A Report on Chinook Salmon Straying Into the Smith River, California in 1983

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A continuing fishery research project was conducted on the Smith River in 1983 by the local Sea Grant marine advisor. This project involved gathering scale samples from adult chinook salmon caught in the Smith River sportfishery. Sampling in 1983 was directed at gathering fishery information about chinook salmon straying into the Smith River system.

Recent fishery studies conducted on the Smith River (Waldvogel, 1983) have indicated that significant numbers of Klamath River system fall chinook salmon have strayed into the Smith River the last two years. These fish begin to enter the river in late August and continue through mid-October. A popular and extensive river sportfishery catches these fish from the mouth of the river to river mile 7 during September and October.

A sampling program was conducted from September 1 through October 31 and a goal of 500 fall chinook samples was established. The sport catch along the river was randomly sampled 3-4 days per week at selected popular fishing sites. Whenever a specific site was chosen, all the salmon caught at that site were sampled. The only exceptions to this procedure were days at the river mouth when 100-200 fish were caught. Then a random sample of approximately 50 fish was taken from these large landings.

The information recorded during each fish sample included: date caught, species, sex, fork length in inches, weight in pounds, location on river where fish were caught, and hatchery marks (fin clips). All salmon with adipose clips had their heads removed and these heads were checked for CWTs (coded wire tags) by California Department of Fish & Game personnel in Eureka. Scale samples were taken from each fish to determine their age and if they were hatchery fish. Hatchery salmon were distinguishable from natural spawned salmon by distinct growth patterns on the scales.

Results

Length and Weight -

A constant sampling effort of the sportfishery along the Smith River during the two months resulted in 613 fall chinook salmon samples. Scale readings from these fish samples established an age distribution and determined that 559 of the salmon were of hatchery origin (91%) and 54 were wild fish (9%). A total of 154 of the salmon sampled had some type of hatchery fin clip. This resulted in a marked fish composition of 25% for all salmon and 27.5% for hatchery salmon.

Table 1 shows the distribution by age and sex of chinook salmon sampled in the Smith River. The mean fork length and weight of chinook salmon sampled is listed in Table 2 by age distribution and sex.

Marks -

A recovery of 154 fin-clipped salmon from the 613 fish sampled indicated a high percentage of hatchery-reared fish were present in the Smith River system in 1983. The fin clips recorded included: 53 adipose clips (34%), 78 right ventral clips (51%), and 23 left ventral clips (15%). Table 3 lists the number and percentage of fin clips recorded from the salmon sampled according to age and sex.

The heads from all 53 adipose-clipped salmon were sent to the California Department of Fish & Game office in Eureka for analysis. The results of the coded wire tag (CWT) recoveries were as follows: 1 Trinity River coho salmon (eliminated from this chinook analysis); 19 fall chinook Iron Gate Hatchery (Klamath River) releases (37%); 22 fall chinook Trinity Hatchery (Trinity River) releases (42%); 1 fall chinook Rowdy Creek Hatchery (Smith River) release (2%); 1 fall chinook Elk River Hatchery (Chetco River) release (2%); and 9 fall chinook where no tag could be found (17%).

Table 1: Number and percentage by age and sex of fall chinook salmon sampled in the Smith River sportfishery in 1983.

	Hatchery Salmon	Wild Salmon*
2 year olds	53 fish (10%) 49 males (92%) 4 females (8%)	19 fish (35%) 19 males (100%)
3 year olds	452 fish (80%) 195 males (43%) 257 females (57%)	33 fish (61%) 15 males (46%) 18 females (54%)
4 year olds	53 fish (10%) 14 males (26%) 39 females (74%)	2 fish (4%) 2 males (100%)
5 year olds	1 fish 1 male	None

*Wild salmon denotes salmon that showed no hatchery growth marks on their scales. However, these fish may not all be Smith River stock.

Table 2: The mean fork length (inches) and mean weight (pounds) of fall chinook salmon sampled in the Smith River sportfishery in 1983.
(SD = Standard Deviation)

	Hatchery Salmon				Wild Salmon			
	Length		Weight		Length		Weight	
	Male	Female	Male	Female	Male	Female	Male	Female
2 year olds	17.6 SD=1.6	21.5 SD=0.6	2.3 SD=0.7	3.6 SD=0.2	18.6 SD=2.8	*	2.8 SD=1.0	*
3 year olds	23.8 SD=2.3	24.2 SD=1.7	5.9 SD=1.9	6.1 SD=1.5	28.4 SD=2.5	27.8 SD=2.6	11.6 SD=3.0	10.0 SD=3.3
4 year olds	29.0 SD=2.0	28.0 SD=1.9	11.3 SD=3.4	9.7 SD=2.8	*		*	
5 year olds	*		*		*		*	

*No statistics were derived for samples with less than 3 salmon.

Table 3: The number and percentage of fin-clipped fall chinook salmon recovered from fish samples taken during the Smith River sport-fishery in 1983.

Fin-clipped Salmon

2 year olds -

Males - 2 of 49 = 4% 1 Ad, 1 RV

Females - 2 of 4 = 50% 2 RV

3 year olds -

Males - 52 of 195 = 27%

Ad - 14 of 52 = 27%

RV - 29 of 52 = 56%

LV - 9 of 52 = 17%

Females - 82 of 257 = 32%

Ad - 28 of 82 = 34%

RV - 43 of 82 = 52%

LV - 11 of 82 = 14%

4 year olds -

Males - 7 of 14 = 50%

Ad - 6 of 7 = 86%

LV - 1 of 7 = 14%

Females - 9 of 39 = 23%

Ad - 4 of 9 = 45%

RV - 3 of 9 = 33%

LV - 2 of 9 = 22%

Discussion

Length and Weight Analysis -

All fork length measurements were made in inches so that comparisons could be made with recent Smith River chinook age and growth studies. Since all of these Smith River studies have utilized sport-caught salmon and some of the fish samples were collected by selective sportfishermen, use of inch measurements was a better standard data base. The same reasons were used for establishing weight measurements in pounds.

Comparisons of length and weight differences between male and female hatchery fish were made for each age group (Table 2). There appeared to be no significant difference in length or weight between sexes for any age group. Three-year-old males were slightly shorter and lighter than 3-year-old females. Four-year-old males were slightly longer and heavier than 4-year-old females.

Any distinctive differences between male and female salmon could have been easily masked by the poor condition factors of many of the hatchery fish. This summer's warm ocean water conditions caused by El Niño had an obvious negative effect on returning hatchery chinooks. There were several verified cases (CWT readings) of 4-year-old chinook which weighed only 7 or 8 pounds. Many 3-year-old female chinooks returned to spawn, weighing only 3 or 4 pounds.

It should be noted here that the recovery of four 2-year-old female hatchery chinooks was an unusual occurrence. The scale samples from these fish were read several times to insure no aging mistakes were made. Whether these 2-year-old females were a result of hatchery release practices or the El Niño water conditions is unknown. Two of the four female fish had RV clips.

Attempts were made to compare the lengths and weights of hatchery salmon and wild salmon. The lengths and weights of all wild salmon sampled were significantly larger than hatchery fish of the same age group. However, no acceptable comparisons can be used for these groups of fish because the wild Smith River fall chinook is a completely different stock of fish than the Klamath and Trinity fall chinook.

Sex Ratio -

A comparison of the samples of male and female chinook salmon in Table 1 shows a dominance of females for 3 and 4-year-old hatchery fish. The 3-year-old group comprised 57% females and 43% males. Interestingly enough, the 3-year-old wild fish sampled were also very close to these percentages (54% female - 46% male). The 4-year-old hatchery salmon had a high component of females (74%) to males (26%). It is not unusual to have adult chinook returns with large numbers of females present (California Department of Fish and Game, Oregon Department of Fish and Wildlife Communications). Conversations with sportfishermen on the Klamath River and with the Iron Gate Hatchery manager indicated that there was a higher than normal percentage of adult female chinooks returning to that system in 1983.

Marked Salmon -

The three fin clips recorded from the salmon samples were dominant ones used in the Klamath River system. The adipose clip (Ad) is used whenever a coded wire tag (CWT) is inserted in a salmon's head. A right ventral (RV) clip is a fractional clip used for chinook salmon released from Trinity River Hatchery. A left ventral (LV) clip is a fractional clip used for chinook salmon released from Iron Gate Hatchery. Both of the fractional clips (RV and LV) are used on approximately 33% of the "unmarked" chinook salmon (non-CWT) released from their respective hatcheries. Marked chinook salmon returning to Rowdy Creek Hatchery and the Chetco River are presently marked only with adipose clips.

An analysis of the percentage of marked salmon recovered in the samples suggests some interesting results. Comparison of the percentages of 3-year-old males and females in Table 3 shows that Ad, RV and LV clips were recovered at approximately the same percentages between male and female fish (Ad = male 27%, female 34%; RV = male 56%, female 52%; LV = male 17%, female 14%). This indicates that the condition of straying was not sex related; male and female chinooks seemed to stray equally. Comparisons were not made in other age groups because the number of marked recoveries was too small to be reliable.

Results from the CWT recoveries verified that the majority of the straying chinook salmon were from the Klamath River system (41 of 43 CWTs recovered in the heads - 95%). The large number of RV and LV clips also substantiated these findings. Analysis of the different tag codes recovered indicated that many treatments (batch releases) of fall chinook were doing the straying. Initial thoughts on the reasons for the straying included the downriver release experiments being conducted by the California Department of Fish & Game. However, only three of the 41 recovered CWT fish were downriver releases. The rest of the CWTs (93%) were from fall chinook released at Iron Gate and Trinity Hatcheries. Downriver releasing of chinook salmon in the Klamath River system does not appear to be the major factor for large amounts of fall chinook straying into the Smith River.

General Observations -

The timing of the peak straying of Klamath River fall chinook into the Smith River in 1983 correlated very closely with the time of entry of fall chinook into the Klamath River. Large numbers of Klamath salmon entered the Smith River during the first two weeks of September and again during the first two weeks of October. Reports from sportsfishermen, river guides and campground owners verified that these same two-week periods were the peak entry times for fall chinooks into the lower Klamath River.

After each of the peak straying periods (within 5 days) into the Smith River, upriver sport catches on the Smith River increased significantly. These increased catches indicated a direct movement of Klamath River chinook up the Smith River. By the middle of October, many of the deeper holes that were 5 to 7 miles upstream (Early, Society, Brundeen, Jed Smith and Peacock Holes) had 500-2,000 chinook per hole (visual and diving observations). Many of the fish were quite bright (fresh) while others were becoming darkened from being in the river for some length of time.

The reported straying of Klamath River fall chinooks into the Smith River in 1982 was predominantly 2-year-olds (Waldvogel, 1983). Straying in 1983 was predominantly 3-year-olds (80%). A continuing sampling effort will be conducted in 1984 to determine if Klamath River fall chinook straying occurs again. A straying of large numbers of 4-year-old salmon in 1984 would indicate that some type of release or return problem was occurring in a certain year class of Klamath fall chinook.

Salmon spawning escapement estimates and carcass counts have been conducted by the U.S. Forest Service, California Department of Fish & Game and the U.C. Sea Grant program on four or five tributaries of the Smith River system for the past three winters. In 1982 there was no directed effort to look for Klamath strays in these studies because most of the straying constituted 2-year-old males.

When large numbers of 3-year-old females started appearing in 1983, a concerted effort was made by the U.S. Forest Service and U.C. Sea Grant to determine if any of these strays would spawn in the Smith River. Observations through late October indicated thousands of these fish had slowly moved upriver 7-10 miles and were beginning to mature. Marked female salmon caught upriver late in October had well-developed eggs and protruding vents.

The natural peak spawning time historically for Klamath River fall chinook is mid-November. Heavy rains started early in November in 1983 and continued through most of December. Although efforts were made to detect chinook spawning in upper reaches of the Smith River during this time, the heavy rains made it almost impossible to survey the streams. Observations of spawning chinook salmon in mid-November were recorded, but no "marked" salmon carcasses were found during these surveys. By mid-December, large numbers of wild Smith River spawning chinook were found in all tributaries surveyed.

It is unlikely that the thousands of upriver straying, maturing Klamath fall chinook would go downstream with the inception of the heavy rains. Physiologically

these maturing salmon would not be able to leave the freshwater Smith system, re-enter the ocean and migrate back up the Klamath system. However, how many of these Klamath River chinook spawned in the Smith River and in what areas is unknown. An extensive spawning survey is being discussed if considerable straying of Klamath River fall chinook occurs again in 1984.

Catch Estimate -

An effort was made to estimate the total number of chinook salmon caught by sportfishermen in the Smith River in 1983 during the sampling period (September 1-October 31). Catch rates at the mouth of the Smith River varied from 15 fish per day up to 200 fish per day on numerous occasions. The upriver catch rate was more consistent, ranging from 10-50 fish per day. An estimate of the number of salmon caught on the Smith River was determined by using an average catch of 75 salmon per day (25 fish upriver and 50 fish at the mouth).

Based on the 75 salmon per day estimate, the number of chinook salmon caught by sportfishermen on the Smith River from September 1 to October 31 was approximately 4,500 fish. Conversations with local sportsfishermen, river guides, and boat ramp operators indicated that this was a good minimal estimate of the number of fish caught. One sport tackle operator at the mouth of the Smith River kept records of the number of salmon landed at his docks during this period. He recorded over 3,000 salmon landed.

If one assumed a high sportfish catch rate of 20%, then some 22,500 adult chinook salmon entered the Smith River during this time period. A more realistic catch rate of 10% would provide an estimate of 45,000 salmon entering the Smith.

Salmon scale samples indicated that 90% of the fish were of hatchery origin and virtually all of these hatchery fish were Trinity or Klamath River stocks. A minimal estimate of Klamath River system adult fall chinook entering the Smith River from September 1 to October 31 could range from 20,475 salmon to 40,950 salmon.

This amount of straying by Klamath River fall chinook into the Smith River system is indeed significant.

I would like to thank all the sportfishermen, tackle shop operators and California Department of Fish and Game personnel in Eureka who cooperated with me during this study to collect samples and analyze the CWT tag returns.

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