

THE WILLAMETTE RIVER SPRING CHINOOK SPORT FISHERY, 1947

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INTRODUCTION

The Willamette River has the largest runs of spring chinook salmon of any tributary of the Columbia River rising in Oregon. The run to the Willamette is most unique in that the migrating fish pass up the river through Portland, a city of several hundred thousand people, and support a large sport fishery in the metropolitan area.

This river is the major tributary of the Columbia west of the Cascade Mountains and joins that river about 100 miles from the sea. Anadromous forms, other than spring chinook frequenting the Willamette, include fall chinook and silver salmon, steelhead, trout, and shad.

Spring chinook populations of the Columbia have declined steadily since about 1890 and those of the Willamette have probably done likewise. Records indicating trends in Willamette stocks begin about 1918 at which time fish cultural facilities were first established on the upper tributaries. These records reveal that the Willamette runs maintained themselves from about 1918 to the mid 30's, after which there has been a rapid decline (unpublished ms., Oregon Fish Commission).

Prior to 1927 commercial fishing was carried on in the Willamette up to Oregon City, and since that time only angling has been permitted. Commercial fishing in the Columbia River is prohibited during March and April when most of the Willamette fish are passing through the Columbia. Nevertheless, some Willamette fish are doubtless taken in the Columbia in February, May and perhaps June. In addition, Willamette chinooks are taken by the troll fleet operating at sea (McKernan and Jensen, 1946).

An investigation is being conducted to assess the causes of the decline in Willamette spring chinooks. A study of the sport fishery is part of the program.

FISHING AREAS

The sport fishing for Willamette spring chinook takes place in two general areas, namely: Multnomah Channel and the lower Willamette from Swan Island to the Columbia River; and from Ross Island Bridge in Portland to Oregon City Falls (Figure 1). Within each of these general areas are several favored localities. Below Portland the fishery is particularly concentrated in Multnomah Channel at its lower end, at the mouth of Gilbert Slough and at Coon Island (near Scappoose). Likewise, the fishing is very heavy at the upper end of Multnomah Channel and in contiguous areas of the main Willamette reaching to the Columbia. The favored areas above Portland include those near Milwaukie and from the vicinity of the mouth of the Clackamas River to Oregon City Falls.

FISHING METHODS

Although a few fish are caught by men casting from shore near the falls at Oregon City, at the mouth of the Clackamas River and from log rafts in Multnomah Channel, the majority of anglers fish from boats. Skiffs, usually equipped with outboard motors, are the most common craft, but everything from rubber boats and canoes to tugs and yachts may be seen in the fishery.

In the Multnomah Channel and adjacent areas of the Willamette, most fishermen troll whereas in the river above Portland many anchor their boats and fish in one place, in which case the current alone activates the lure.

Most of the fishermen rent space for their boats at moorages by the season, but some merely rent boats owned by the moorage operators for each

day's fishing. A few anglers come from houseboats and small private moorages and some take their boats to the river on trailers each day and return home with them each night.

Lures used vary widely in shape, color, size and type of surface but consist generally of two types, the spinner and the wobbler.

METHOD OF STUDY

The general methods used in studying the Willamette sport fishery were utilized in 1941 and 1942 by Craig and Townsend of the U. S. Engineers (Craig and Townsend, 1946). In 1946 the method was improved by McKernan of the Fish Commission and the sport census was carried on jointly by the Fish Commission and the Game Commission. The same procedures were continued in 1947.

In a sport fishery so large and so widespread as that for the Willamette spring chinook, indirect means of arriving at the catch must be utilized. Therefore, a large quantity of data was gathered regarding the catch and the number of boats out each day for each area. Based on observations made several times during the season, the total number of boats fishing each day and ultimately the total catch was calculated.

In order to carry out this plan, three procedures were required:

- (1) - Daily records of number of boats fishing and fish caught had to be obtained from moorages;
- (2) - Airplane trips and boat trips had to be made through the fishery in order to count the number of boats present; and,
- (3) - Day-long observations at various moorages were necessary in order to determine the distribution of fishing effort throughout the day.

To secure consistent daily records of fish caught and boats fishing, log books were left at all the moorages along the Willamette River and Multnomah Channel from Oregon City to St. Helens. Fourteen log books

were left at moorages along the river below Portland and eleven were left at moorages between there and Oregon City. Twenty-one of these twenty-five moorages recorded the desired information. In each log book space was provided for daily entries regarding catch and boats fishing. Moorage operators were encouraged to record the weights of fish taken.

In order to count the number of boats fishing at any one time, airplane trips were made regularly over the fishing area until May, after which time the fishery was confined to the reach of river between Portland and Oregon City Falls and a boat proved satisfactory. Eight airplane trips and a like number of boat trips were made (Tables I and II). The counts were, of course, not instantaneous and so the mid-time of the flight or boat trip over each fishing area was defined as the time of observation. Traveling the length of the fishery below Portland by plane required about 20 minutes and that between Portland and Oregon City required 10 minutes, so the error occasioned by time differential was in each case insignificant. Furthermore, most observations were made at a time of day when the percentage of fishermen was not changing rapidly (Table I and Fig. 2) and the time was less critical.

Day-long observations were conducted in order to determine the distribution of fishing effort throughout the day, i. e. the percentage of fishermen out during the day that were fishing at any one time (actual computations were by half hour periods). Inasmuch as the distribution of fishing effort appeared to vary between week-days and weekends, especially during the hours most of the airplane and boat counts were made, it was necessary to make observations on both Saturdays and Sundays and week days. In addition the nature of the fisheries above

and below Portland varied and so observations were taken on both sections of the river.

Figure 2 shows the distribution of fishing effort throughout the day. It is apparent that most of the curves are similar in shape, except for that for the river from Portland to Oregon City on week-days. Probably the two peaks on that curve arise from the fact that the fishing area is so accessible that anglers may fish both in the mornings and evenings.

Having found the average distribution of fishing effort throughout the day, it was possible to convert "instantaneous" counts of boats to approximate total numbers fishing on the days of such counts. The total number of boats reported from cooperating moorages on the days counts were made was then compiled and the percentage of the total originating at those moorages was computed. These data are also shown in Tables I and II. For the Willamette above Portland the percentage of boats originating at cooperating moorages varied from 29.5 to 49.0 on Saturdays and Sundays with an average of 37.2. The week-day average was 30.1 per cent. Below Portland an average of 73.8 per cent of the boats originated at moorages on week-ends. On week-days, however, virtually all the boats came from moorages, the actual computation indicating slightly more than 100 per cent (an impossibility occasioned in part by a paucity of data).

The total number of boats fishing each week was computed and then related to the average catch per boat per week to derive the total catch. This necessitated assuming that the catch per boat per week was the same for fishermen originating at cooperating moorages and elsewhere.

The number of anglers per boat was recorded in the course of each day-long observation and boat trip on the river (Table III), and so data involving numbers of boats may be readily converted to terms of anglers.

RESULTS

The total sport catch of Willamette spring chinook salmon in 1947 was approximately 12,000 fish (Table IV). Of this number some 5,500 were taken in Multnomah Channel and 6,500 were taken between Portland and Oregon City Falls. The number of fish actually reported by moorages below Portland was 4,902 whereas the number actually reported by those above was 2,044 (plus 125 fish reported caught by men casting from bank). The above estimate does not include salmon caught in the Clackamas River nor in the Main Willamette and its tributaries above Oregon City.

The average weight of 1,801 fish caught in 1947 was 16.3 pounds. Figure 5 shows a frequency polygon of weights of sport caught salmon. Recorded weights ranged from five to forty-three pounds, the modal weight being sixteen pounds. At an average weight of 16.3 pounds the total catch amounted to a little more than 195,000 pounds or 97.5 tons.

Observation of 1,578 boats revealed the presence of 3,332 anglers or 2.1 anglers per boat. This was almost identical with that found in 1946 in which case the number of anglers per boat was 2.1.

The fishing intensities of 1946 and 1947 are shown in Table VI. In 1946 a calculated 29,483 boat days of fishing effort were expended in fishing for spring chinooks and in 1947 43,728 were expended, an increase of almost 50 per cent in one year. In spite of this increase the catch was slightly lower, and the catch per boat per day dropped from 0.42 to 0.27. This doubtless means that the run of 1947 was smaller than that of 1946.

At 2.1 anglers per boat in 1947, the catch was 0.13 fish per angler per day.

DISCUSSION

Inasmuch as Willamette spring chinook salmon are thought to be largely five years old at maturity, the catches of 1941 and 1946 and those of 1942 and 1947 are probably directly related, the run of the earlier year

being the parent run of the latter. A catch of 30,000 spring chinook salmon was taken in 1941, but less than half that number was taken in 1946. In 1947, however, the catch was equal to that taken from the parent run in 1942. In general the catch of salmon depends largely on three factors:

- (1) - size of the run;
- (2) - fishing intensity; i.e. number of anglers; and
- (3) - water conditions.

Were these factors identical in 1942 and 1947, this year's catch would mean that the chinook run of 1942 had maintained itself. This is in sharp contrast to the relationship between the 1941 and 1946 catches, in which case there was more than a 50 per cent decline.

For the years 1941, 1942, and 1946 the weekly take of salmon at cooperating moorages has been compared (McKernan and Jensen, 1946). In 1947 the number of cooperating moorages had increased on the river below Portland and had decreased above Portland. For that reason the reported catches do not bear a constant relationship to the total catches. Therefore, the data of former years has been recomputed to derive the total weekly catches. This could be done accurately for 1946, but was only approximate for data obtained in 1941 and 1942. In the latter mentioned years it was known that about 55 and 62 per cent, respectively, of the total catch was reported as caught by boats from moorages. Approximate weekly catches were derived on this basis for comparison with 1946 and 1947.

Figure 4 and Table V show the weekly catch of spring chinook salmon for the years 1941, 1942, 1946 and 1947. In both 1941 and 1942 peak catches were taken during the week ending April 12, with a subsidiary peak about April 26 in the latter year. In 1946 peak catches were made about April 26 and in 1947 the mode was about a week earlier.

Fishing continued later in 1947 than in the previous years of study

and lasted much longer in the reach of river between Portland and Oregon City than it did below Portland. The season's first salmon was taken on February 21 at Milwaukie, but it was not until March 1 that salmon were reported taken in Multnomah Channel. Likewise the peak catch above Portland was made during the week of April 13-19, but the peak catch below Portland was taken a week later (Table IV, Figure 3). The lower fishery ended in the first week in May whereas that above Portland, particularly just below Oregon City Falls, continued through May.

Hydrographic factors are known to have a pronounced effect on the sport fishery and such proved to be the case in 1947. Beginning about March 8, rains and melting snows caused the Willamette to rise sharply and the water to become muddy. This continued for more than a week and resulted in a decline in fishing intensity and yield (Figure 3). In April the water was again high and muddy until about the 10th, and the consequences were similar. Throughout the remainder of April water conditions were ideal for fishing.

About May 1 the Columbia began to rise and caused the water to back up in the Willamette as far as Oregon City. As a result there was subsequently little current in the Willamette from its mouth to the Willamette Falls. On the other hand the muddy water from the Columbia considerably augmented the flow in Multnomah Channel. Consequently the fishing in the two areas terminated about the first week in May. An exception to this was the condition below the falls at Oregon City where water passing through the mills furnished considerable current.

ILLEGAL FISHING

An effort was made by the Gam Commission this year to determine the amount of illegal fishing in areas near the Oregon City Falls. By making observation from a boat it was found that snagging started about the middle of May or approximately the time that salmon were no longer striking

a lure in that vicinity. This type of fishing was especially heavy immediately below the arches of the Crown Willamette Paper Mill and near the outlets of the Hawley mill. From May 20 through May 24, 33 salmon were observed caught. Of this number 30 salmon (91 per cent) were snagged in the body whereas 3 salmon (9 per cent) were hooked in the mouth. The type of gear generally in use was difficult to determine because in the presence of an observer most of the fishermen used equipment that was within the law. Only in one case was the gear, used in catching one of the above fish, questionable. Undoubtedly the lack of current from a point near the deadline to the fish ladder causes the salmon to concentrate in areas of major water attraction near the outlets of the mills. This in turn encourages illegal fishing during the latter part of May.

SUMMARY

- (1) - The Willamette River has the largest run of spring chinook salmon of any Oregon tributary of the Columbia River.
- (2) - The Willamette salmon run, since 1927, exploited largely by anglers, has been declining rapidly in recent years.
- (3) - A part of the investigation of the salmon runs is a study of the sport fishery, conducted jointly in 1947 (and 1946) by the Fish Commission and Game Commission and carried on in 1941 and 1942 by Craig and Townsend for the U. S. Engineers.
- (4) - The object of the study was to ascertain the catch and study trends in the fish populations.
- (5) - The catch was obtained from the calculated total fishing effort and a large sample of data regarding catch per unit of effort.
- (6) - Information on catch per unit of effort was obtained from moorage operators. Below Portland from 73.8 per cent (week-ends) to 100 per cent (week days) of the boats fishing

SUMMARY - continued

- (6) - originated at cooperating moorages, whereas the percentages above Portland were 37.2 and 30.1, respectively.
- (7) - The total catch was about 12,000 fish. At an average weight of 16.3 pounds in 1947 the total landings amounted to more than 195,000 pounds.
- (8) - Catches in 1941, 1942 and 1946 amounted to 30,000 - 12,000 and 12,630 salmon respectively. Assuming that spring chinooks are five years of age at maturity, these records indicate that, whereas the 1941 run did not maintain itself, that of 1942 was successful in doing so. Such may not be the case, particularly in the 1942 run, because catches are not only affected by the size of the run, but also by fishing intensities and water conditions.
- (9) - Chinooks were taken from late February through May. Best catches were made during the week April 13 to 19 in the Willamette above Portland, whereas the peak was reached a week later below Portland.
- (10) - In 1946 the number of boat-days involved in fishing spring chinook salmon was 29,483. In 1947 this increased to 43,728 a gain of about 50 per cent in one year.
- (11) - Comparison of catch per unit of effort in 1946 and 1947 reveals that the catch per boat per day dropped from 0.41 to 0.27.

RECOMMENDATION

It is recommended that:

- (1) - The sport census and counts at Oregon City Falls be continued.
- (2) - Studies be undertaken which will establish the take of Willamette fish in the commercial fishing in the Columbia River and at sea.

RECOMMENDATION - continued

(3) - Studies of conditions at Oregon City Falls be intensified.

(4) - The sport fishery be curtailed at Oregon City Falls - for the time being - by the following measures - -

(a) - That fishing for and possession of salmon over 20" in length be prohibited in the area between the Oregon City West Linn Bridge and the deadline at Oregon City Falls after about May 5th to 10th each year.

(b) - That one lure with only one single hook be permitted to be used in the above area after the dates suggested and until July 15th of each year.

(c) - That the maximum sized hook to be allowed in the above area between the above dates suggested shall be one in which the shortest distance from points to shank is $3/8$ ", measured from point of hook to inside edge of shank.

Recommendations (1) and (2) need no elaboration and number (3) is a part of the study of obstructions. Curtailment of the sport fishery by means of the measures recommended will provide some added protection for late fish. From observations made in 1947 it appears that, during the entire salmon run, fish are attracted by the waters flowing from the mills at the Falls. Such fish remain below the mills for an unknown length of time and then presumably they eventually find the fishways. As the season advances and a progressively smaller percentage of the flow passes over the face of the Falls, the attraction into the vicinity of the fishways becomes less and less. Consequently the fish still remaining below the mills have less incentive to leave those areas and proceed to the fishways, and the percentage of delayed fish apparently increases. It is those fish in particular that are vulnerable to both

RECOMMENDATION - continued

legitimate anglers and a group of men fishing illegally by snagging.

Recommendations designed to protect the heavy late-season concentrations of fish should take into consideration both the water flows and a harmless shad and jack salmon fishery that takes place concurrently with that for chinooks.

The time at which the percentage of delayed salmon increases to a maximum is not known, and necessarily varies with water flows. In 1947 it appears to have occurred in early May concurrently with the rise in the Columbia and the reduced flow in the Willamette.

Recommendations concerning the sport fishery are designed to protect only late fish from capture and injury. They will not increase the escapement appreciably.

ACKNOWLEDGMENTS

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Table I Counts of Boats on Willamette River from Portland to Oregon City Falls With Computation of Total Number of Boats on the River During the Day and Per Cent Reported by Moorages, 1947

Day	Method	Time	Observer Counts	Per Cent Available*	Total Boats, Calculated	Reported by Moorages	Per Cent Reported
<u>Saturdays and Sundays</u>							
Saturday	Plane	1:40	371	58.0	640	189	29.5
Sunday	"	12:45	380	60.3	630	239	38.0
Saturday	"	2:10	576	57.5	1176	380	32.3
Sunday	"	2:20	716	57.3	1250	445	35.6
Saturday	"	1:00	422	59.0	716	351	49.0
Sunday	"	2:00	367	57.6	637	303	47.6
Saturday	Boat	11:30	420	69.6	604	196	32.4
Saturday	"	10:45	100	69.2	145	47	32.4
Sunday	"	11:15	92	69.4	133	46	34.6
Saturday	"	1:10	51	58.7	87	41	47.2
Total					6018	2237	37.2
<u>Week-Days</u>							
Tuesday	Plane	12:05	91	45.4	200	66	33.0
Wednesday	"	2:10	345	41.4	833	259	31.1
Tuesday	Boat	12:30	366	41.1	890	264	29.6
Thurs.	"	12:15	320	43.8	730	236	32.4
Wednesday	"	1:45	89	40.2	222	49	22.1
Tuesday	"	10:45	24	55.5	43		
Total					2875	864	30.1

Percent of total boats for day that were on the river at time of count. (Figure 2)

TABLE II Counts of Boats on Multnomah Channel and the Willamette River Below Portland with Computation of Total Number of Boats on River During Day and Percent Reported by Moorages, 1947

Day	Method	Time	Observer Counts	Percent Available*	Total Boats Calculated	Reported by Moorages	Percent Reported
<u>Saturdays and Sundays</u>							
Sat.	Plane	1:00	379	68.0	558	444	79.5
Sun.	"	12:30	583	70.0	832	545	65.5
Sat.	"	1:50	630	67.2	938	698	74.4
Sun.	"	1:40	806	67.5	1195	823	68.8
Sat.	"	12:40	545	69.2	788	656	83.2
Sun.	"	1:20	555	67.7	820	620	75.6
Total					5131	3786	73.8
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<u>Week-Days</u>							
Tues.	Plane	12:30	135	76.5	177	192	108.5
Wed.	"	1:45	281	71.0	396	399	99.3
Total					573	591	103.2

ent of total boats for day that were on the river at time of count (Figure 2).

TABLE III. Average Number of Fishermen per Boat as
Obtained by Observations at Moorages and
During Boat Trips Through the Fishery, 1947

Date	Number of Boats	Number of Fishermen	Fishermen Per Boat
<u>Portland to Oregon City</u>			
March 22	129	281	2.18
April 7	29	60	2.07
16	52	103	1.98
18	244	451	1.85
20	214	506	2.36
22	141	265	1.88
25	59	118	2.00
May 2	52	90	1.73
3	52	103	1.98
10	100	188	1.88
11	87	190	2.18

<u>Below Portland</u>			
March 23	94	212	2.26
26	48	105	2.19
April 5	45	95	2.11
19	78	179	2.30
21	51	122	2.39
27	103	264	2.56
Total	1578	3332	2.11

TABLE IV. Catch of Chinook Salmon in the Willamette River by Weekly Intervals, Calculated from Moorage Reports, 1947

Date	Below Portland	Portland to Oregon City	Total
Feb. 16-22	0	3	3
23-March 1	4	16	20
March 2-8	17	0	17
9-15	0	0	0
16-22	208	159	367
23-29	378	102	480
30-April 5	287	55	342
April 6-12	173	168	341
13-19	1514	2592	4106
20-26	2292	1507	3799
27-May 3	601	1071	1672
May 4-10	26	347	373
11-17	0	112	112
18-24	0	152	152
25-31	0	71	71
Total	5500	6356	11855

Number taken by) Anglers Casting) From Shore)	No Record	145	145
GRAND TOTAL	5500	6500	12000

TABLE V. Salmon Catch in the Willamette River by Weekly Intervals as Calculated from Moorage Reports for the Years 1941, 1942, 1946 and 1947

Date	1941* Catch	1942* Catch	1946* Catch	1947* Catch
Feb. 8			1	
9-15			3	
16-22			41	3
23-March 1		14	21	20
March 2-8	202	128	16	17
9-15	804	290	68	0
16-22	1615	544	38	367
23-29	3753	1732	672	480
30-April 5	5518	2080	1523	342
April 6-12	6392	2536	2125	341
13-19	5823	1278	2740	4106
20-26	4382	1610	3173	3799
27-May 3	1183	1417	1308	1672
May 4-10	267	305	506	373
11-17	61	66	181	112
18-24			26	152
25-31			1	71
Total	30,000	12,000	12,342	11,855

Catch by Anglers Casting from Shore, etc.			288	145
GRAND TOTAL	30,000	12,000	12,630	12,000

* Derived from Craig and Townsend (see text).

TABLE VI. Comparison of the Spring Chinook Salmon
Fishery of the Willamette River in
1946 and 1947.

Year	Fishing Intensity*	Catch in No. of Fish **	Catch per Boat per Day
1946	29,485	12,342	0.418
1947	43,728	11,855	0.271

* Boat-days of fishing for salmon thru May (boat fishermen only).

** Catch from boats.