messrs. Eaton, Caulfield and Neate, is acknowledged.

Appendix No. 14

W.P. Wickett

NATURAL AND ARTIFICIAL PROPAGATION OF CHUM AND PINK SALMON AT NILE CREEK 1949-50

Evaluation of the natural percentage production of seaward migrants, and assessment of the influence of surface flow, and of stream predation on the freshwater survival was continued, using the methods of comparative propagation laid down by Mr. Neave.

The artificial methods are better producers of fry, both on a percentage and on an absolute basis. The methods used may be capable of enlargement to become practical ways of improving or restoring salmon populations. In the future it is hoped that a quantitative assessment of stream improvement practices will also be made.

						Fry				
CHUM	Section	Females	Egg Count	No. of Eggs	No. of Eggs Planted	Count, Live and Dead	Marked	% Survival from Predation	% to Emergence	% Production
1945 -46	1[X]	1564	2263	3,540,000		138,388	40,000 BV	62.00	6.20	3.9
1946 -47	1	827	2558	2,115,000		8,319	4,736 A.RV.	45.00	0.87	0.40
	2			761,000	254,000	20,275	13,956 A.LV.	13.89[V]	19.17[V]	2.66
1947 -48	1	473	2697	1,276,000		4,808		55.86	0.67	0.38
	2			491,000	275,000	52,109		61.00	17.40	10.6
	3			422,000		14,331		66.47	5.11	3.40
1948 -49	1	170	2263	385,000		23,188		34.75	17.40	6.03
	2			461,000	259,000	13,882		26.82	11.30	3.01
	3			402,000		47,635		46.12	25.70	11.8
1949 -50	1	485	2400	1,022,000		782		36.00	0.21	0.08
	2			504,000	48,500	3,939		36.67	2.13	0.78
	3			344,000		29,282		83.75	10.1	8.51
PINK										
1948 -49	1					53				
	2					1,505				
1949 -50	1	3				55				
	2	3				92				
	3			102,000		13,742		83.75	16.1	13.5

[X]Type of propagation -
Section 1, natural.
" 2, eyed egg planting.
" 3, green eggs, controlled water.

[V]From two tests near end of run.
BV - both ventral mark.
A.RV. - adipose, right ventral mark.
A.LV. - adipose, left ventral mark.

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Influence of surface flow

Unforeseen and adverse conditions were experienced during the year in all three methods of propagation under study.

Natural - 0.08 per cent - Excessive floods in November were sufficient to wash out No. 1 and No. 2 fences. (ca. 1500 c.f.s.). In the spring, bulldozers were at work changing the course of the stream above No. 1 fence and widening the channel below No. 2 fence.

Eyed eggs from hatchery - 0.78 per cent - Salt water was accidentally pumped into the storage tank, resulting in exosmosis of 70 per cent to 90 per cent of the eggs in the eyeing trays. Excessive cold may have been a contributing cause of death.

Controlled water section - 8.51 per cent chum; 13.5 per cent pink - Anchor ice and freezing of the inlet reduced the surface flow to a very low level for two weeks.

Protection from surface fluctuations appears to result in higher production. In 1947-48 the dam on the controlled section broke so that full protection was not given. In 1948-49 and 1949-50 salt was present in the eyeing station water supply, accounting for low survivals from eyed eggs.

Influence of predation

Some predation was eliminated this year in the controlled-water section (No. 3) by removal of coho and trout yearlings and screening of the intake.

Each year the results of weekly predation tests on all three sections show higher percentage survival when large numbers of fry are migrating than when few fry are migrating. For a given number of predators there is probably a critical fry population level below which the fry will be virtually exterminated. Three-day comparative predation tests with marked and unmarked fry showed a small (7%) but not statistically significant difference. The method of releasing marked fry in the stream to assess predation of migrating fry is therefore a valid one. Predators were observed to gulp fry indiscriminately from the school or mill of fish. A small difference in predation is apparently not the case in the ocean, judging by the return of fish marked in the spring of 1946. In that year 40,000 marked (BV) and 57,700 unmarked live fry were released. Six three-year-olds returned in 1948 and 22 four-year-olds in 1949 (about the normal age distribution). The ocean survival of the unmarked fry is 1.4 per cent if based on the return of 834 four-year-olds in 1949. This corresponds to an instantaneous mortality rate of 4.25. The marked fry ocean survival rate was 0.055 per cent or an instantaneous mortality rate of 6.31. The increase in the instantaneous mortality rate due to marking is 2.06 or 48 per cent.

If the fish lose their strong aggregating tendency after entering the sea, or it may be a question of size, the predators may single out individual fish rather than attack indiscriminately. The lack of full manouvering ability would then be a disadvantage and the increase in differential mortality explained.

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Appendix No. 15

OXYGEN SUPPLY TO SALMON EGGS IN GRAVEL

Field determinations of the oxygen demand of chum salmon eggs were found to be:

Pre-eyed	.0004 mg./egg/hr.	at 8°C.
	.0002	0.1 - 0.7°C.
Faintly eyed	.0002	0.1 - 0.7°C.
	.0009	4°C.
Eyed	.002	6°C.
Eyed - 10 days before hatching		

Limiting values of dissolved oxygen and velocity of gravel-water flow may be calculated from the formula

$$B.O.D. = pV_e \frac{v}{d} (DO-C_o)10^{-6}$$

where B.O.D. = oxygen demand of eggs — mg./egg/hr.
p = porosity or voidage of gravel — (approx. 0.6 vol. of egg)
V_e = effective volume of water per egg — mm./hr.
v = velocity of water — mm.
d = diameter of egg — p.p.m.
DO = dissolved oxygen in gravel water
C_o = critical saturation of DO at which consumption of eggs is reduced — p.p.m.

Values of velocity and dissolved oxygen less than the limiting values have been found in parts of the controlled-water section at Nile creek.

A modified well-point has been developed to sample water from twelve inches below the surface of the gravel. Further work will be carried out to evaluate its usefulness as a means of determining rate of flow using dyes. If successful, a simple method of surveying stream gravels for oxygen supply to salmonoid eggs should result.

Appendix No. 16

H.W. Spencer

NUMERICAL ESTIMATES OF SALMON ESCAPEMENTS TO DISTRICT 3, 1934-49

Salmon-stream spawning reports were gone over and estimations of numbers of salmon ascending streams tabulated by species, by years and by inspectors' areas. These tables go back to 1934 except in the case of Alert Bay (only 1949 present), Nitinat (1940) and Alberni (1940) areas. Previous to these dates no estimations of the numbers of fish were available. Tables were also made for each statistical area as shown on Department of Fisheries Statistical Map, April, 1950, old areas appearing in brackets.

Records have been kept of the number of streams totalled per year. A list was made of these streams for each area and the years they were not recorded.

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For number of fish the letters on the Inspectors' reports were recorded as follows:

A	50	E	1,000	I-K	20,000	
B	100	F	2,000	L	50,000	
C	300	G	5,000	M-Z	100,000,	these being the maxima
D	500	H	10,000			of each grouping.

The figures available are not as accurate as could be desired owing to the extreme difficulty in surveying the streams because of high water or heavy underbrush near the stream beds. Estimations for the same stream also vary with the experience of the Inspector reporting.

The estimations for sockeye and steelhead are incomplete as in many cases the observer merely noted their presence in the stream but made no attempt to estimate numbers. Pink salmon figures are also lower than expected.

All streams reported are not equally accurate, as those near populated areas have more inspections and sometimes resident observers assigned to them while streams in isolated districts are not as frequently surveyed.

The classifying of individual stream escapements into heavy, light and medium gives little indication of the numerical size as it varies considerably with the person reporting and his knowledge of the stream. However, for the whole district, there is very close agreement between the subjective and numerical estimates of chum salmon.

I wish to extend my thanks to Mr. Tait, Supervisor of Fisheries, District 3, and his staff for their co-operation in making the records available; also to Mr. W.P. Wickett for his advice on the tables.

A. Andrekson Appendix No. 17

ADULT SALMON MIGRATION INTO PORT JOHN LAKE CREEK, 1949

In order that no adults might migrate up this major lake tributary, on which the counting fence was located, until proper preparations to enumerate them had been made, the fry dam had been left in place. The dam was removed on August 27 and construction of new panels for the adult fence started. By September 8 these were completed and installed. No major rainfall occurred during the construction period. Consequently no freshets or fish migrations occurred.

The first sockeye appeared on September 17. In the following table are given the numbers of the three species of Oncorhynchus counted during the season:

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Week ending		Sockeye	Coho	Chums
Sep	9	0	0	0
	16	0	0	0
	23	147	1	0
	30	465	1	0
Oct	7	293	0	0
	14	703	19	6
	21	4	0	0
	28	0	12	0
Nov	4	0	4	0
	11	0	12	0
	18	0	24	0
	25	0	7	0
Dec	1	0	4	0
	8	0	4	0
	15	0	1	0
	22	0	7	0
Total		1,612	96	6

The sockeye (O. nerka) run coincided in time with that of 1948, but the peak was reached earlier. Sockeye that had passed into the lake early in July were found to intermingle with sockeyes that were coming from the sea in mid and late September. Therefore, the early run sockeye matured in the freshwater lake and there seemed to be no segregation of the two types on the spawning grounds. A portion of the late-run sockeye was tagged. Any separation or segregation was therefore quite simple to observe.

Each fiftieth female was taken and an egg count made. The average egg count from 16 females was 2,425.05 eggs. This gave a total egg deposition of 2,029,756.

Of the 2,245 sockeye passing through Hooknose creek fence, only 1,612 passed through the fence at the lake. Another 150 to 200 were accounted for in a stream directly across from the one that is fenced, thus leaving 450 unaccounted for. These may have spawned in the main stream or in the lake itself. No proof has yet been established of either of these possibilities, but during the spring (1950) fry migration, 153 sockeye fry were counted through the Hooknose fence, thus suggesting that at least some of the 450 may have spawned in Hooknose creek itself.

Of the 681 coho (O. kisutch) adults passing through the Hooknose fence, only 96 entered the lake stream with the fence. Of these, 62 were males, 34 females. Average egg count (1947) being 2,313 per fish, the approximate deposition in the fall of 1949 was 78,200 eggs. The balance of the coho must have spawned in Hooknose creek itself or in some of the smaller tributaries.

Of the six chums (O. keta) that passed through the upper fence, five were males and one was a female.

J.G. Hunter and A. Andrekson Appendix No. 18

PRODUCTION OF SEAWARD MIGRANTS AT PORT JOHN

The fry fence on Hooknose creek was installed and put in operation March 28. A few changes were introduced into the fence, in making experiments with different gauges of screen, varying slopes of the screens, and varying heights through which the water must drop before hitting the screens. The most successful innovation was the combination of the Holmes fence with the Wolf design. A flume to underpass water was tried but failed to meet with success.

After installation, pink and chum fry were observed and collected from March 29 onward, while the other species of Oncorhynchus followed at later dates.

The course of the run is indicated in the following table:

Table I. Dates and Numbers of the Different Species of Migrating Young Salmon

Week Ending	Pinks	Chums	Sockeye Fry	Sockeye Smolts	Coho Fry	Coho Smolts
Mar 31	49	100	0	0	0	1
Apr 7	246	199	0	0	0	1
14	1,777	123	0	0	0	3
21	10,025	623	0	0	0	16
28	15,368	1,460	28	6	0	18
May 5	14,428	2,770	89	448	134	46
12	9,936	14,605	28	6,948	2,630	727
19	2,015	12,733	3	3,867	2,896	1,074
26	206	9,652	8	2,369	5,253	654
Jun 2	11	1,541	1	1,399	3,629	328
9	0	627	0	247	3,385	85
14	0	30	0	19	2,585	29
Total	54,061	44,463	157	15,303	20,512	2,982

The general pattern of the run was similar to that of 1949. Peaks for the different species were at approximately the same times, but were of less magnitude. The ice cover left Port John lake about April 6. Hooknose creek was well frozen over above the zone of tidal influence.

Table II. Total Numbers Counted and the Percentage Survival of Migrants in Relation to the Potential Egg Deposition as Estimated in the Fall of 1948 and 1949

Species	Sex and No. of Adults		Average No. of Eggs	Potential Deposition	Downstream Migrants	Per Cent Survival
	Male	Female				
Pinks	650	523	1,650.46	863,190	54,061	6.239
Chums	362	343	2,082.76	714,386	44,463	6.223
Sockeye[x]	154	77	1,830.07		15,303	
Coho[x]	351	203	2,459.4		2,982	

[x]1948 parent year and count incomplete.

From table II, it would appear that the coho migrants suffer a high mortality. This is not necessarily a valid conclusion since large numbers of coho fry (table I) are known to go to the brackish water of the sea soon after they emerge. Perhaps some of these remain at sea and do not move back into the freshwater lakes and streams during the winter. If this is true, the figure for percentage survival of the migrant coho salmon is of no value as a comparative figure.

The close correlation between percentage survivals of the pink and chum salmon (table III) is of interest.

Table III. Percentage Survival of Pink and Chum Salmon Counted at Port John from 1948 to 1950

Species	1948	1949	1950
Pink	0.866	8.020	6.239
Chum	0.990	7.346	6.223

Cold weather and frost caused high mortality in redds which had become exposed due to low water. As in previous years, redds located in the tidal zone of influence had a higher per cent survival than those above it, e.g., 81 per cent survival in the tidal area on January 11 as opposed to a very heavy mortality above the zone of tidal influence. It is generally believed that survival is much greater in the brackish areas of the stream but excessive mortality found above this zone is partly attributable to redd sampling technique.

Stream predation studies, using pink and chum salmon fry and the thread-marking technique, resulted in estimates of stream predation as being in the neighbourhood of 60-75 per cent.

No marking of migrants on a large scale was attempted this spring.

Detailed records of precipitation and stream levels have been maintained throughout the entire year.

Appendix No. 19

A. Andrekson

COHO SMOLT MIGRANTS AT PORT JOHN, 1950

In order to add to the information being collected on the life history, habits, etc. of coho salmon in fresh water, the following observations were made. Samples, which were believed to be random, were taken each day during the seaward migration of the coho smolts. They were obtained mainly at the marine fence but a few were collected at the lake fence. The samples from the marine fence were anaesthetized, weighed, scale sampled, and then released. Some were retained each day as permanent samples and from these the sexes were determined. At the lake fence, only length measurements and scale samples were taken.

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Table I arranges the marine migrants into "time groups", showing actual number of migrants, number sampled, range of lengths and average lengths.

Table I. Average Lengths and Ranges of Lengths (in cm.), Numbers of Migrant Cohos, and Number Sampled at Port John Marine Fence, 1950

Time	No. of Migrants	No. Sampled	Range of Lengths (cm.)	Av. Length (cm.)
Apr 26-30	40	6	8.9 - 16.2	11.41
May 1- 7	118	48	6.8 - 19.7	11.49
8-14	1,130	66	7.7 - 15.9	11.28
15-22	904	71	7.8 - 14.6	11.37
23-29	494	63	8.3 - 13.3	10.88
30-Jun 4	218	74	8.2 - 14.2	10.68
Total	2,904	322	Average length	11.14

Approximately 11 per cent of the coho run was sampled. The larger fish appear to be the first to go seaward. This is a general trend, and the weights of the migrating groups (table II) are confirmatory.

Table II. Average Weight and Ranges of Weights (in gm.), of Coho Smolts Sampled at Marine Fence, Port John, 1950

Time	No. of Migrants	No. Sampled	Range of Weights (gm.)	Av. Weights (gm.)
Apr 26-30	40	6	--	--
May 1- 7	118	45	3.3 - 48.7	15.50
8-14	1,130	66	5.2 - 34.5	13.93
15-22	904	71	3.7 - 28.7	14.42
23-29	494	64	3.9 - 21.4	13.15
30-Jun 4	218	73	5.5 - 26.6	12.50
Total	2,904	325	Average weight	13.90

Table III. Average Length, Range of Lengths, and Number Sampled in the Given Time Interval. Samples taken at Port John Lake, 1950

Time	No. of Migrants	No. Sampled	Range of Lengths (cm.)	Av. Lengths (cm.)
May 1- 7	22	10	9.4 - 7.2	8.26
8-14	34	19	12.7 - 7.4	9.09
15-21	25	13	11.6 - 7.0	9.01
22-28	30	18	12.5 - 7.6	9.94
29-Jun 4	7	9	12.6 - 6.5	9.55
Jun 5-11	2	1	7.7	7.70
12-18	9	3	6.3 - 5.4	5.96
19-25	3	2	5.8	5.80
26-Jul 2	3			
Jul 3- 9	5			
10-16	5			
Total	145	75	Average length	8.16

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Here again it can be noted that, in general, the larger fish migrate first, with the exception of the first week. Approximately 52 per cent of the run was measured.

Age-Groups

The 330 scale samples from the marine fence were examined and these results are tabulated in table IV.

Table IV. Numbers of Smolts in Respective Age-groups

Age	1 year	1 year plus additional check	2 years	no annulus
No.	298	27	1	4
Percentage	90.3	8.2	.3	1.2

The group with the 1-year check and an additional check cannot be classed as two-year-olds because of nearness of second check to the first annulus. The reason for this second check is, as yet, undetermined.

Table V, which follows, groups the smolts sampled by J.R. Robertson from the lake at Port John into respective age brackets.

Table V. Age-groups of Port John Lake Coho Smolts

Age	1 year	1 year plus additional check	2 years	no annulus
No.	66	5	0	4
Percentage	88.0	6.7	0	5.3

Tables IV and V roughly coincide in percentage composition. The number of migrants without annulus in table V may be due to the lateness of sampling, as the majority came at the end of the sampling year.

Appendix No. 20

J.G. Robertson

SOCKEYE FRY PRODUCTION, PORT JOHN LAKE, 1950

The disposition of the 1949 sockeye escapement into streams tributary to Port John lake has already been reported in Appendix No. 17. The potential egg deposition from data obtained at the weir on Tally creek was 2,029,756. The fry return from this egg deposition was enumerated this

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spring. With associated meteorological data the results were as follows:

Week Ending	Sockeye Fry	Precipitation (in inches)	Average Temperature (Fahrenheit)
Apr 22	1		--
29	4		--
May 6	13		--
13	152		39.5
20	384		39.5
27	1,569	4.55	39.5
Jun 3	3,852	2.15	39.8
10	10,416	.00	40.9
17	16,105	.00	42.7
24	2,694	1.45	46.8
Jul 1	221	.55	48.5
8	22	.77	49.6
Total	35,433		

Under the conditions of natural incubation the per cent fry survival was 1.745 per cent (25.26% in 1949). This low return may be correlated with the severe winter. The resident investigator reported a complete freeze-up had occurred at one time of observation, and inspection of the redds showed extensive damage had been done. With this implication it may be added that other spring migrants (lampreys, trouts and cottids) were notably scarce as compared to the numbers counted in 1949.

The climatological data obtained over the period of migration showed less precipitation and colder stream temperatures than in 1949. The stream flow was maintained by the run-off provided by a heavy accumulation of snow.

Appendix No. 21

J.G. Robertson

LIMNOLOGICAL STUDIES, PORT JOHN LAKE, 1950

This programme was initiated in 1949 as a corollary to the sockeye investigation here. The bottom fauna studies were discontinued this year, but otherwise no changes were made in the methods of investigation.

The work was begun May 15, and to September 6 the maximum-minimum difference in the lake level was 2.32 feet. The temperature variation at the level gauge was 10.6°C. (maximum 19.7°C. June 16).

At Station I (72 feet of water) in the south end of the lake, 11 temperature series were taken using a reversing thermometer and shallow-type bathythermograph. Bottom temperatures varied from 5.2°C. (May 31) to 5.7°C. (Sept. 6). The surface fluctuation was between 9.8°C. (May 31) and 19.7°C. (Aug. 25). From Station II (145 feet of water) in the north end of the lake, 10 temperature series were taken. Corresponding data here were 4.8°C. to 5.2°C. (bottom) and 9.8°C. to 19.7°C. (surface). A short epilimnion and an extensive hypolimnion were peculiar to both stations. A thermocline lay approximately between the 5- and 30-foot levels throughout

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the season. The last recordings (Sept. 6) showed that while the surface layers were cooling off, the bottom water was still rising in temperature. This seemed to be associated with the extensive humus deposits in the lake.

Four series of oxygen determinations were made from each station commencing July 26. The minimum percentage saturation (63.2) occurred this date (Station II, in 49 feet) while the maximum recording (95.0) was taken August 25 (Station I, surface).

Transparency data were obtained at both stations with a Secchi disc and the somewhat brownish waters showed an average reading of 15 feet.

Plankton samples were collected in vertical series (12, 11) at the points of reference, and horizontal drags (12) were made over a fixed course in the limnetic region.

While no attempt has been made to analyse the data, general observations indicate the lake is temperate of the second order (bottom temperatures) and by reason of its thermal stratification and oxygen saturation it may be oligotrophic. However its colour, transparency, absence of water blooms, paucity of bottom fauna, and apparent absence of coregonine fishes, would indicate features of the eutrophic and dystrophic types. Its succession as evinced from adjacent terrain seems to be into a peat bog, characteristic of the latter type of lake.

Time and ice-cover permitting, helpful fall and winter data have been, and are being collected by Messrs. J.G. Hunter, A. Andrekson, R.C. Wilson and J.S.T. Gibson.

D.J. Milne

Appendix No. 22

COMMERCIAL FISHERY STUDIES ON SPRING AND COHO SALMON

The amount of salmon handled fresh and frozen has increased greatly in recent years. Because salmon catch figures are not published by species except where canned, it is difficult to determine the quantity and value of the commercial catch of spring and coho salmon in British Columbia. The annual catch is about 650,000 (10,000,000 lbs.) spring salmon and 2,500,000 (20,000,000 lbs.) coho salmon which may amount to one-third of the total salmon value. The general introduction of the Multiple Sales Slip in 1951 will provide the first reliable figures for these two species. Therefore from past data it has been impossible to determine with assurance the trends in the catches. The indication is that there has been a general decline in both species but it is difficult to show whether this is true or not. At present all that can be said is that over the last 50 years there has been a decline in the spring salmon to the Columbia river and in the coho salmon of the Fraser river area.

The majority of these two species are now taken by trolling (spring 70% and coho 60%) although in restricted areas many spring salmon are taken by gill nets and coho salmon by purse seines. During the last 10 years the number of trolling licenses has increased from 3,000 to 5,000. The modern trolling boat is large and well equipped with radiophones and other navigational instruments so that it can catch the fish anywhere on their long migration routes. A map of the present fishing areas in British Columbia is being compiled. It shows that most of the fishing is done on the continental

shelf within 25 miles of shore and at depths less than 50 fathoms. The season extends over a long period from April to October with July and August, the peak months. As all troll-caught fish are landed in a cleaned condition and are not counted, conversion factors are necessary to obtain round weights and numbers of fish. Much data, from both the Department of Fisheries and the industry, require summarization before the catch and effort picture is at all clear.

Commercial fishery off the west coast of Vancouver island

This year an attempt was made to arrive at reasonable estimates for the troll-caught fish off the west coast of Vancouver island in order to show the trend in the catches. Data were available from the Department of Fisheries from 1929 to the present. However on checking the accuracy of these data it was found that prior to 1945 the catches of each species had not been kept separate in the original tabulations and since then many gross errors occur. Therefore it has proved impossible to determine the catch of spring and coho salmon for each year or to evaluate the trend during this period. The annual catch of each species has evidently fluctuated between two and five million pounds.

Since 1947 Trip Reports have been filled out by our port observers for trollers landing fish in either Victoria or Vancouver. These fishermen have large boats and by carrying ice they can remain on the fishing grounds for five or six days before bringing in their catches. They are a select group in comparison to the larger number of smaller "day boats". The effort, catch and return per-unit-of-effort of these "ice boats" for the last two years are given below:

Year	No. of Boat-days	No. of Lbs. (dressed) Spring	Coho	Lbs. per Boat-day Spring	Coho
1949	2,149	321,204	537,863	150	250
1950	3,217	531,187	873,095	165	270

It appears that these fishermen had better fishing this season than in 1949. However the data available for the "day boats" indicates that the 1950 fishing was not as good as in 1949. Sales Slip returns from all boats next season will provide a much more accurate picture of the catch.

For example, the 1950 returns from the Sales Slip System operated in Areas 3 and 4 give the following data for troll-caught fish.

	No. of Boat-days	No. of Lbs. (round) Spring	Coho	Lbs. per Boat-day Spring	Coho
Area 3 (Nass R.)	5,626	35,664	570,724	6	103
Area 4 (Skeena R.)	5,438	381,864	621,194	70	114