

MUCKLESHOOT INDIAN TRIBE
and
U.S. FISH AND WILDLIFE SERVICE
FISHERIES ASSISTANCE OFFICE
OLYMPIA, WASHINGTON

PRELIMINARY REPORT

POPULATION ESTIMATION OF THE 1976-77
STEELHEAD TROUT RUN TO THE
LAKE WASHINGTON WATERSHED

JUNE 1977

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INTRODUCTION

The Muckleshoot Indian Tribe and the Olympia Fisheries Assistance Office of the U.S. Fish and Wildlife Service (USFWS), with cooperation from the Washington Department of Game, conducted a tagging study on the 1976-77 winter steelhead run returning to the Lake Washington watershed. The purpose of this study was to estimate the run size and escapement, monitor the sport and commercial catch and gather biological information on timing, sex, weight, length and hatchery/wild composition of the run. This information should prove useful for management of this valuable resource.

The preparation of this preliminary report was done in part to fulfill obligations of the Tribe to contracts through the Small Tribes Organization of Western Washington and the Bureau of Indian Affairs. The data presented here are preliminary. A final report will be completed by September 30, 1977.

METHODS AND MATERIALS

The steelhead trout tagged for the study were captured from November 10, 1976 to March 11, 1977 in a portable trap installed at the upstream exit of the fish ladder at the H. M. Chittenden Locks, Ballard, Washington. The fish were dipnetted from the trap and placed in a tagging cradle where sex and fork length were determined. The source of the fish (hatchery or wild) was also evaluated by visual inspection of the dorsal fin. A coded butt-end tag (National Band and Tag Company) was then clamped on the right mandible of each fish. Jaw tags were employed since they are not selectively taken in the fishery and are retained better than other types of tags used in previous tagging studies (USFWS unpub. data). Prior to release into the ship canal, the adipose fin of tagged fish was removed to facilitate in tag recovery and identification of fish which had lost tags. The recovery of tagged steelhead from the watershed required monitoring of the Indian gill net and all-citizen sport fisheries. Length, weight, sex and source (hatchery or wild) were recorded and scale samples were taken from all fish sampled. The gill net catch was sampled at the various boat landing sites while the sport catch necessitated surveillance of the ship canal and Cedar and Sammamish rivers through creel census methods. Total gill net catch

was summarized from commercial fish tickets, while sport catch was estimated by using creel census methods outlined by the Washington Department of Game (Brown, 1977).1/

The sport catch was estimated because complete enumeration of angler success from the Sammamish and Cedar rivers is not feasible. Therefore, specific portions of these rivers, or index areas, were established. Monitoring of these index areas supplied information on the angling effort in hours per day. An unbiased evaluation of catch per effort was determined by questioning individual anglers at random throughout the river. These two bits of information -- hours of effort and catch per unit effort -- when multiplied provide an estimate of the steelhead catch. However, this data would not be representative of the entire river since the effort was tallied only within index areas. To estimate the total effort expended on a river, the index effort would require an expansion factor. This was determined by comparison of index "head counts" to total river head counts made by aerial observation six times per month, e.g.:

$$\text{Expansion Factor} = \frac{\text{Total Anglers}}{\text{Sum of Anglers in Index Areas}}$$

The expanded index effort when multiplied by the catch per unit effort provided a reasonable estimation of steelhead catch:

$$\text{Catch Estimate} = (\text{Index Effort}) (\text{Expansion Factor}) (\text{Catch/Unit Effort})$$

The population size was calculated by using the Petersen method, and the confidence interval was determined using a method described by Chapman (1948).2/

RESULTS

A total of 140 steelhead were tagged during the 5-6 day per week effort from November 10, 1976 to March 11, 1977. From the total of 749 steelhead mark sampled, 12 tagged fish were recovered. There was no evidence

1/ Brown, Larry G. 1977. Steelhead creel census procedures, Washington Department of Game, Olympia, Washington

2/ Chapman, D. G. 1948. A mathematical study of confidence limits of salmon populations calculated from sample tag ratios. International Pacific Salmon Fisheries Commission Bull. 2, 69-85.

of lost tags or straying from the watershed. The gill net fishery contributed 8 of the tags from a sample of 600 while the creel census technicians recovered 4 tags from the 149 fish inspected from the sport catch. Seven tags were voluntarily returned by fishermen. The Petersen estimation of the steelhead run size was 8,738 fish (Table 1). A stratified population estimate is perhaps more appropriate and application to these data will be investigated. The confidence interval of 4,404 to 15,414 is large as a result of the small number of tags recovered. The exploitation of 2,561 fish was calculated by combining the gill net fish ticket receipt totals with the creel census catch estimates. Escapement was estimated as approximately 6,177 fish, or about 71 percent. However, the confidence interval indicates that the point estimate of run size or escapement should be viewed with caution.

The creel census data has been summarized bi-weekly and presented in Table 2. Categorization of this information by angling method, week-day or week-end, and index area will be done in the final report, along with the comparison of the monthly creel survey catch estimates to punchcard data. It should be noted that the expansion factors become smaller after February 15. This is in part a result of adjustment in the index areas of both the Cedar and Sammamish rivers on this date, and perhaps a reduction in fishing pressure.

The estimated total sport catch (all data combined) was 942 steelhead. The gill net fishery steelhead catch (Table 3) totaled 1,619 fish. For comparison, Table 4 shows catch information from 1962 to present.

Monthly averaged length, weight and ratios on sex and fish source (hatchery or wild) was separated as to capture gear and location (Table 5). The information in the tagging row was accumulated at the fish ladder during the jaw tagging operation and is probably a random sample of the steelhead entering the Lake Washington watershed. The hatchery/wild composition of the run appeared to change as the season progressed; however, this will require further analysis as the observations from the sport catch are few. A cursory comparison of the hatchery/wild composition of the sport and gill net catch (December and January) does not reveal any obvious difference.

Table 1. Steelhead tagging, recovery, and population estimates for the 1976-77 winter run.

Number Tagged 140

MARK SAMPLE

Gillnet

North Lake Washington 241
 South Lake Washington 354
 Ship Canal 5

Sport

Cedar River 121
 Sammamish River 28

Total Mark Sample -- 749

TAG RECOVERIES

Gillnet

North Lake Washington 5
 South Lake Washington 2
 Ship Canal 1

Sport

Cedar River 2
 Sammamish River 2

Total Tag Recoveries -- 12

Population Estimation 8,738
 Confidence Interval (P = .95) 4,404 to 15,414
 Gillnet Total Catch 1,619
 Sport Catch Estimate* 942
 Escapement 6,177
 Exploitation Rate 29%

*Does not include 54 steelhead caught below the tagging site.

Table 2. Creel census summary (all data combined).

<u>DATE</u>	<u>PARAMETER</u>	<u>SAMMAMISH</u>	<u>CEDAR</u>
12/1 - 12/15	Total effort	281.2	650.2
	c/e *	0	0.013
	expansion	4.0	3.0
12/16 - 12/31	Total effort	741.2	1179.16
	c/e	0.033	0.008
	expansion	2.9	3.52
	December Catch	92	55
1/1 - 1/15	Total effort	512.78	869.74
	c/e	0.017	0.017
	expansion	3.95	3.27
1/16 - 1/31	Total effort	672.0	1090.14
	c/e	0.016	.01
	expansion	6.3	3.27
	January Catch	89	117
2/1 - 2/15	Total effort	499.8	1144.5
	c/e	0.032	0.014
	expansion	4.06	7.48
2/16 - 2/25	Total effort	602.8	1550.3
	c/e	0.32	0.022
	expansion	1.69	2.8
	February Catch	101	264
3/1 - 3/15	Total effort	785	1532.17
	c/e	0.021	0.023
	expansion	1.45	2.08
3/16 - 3/31	Total effort	691	1961.8
	c/e	0.023	0.018
	expansion	1.5	2.63
	March Catch	44	180

* c/e = catch per hour of angling effort

Table 3. 1976-77 gillnet catch - Lake Washington*

<u>WEEK</u>	<u># STEELHEAD</u>
Nov. 17-23	20
24-30	40
Dec. 1-7	118
8-14	181
15-21	76
22-28	194
Dec. 29 - Jan. 4	224
Jan. 5-11	213
12-18	198
19-25	279
Jan. 26 - Feb. 1	72
Feb. 2-8	4
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TOTAL -- 12 weeks	1,619

*Summarized from commercial fish sale tickets.

Table 4. Lake Washington system winter steelhead data summary (Washington Department of Game).

<u>Year</u>	<u>Ship Canal</u>	<u>Lake Wash.</u>	<u>Sammamish</u>	<u>Cedar</u>	<u>Indian Harvest</u>	<u>System Plant (Year n-2)</u>	<u>Total Harvest</u>
1962	594	77	888	493	---	13,400	2,052
1963	610	22	921	523	---	12,800	2,076
1964	692	--	616	492	---	20,100	1,800
1965	581	20	622	299	---	20,300	1,522
1966	646	33	649	473	---	19,600	1,801
1967	892	59	1,148	764	---	21,600	2,863
1968	755	47	513	627	---	15,100	1,942
1969	612	37	569	812	---	20,700	2,030
1970	304	40	415	576	---	15,100	1,335
1971	449	34	988	1,459	---	70,300	2,930
1972	631	72	578	685	---	45,200	1,966
1973	521	12	430	459	---	48,000	1,422
1974	349	298	694	558	---	45,500	1,899
1975	114	316	506	507	558	38,000	2,001
1976	283	7	179	285	2,313	92,000	3,067
1977*					1,619	59,800	

*Data from U. S. Fish and Wildlife Service

Table 5. Summary of 1976-77 winter steelhead bio data from the sport and commercial fishery in the Lake Washington watershed.

	<u>n</u>	<u>H/W</u> *	<u>Male/Female</u>	<u>M a l e</u>		<u>F e m a l e</u>	
				<u>Length</u>	<u>Weight</u>	<u>Length</u>	<u>Weight</u>
<u>DECEMBER</u>							
<u>Sport</u>							
Sammamish	8	2/6	6/2	28.6	8.6	26.3	7.3
Cedar	16	7/7	9/7	28.7	8.7	29	9
Ship Canal	0						
<u>Gillnet</u>							
No. Lk. Wash.	74	40/34	33/44	28.1	10.6	27.7	8.8
So. Lk. Wash.	144	65/79	73/71	27.9	10.1	28.4	10.7
<u>Tagging</u> **	59	13/40	27/30	27.8	N.A.	26.5	N.A.
<u>JANUARY</u>							
<u>Sport</u>							
Sammamish	6	2/4	1/5	29	10	26.4	7.5
Cedar	29	14/14	16/13	28	8.5	28	8.4
Ship Canal	13	3/10	5/7	27.9	7.6	27.6	9.5
<u>Gillnet</u>							
No. Lk. Wash.	99	33/66	41/58	29.4	9.3	27.8	8.7
So. Lk. Wash.	206	77/129	77/129	28.6	8.6	28.9	9.2
<u>Tagging</u>	36	13/19	18/17	25.5	N.A.	23.4	N.A.
<u>FEBRUARY</u>							
<u>Sport</u>							
Cedar	9	4/5	3/6	29.5	10.8	26.2	7.3
Sammamish	32	6/24	19/13	28.82	8.7	27.81	8.2
Ship Canal	0						
<u>Tagging</u>	28	11/17	15/13	23.4	N.A.	24.6	N.A.
<u>MARCH</u>							
<u>Sport</u>							
Sammamish	5	1/4	2/3	21.5	4.5	24.8	6.2
Cedar	44	14/29	19/25	29.5	8.93	28.8	8.78
Ship Canal	6	0/6	1/2	29.2	11	28.4	9
<u>Tagging</u>	17	8/9	10/7	22.4	N.A.	24.5	N.A.

* Hatchery/Wild

** Includes 9 fish tagged in November

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