

February 9, 2000

TO: Klamath River Technical Advisory Team

FROM: Yurok Tribal Fisheries Department  
Hoopa Valley Tribal Fisheries Department

SUBJECT: 1999 Klamath River fall chinook age composition

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Attached are the results of the Klamath-Trinity Basin age composition project for the 1999 fall chinook run. This project was a joint venture between the Hoopa Valley Tribe, the Yurok Tribe and the U.S. Fish and Wildlife Service (USFWS). The Hoopa Valley Tribe was responsible for scale analysis for the Trinity River, and the Yurok Tribe was responsible for the Klamath Basin. The U.S. Fish and Wildlife Service provided assistance to the Yurok Tribe.

A total of 9,472 scale samples from 14 different sampling locations were examined to estimate age composition for the total in-river run (Table 1). Scales were aged twice independently. A third aging was used as needed to resolve any discrepancies between the two primary readers. A total of 1,041 of the scale samples were unusable due to scale re-absorption, regeneration, missing scales, inconclusive age estimates or they were coded wire tagged (CWT) fish non-randomly sampled at Iron Gate Hatchery.

Scale samples from known-age CWT fish were aged to determine error associated with the Klamath River aging project. These scales were distributed throughout the Klamath Basin project, in an attempt to reflect error throughout the aging process. Of the Klamath Basin known-age scales aged, 91.2% (n=34) of the age 2 fish were correctly aged, 82.0% (n= 89) of the age 3 fish were correctly aged, 86.9% (n=137) of the age 4 fish were correctly aged and none (n=2) of the age 5 fish were aged correctly. Reader error was adjusted for bias using a maximum likelihood estimator described by Kimura and Chikuni (1987). The age 5 fish were not corrected as the small sample size rendered any correction questionable.

Analysis of scale reader error for the Trinity River samples indicated that scale readers aged known age fish with an overall accuracy rate of 92.6%. Approximately 3.6% of the known age 2 fish were read as age 3, 18.1% of the known age 3 fish were misread as age 4, 2.6% of the known age 4 fish were misread as age 3, and 100% of the known age 5 fish were misread as age 4 (n=2). Reader error was adjusted for bias using a maximum likelihood estimator described by Cook and Lord (1978) and Cook (1983). It should be noted however, that known age 5 fish were not corrected for bias. The uncorrected age 5 proportion was consistent with the proportion of known age 5 returns in relation to all known aged fish.

Two year old fish (jacks) numbers were taken from the final 1999 mega-table (CDFG 2000). The number of jacks recorded in the mega-table was primarily determined by using length-frequency distributions to determine the age 2 length cutoff. The proportion of fish belonging to age classes 3, 4, and 5 was adjusted so that the sum of all ages totaled 100%. Two exceptions

were made to this method. The number of jacks from Iron Gate Hatchery (IGH) and Bogus Creek were determined using the results from the age composition project, as the method of determining the jack cutoff length in those areas was not consistent with the other areas. The IGH jack cutoff had been determined using only fish with coded wire tags, rather than a random sample. The Bogus Creek cutoff had been determined using a subset of the data whose distribution showed no clear cutoff, and was dissimilar to the distribution for the entire data set.

In fisheries and areas where an insufficient number of scales were collected, areas that were believed to best represent the under-sampled areas were used as surrogates. The age compositions of the surrogate areas were weighted according to their escapements. Areas where surrogates were used are labeled accordingly in Table 2.

The portions of the population that contained coded wire tags were apportioned by age using the coded-wire tag information. Portions of the escapement not bearing tags were apportioned by age using scale samples from randomly sampled fish, adjusted as described above.

The Trinity Basin natural escapement was apportioned by age as follows: The total combined natural and hatchery escapement was apportioned using scale samples from the Willow Creek Weir. The age specific escapement at Trinity River Hatchery was then subtracted from the total upriver escapement at age to arrive at the net natural escapement by age. The entire Trinity River recreational fishery portion was apportioned by age using scale samples from the Hoopa Tribal Creel census program below Willow Creek Weir.

The final results for the 1999 Klamath River Basin in-river age composition after the applicable correction factor was applied resulted as follows (Table 3):

2 year olds, brood year 1997	(27.3%)
3 year olds, brood year 1996	(42.0%)
4 year olds, brood year 1995	(28.8%)
5 year olds, brood year 1994	(1.9%)

#### Literature Cited

- Kimura, D.K. and Chikuni, S. 1987. Mixtures of Empirical Distributions: An Iterative Application of the Age-Length Key. *Biometrics* 43, 23-35.
- Cook, R.C., and G.E. Lord. 1978. Identification of stocks of Bristol Bay Sockeye Salmon, *Oncorhynchus nerka*, by evaluating scale patterns with a polynomial discriminant method. *Fishery Bulletin* 76:415-423.
- Cook, R.C. 1983. Simulation and application of stock composition estimators. *Can. J. Fish. Aquat. Sci.* 40:2113-2118.
- CDFG. 2000. Klamath River Basin Fall Chinook Salmon Spawner Escapement, In-river Harvest and Run-size Estimates, 1978-1999. Memo.

Table 1. Scale sampling locations and numbers of samples provided for the 1999 Klamath River Fall chinook age composition.

Sampling Location	# Samples	Used	Not Used	Agency
Iron Gate Hatchery (IGH)	1,238	494	744	CDFG
Trinity River Hatchery (TRH)	1,687	1,670	17	HVT,CDFG
Salmon River Carcass Survey	122	115	7	USFS, CDFG
Scott River Carcass Survey	394	373	21	USFS, CDFG
Shasta River Weir & Carcass	441	428	13	USFS, CDFG
Bogus Creek Weir	735	692	43	CDFG
Willow Creek Weir	591	578	13	HVT,CDFG
Lower Klamath River Creel Census	890	861	29	CDFG
Upper Klamath River Creel Census	111	104	7	CDFG
Lower/Upper Trinity River Creel	190	183	7	HVT,CDFG
Hoopla Tribal Net Harvest	678	664	14	HVT
Yurok Tribal Net Harvest (Mouth to Hwy 101)	1,260	1,231	29	Yurok Tribe
Yurok Tribal Net Harvest (Hwy 101 to Surpur Creek)	278	267	11	Yurok Tribe
Yurok Tribal Net Harvest (Surper to Weitchpec)	1,898	1,812	86	Yurok Tribe
<b>TOTALS</b>	<b>10,513</b>	<b>9,472</b>	<b>1,041</b>	

Table 2. Age Composition of the 1999 Klamath River fall chinook run using jack estimates from the CDFG "Megatable" and scale analysis for adults.

Surrogate Scale Samples Utilized	AGE					Total Adults	Total
	<b>SPAWNER ESCAPEMENT</b>						
	2	3	4	5			
	<b>Hatchery Spawners</b>						
	4,830	7,727	1,395	168	9,290	14,120	
	1,977	2,331	2,700	32	5,063	7,040	
	<b>6,807</b>	<b>10,058</b>	<b>4,095</b>	<b>200</b>	<b>14,353</b>	<b>21,160</b>	
	<b>Natural Spawners</b>						
	Trinity River basin						
	(above Willow Creek, excluding TRH)						
	4,675	3,538	3,504	37	7,079	11,754	
	107	383	266	6	655	762	
	540	2,094	775	36	2,906	3,446	
	1,895	671	609	12	1,292	3,187	
	2,628	3,359	169	9	3,537	6,165	
IBSSS	Main Stem Klamath River						
	(excluding IGH)						
	367	1,582	393	27	2,002	2,369	
SSS	Misc. Klamath Tributaries						
	(above Hoopa and Yurok Reservations)						
	140	452	302	8	762	902	
	0	20	24	0	44	44	
SSS	Yurok Reservation Tributaries						
	108	220	147	4	371	479	
	<b>10,460</b>	<b>12,321</b>	<b>6,188</b>	<b>138</b>	<b>18,648</b>	<b>29,108</b>	
	<b>17,267</b>	<b>22,379</b>	<b>10,284</b>	<b>339</b>	<b>33,001</b>	<b>50,268</b>	
	<b>IN-RIVER HARVEST</b>						
	<b>Angler Harvest</b>						
LR Creel	25	94	18	2	114	139	
LR Creel	869	914	177	21	1,112	1,981	
	124	567	35	15	617	741	
	205	160	258	4	422	627	
	<b>1,223</b>	<b>1,735</b>	<b>488</b>	<b>42</b>	<b>2,265</b>	<b>3,488</b>	
	<b>Indian Net Harvest</b>						
	127	1,629	2,458	305	4,392	4,519	
	286	2,799	3,732	514	7,045	7,331	
	126	459	2,489	54	3,002	3,128	
	<b>539</b>	<b>4,887</b>	<b>8,679</b>	<b>873</b>	<b>14,439</b>	<b>14,978</b>	
	<b>1,762</b>	<b>6,622</b>	<b>9,167</b>	<b>915</b>	<b>16,704</b>	<b>18,466</b>	
	<b>IN-RIVER RUN</b>						
	<b>Totals</b>						
	19,029	29,001	19,450	1,253	49,705	68,734	
	24	35	10	1	45	70	
	43	391	694	70	1,155	1,198	
	<b>19,096</b>	<b>29,427</b>	<b>20,154</b>	<b>1,324</b>	<b>50,905</b>	<b>70,001</b>	

1. Iron Gate Hatchery and Bogus Creek used the jack proportions as determined by scale analysis.

IBSSS = Iron Gate Hatchery, Bogus Creek, Shasta R., Scott R., Salmon R.  
 SSS = Shasta R., Scott R., Salmon R.  
 LR Creel = Lower Klamath R. creel census

Table 3. Age Composition (percentages) of the 1999 Klamath River fall chinook run using jack estimates from the CDFG "Megatable" and scale analysis for adults. <sup>1</sup>

SPAWNER ESCAPEMENT	AGE				Total
	2	3	4	5	
<b>Hatchery Spawners</b>					
Iron Gate Hatchery (IGH)	34%	55%	10%	1%	100%
Trinity River (TRH)	28%	33%	38%	0%	100%
<b>Subtotals</b>	<b>32%</b>	<b>48%</b>	<b>19%</b>	<b>1%</b>	<b>100%</b>
<b>Natural Spawners</b>					
Trinity River basin (above Willow Creek, excluding TRH)	40%	30%	30%	0%	100%
Salmon River basin	14%	50%	35%	1%	100%
Scott River basin	16%	61%	22%	1%	100%
Shasta River Basin	59%	21%	19%	0%	100%
Bogus Creek Basin	43%	54%	3%	0%	100%
Main Stem Klamath River (excluding IGH)	15%	67%	17%	1%	100%
Misc. Klamath Tributaries (above Hoopa and Yurok Reservations)	16%	50%	33%	1%	100%
Hoopa Reservation Tributaries	0%	45%	55%	0%	100%
Yurok Reservation Tributaries	23%	46%	31%	1%	100%
<b>Subtotals</b>	<b>36%</b>	<b>42%</b>	<b>21%</b>	<b>0%</b>	<b>100%</b>
<b>Total Spawner Escapement</b>	<b>34%</b>	<b>45%</b>	<b>20%</b>	<b>1%</b>	<b>100%</b>
<b>IN-RIVER HARVEST</b>					
<b>Angler Harvest</b>					
Klamath River (below Hwy 101 bridge)	18%	67%	13%	2%	100%
Klamath River (Hwy 101 to Coon Cr. Falls)	44%	46%	9%	1%	100%
Klamath River (Coon Cr. Falls to IGH)	17%	77%	5%	2%	100%
Trinity River basin (above Weitchpec)	33%	26%	41%	1%	100%
<b>Subtotals</b>	<b>35%</b>	<b>50%</b>	<b>14%</b>	<b>1%</b>	<b>100%</b>
<b>Indian Net Harvest</b>					
Klamath River(below Hwy 101)	3%	36%	54%	7%	100%
Klamath River(Hwy 101 to Trinity mouth)	4%	38%	51%	7%	100%
Trinity River(Hoopa Reservation)	4%	15%	80%	2%	100%
<b>Subtotals</b>	<b>4%</b>	<b>33%</b>	<b>58%</b>	<b>6%</b>	<b>100%</b>
<b>Total in-river Harvest</b>	<b>10%</b>	<b>36%</b>	<b>50%</b>	<b>5%</b>	<b>100%</b>
<b>IN-RIVER RUN</b>					
<b>Totals</b>					
In-River Harvest and Escapement	28%	42%	28%	2%	100%
Angling Mortality (2% of harvest)	35%	50%	14%	1%	100%
Net Mortality (8% of harvest)	4%	33%	58%	6%	100%
<b>Total In-river Run</b>	<b>27%</b>	<b>42%</b>	<b>29%</b>	<b>2%</b>	<b>100%</b>

1. Iron Gate Hatchery and Bogus Creek used the jack proportions as determined by scale analysis.

