

# **Spring Chinook Age Composition Yurok Fisheries, 1987 through 2005**

Yurok Tribal Fisheries Program  
April 2006

## **Introduction**

This document presents the age composition for spring Chinook that were harvested in the Yurok Tribal fishery from 1987-2005 and from 1999 in the inriver recreational fishery; the only year the recreational fishery was monitored by the Yurok Tribal Fisheries Program (YTFP). It should be noted that these results are not intended to be representative of the entire run, due to size selectivity of the fisheries, but only represent fish harvested in the fisheries. A representation of the age structure of the entire run would require the collection and aging of fish that returned or were harvested throughout the entire Klamath-Trinity Basin..

## **Methods**

Age composition for samples collected from the Yurok fishery are divided into two categories: 1) those harvested below the Hwy. 101 bridge and those harvested above the bridge. The samples collected from the recreational fishery represent fish harvested downstream of Surpur Creek.

Scales were aged by two independent readers, with a third read determining the age when the first two reads disagreed. Where possible, statistical methods (Kimura and Chikuni 1987) were used to correct potential bias in the read ages of fish having no coded wire tag (validation). Only scales from fish harvested prior to August 1, or belonging to a fish with a CWT indicating that it was a spring Chinook were used for this analysis.

## **Results**

A total of 10,647 scales were mounted in this project, representing fish sampled while monitoring the Yurok harvest from 1987 through 2005, excluding 1991, and the spring recreational harvest from 1999. The numbers of fish at age are listed for each year and fishery in Table 1. Proportions at age are found in Table 2.

The number of scales available for analysis varied widely from year to year (Table 3). Some of the variation reflects different harvest levels, while some represents scales lost over the years. Missing scales are especially prevalent prior to 1994, the year the Yurok Tribe took over monitoring responsibilities from the U.S. Fish and Wildlife Service.

Several years had fewer than 100 scales available for analysis. Even though some sample sizes were inadequate to have much confidence in the results, they are presented anyway

as the only data available. In some cases, there were insufficient or zero CWT fish aged, preventing the validation matrix from presenting a reasonable correction for reader bias. Only known age fish from the same year can be used in validation, as growth patterns vary from year to year. In the cases where insufficient validation scales were available, and the validation process produced results vastly different from the read scales, no validation was used. The proportion used instead of the Kimura-corrected proportion was noted in Table 1.

Age two proportions can be determined either by setting a fork length cutoff (e.g. 22 inches), below which a fish is called a jack, or by aging scales as done in this project. Table 1 presents age two fish as determined by scale ageing. In many of the years presented here, the cutoff number is likely to be more representative, especially where there were few scales available. When the fork length cutoff for jacks was used, the adult ages were then reapportioned so that the total remains the same. The results of these calculations are found in Table 4.

### **Literature Citations**

Kimura, D.K. and Chikuni, S. 1987. Mixtures of empirical distributions: an iterative application of the age-length key. *Biometrics* 43:23–35.

Table 1. Age composition of Yurok and lower river recreational harvests

Year <sup>1</sup>	Area <sup>2</sup>	Age				Total
		2	3	4	5	
1987	Below Hwy. 101	1	378	430	0	809
	Above Hwy. 101	1	529	355	0	885
1988 <sup>3</sup>	Below Hwy. 101	50	557	1,070	0	1,677
	Above Hwy. 101	0	625	546	78	1,249
1989	Below Hwy. 101	0	177	671	2	850
	Above Hwy. 101	0	106	3,819	0	3,925
1990	Below Hwy. 101	0	92	243	3	338
	Above Hwy. 101	0	244	780	1	1,025
1992 <sup>4</sup>	Below Hwy. 101	0	3	11	0	15
	Above Hwy. 101	1	89	285	7	381
1993 <sup>5</sup>	Below Hwy. 101	0	13	6	0	19
	Above Hwy. 101	11	355	159	6	531
1994 <sup>6</sup>	Below Hwy. 101	12	102	46	0	161
	Above Hwy. 101	7	73	275	11	366
1995	Below Hwy. 101	1	598	45	12	656
	Above Hwy. 101	12	1,514	371	39	1,936
1996	Below Hwy. 101	0	2,363	2,618	0	4,981
	Above Hwy. 101	0	296	657	0	953
1997 <sup>7</sup>	Below Hwy. 101	0	290	2,472	157	2,919
	Above Hwy. 101	0	251	2,135	135	2,521
1998	Below Hwy. 101	0	215	405	3	623
	Above Hwy. 101	1	462	1,244	10	1,717
1999	Below Hwy. 101	0	110	345	3	458
	Above Hwy. 101	0	475	1,460	1	1,936
	Lower River Recreational	1	437	205	2	645
2000	Below Hwy. 101	1	1,597	179	0	1,777
	Above Hwy. 101	2	991	434	2	1,429
2001	Below Hwy. 101	2	6,099	7,613	0	13,714
	Above Hwy. 101	0	536	1,180	0	1,716

Table 1 cont. Age composition of Yurok and lower river recreational harvests

Year <sup>1</sup>	Area <sup>2</sup>	Age				Total
		2	3	4	5	
2002	Below Hwy. 101	0	5,394	3,040	1	8,435
	Above Hwy. 101	0	2,348	1,261	0	3,609
2003	Below Hwy. 101	1	659	1,933	0	2,593
	Above Hwy. 101	0	1,039	3,043	3	4,085
2004	Below Hwy. 101	0	1,133	1,454	1	2,588
	Above Hwy. 101	1	1,615	2,461	1	4,078
2005	Below Hwy. 101	0	180	222	1	403
	Above Hwy. 101	0	776	970	6	1,752

1. No scales were available for 1991
2. Unless otherwise stated, all areas represent Yurok fisheries
3. Due to lack of unknown scales, proportion used was that of the uncorrected sum of known and unknown scales
4. Due to no validation matrix and low estuary sampling, the unknown fish were proportioned using uncorrected proportions from both areas' unknown scale reads
5. Inadequate validation matrix (2 known scales), no estuary scales, all areas used uncorrected proportions from the harvest above Highway 101.
6. Inadequate validation matrix (6 known age scales), used uncorrected proportions
7. Based on a single reader, no scales from Middle or Upper Klamath. Inadequate validation matrix (only one 3-year old), used uncorrected Estuary proportions

Table 2. Age composition proportions of Yurok and lower river recreational harvests

Year	Area	Proportion at Age				Total
		2	3	4	5	
1987	Below Hwy. 101	0.0012	0.4676	0.5312	0.0000	1.0000
	Above Hwy. 101	0.0011	0.5983	0.4006	0.0000	1.0000
1988	Below Hwy. 101	0.0298	0.3323	0.6379	0.0000	1.0000
	Above Hwy. 101	0.0000	0.5004	0.4370	0.0626	1.0000
1989	Below Hwy. 101	0.0000	0.2083	0.7893	0.0024	1.0000
	Above Hwy. 101	0.0000	0.0269	0.9731	0.0000	1.0000
1990	Below Hwy. 101	0.0000	0.2708	0.7203	0.0089	1.0000
	Above Hwy. 101	0.0000	0.2381	0.7610	0.0010	1.0000
1992	Below Hwy. 101	0.0000	0.2321	0.7500	0.0179	1.0000
	Above Hwy. 101	0.0026	0.2329	0.7467	0.0177	1.0000
1993	Below Hwy. 101	0.0215	0.6667	0.3011	0.0108	1.0000
	Above Hwy. 101	0.0213	0.6685	0.2996	0.0106	1.0000
1994	Below Hwy. 101	0.0768	0.6349	0.2884	0.0000	1.0000
	Above Hwy. 101	0.0203	0.1994	0.7507	0.0296	1.0000
1995	Below Hwy. 101	0.0015	0.9119	0.0688	0.0178	1.0000
	Above Hwy. 101	0.0064	0.7818	0.1917	0.0202	1.0000
1996	Below Hwy. 101	0.0000	0.4744	0.5256	0.0000	1.0000
	Above Hwy. 101	0.0000	0.3109	0.6891	0.0000	1.0000
1997	Below Hwy. 101	0.0000	0.0994	0.8469	0.0537	1.0000
	Above Hwy. 101	0.0000	0.0997	0.8469	0.0535	1.0000
1998	Below Hwy. 101	0.0000	0.3453	0.6499	0.0048	1.0000
	Above Hwy. 101	0.0006	0.2690	0.7246	0.0058	1.0000
1999	Below Hwy. 101	0.0000	0.2409	0.7525	0.0066	1.0000
	Above Hwy. 101	0.0000	0.2456	0.7539	0.0005	1.0000
	Lower River Recreational	0.0016	0.6771	0.3182	0.0031	1.0000
2000	Below Hwy. 101	0.0006	0.8989	0.1005	0.0000	1.0000
	Above Hwy. 101	0.0014	0.6931	0.3041	0.0014	1.0000
2001	Below Hwy. 101	0.0001	0.4447	0.5551	0.0000	1.0000
	Above Hwy. 101	0.0000	0.3123	0.6877	0.0000	1.0000
2002	Below Hwy. 101	0.0000	0.6395	0.3603	0.0001	1.0000
	Above Hwy. 101	0.0000	0.6506	0.3494	0.0000	1.0000
2003	Below Hwy. 101	0.0004	0.2540	0.7456	0.0000	1.0000
	Above Hwy. 101	0.0000	0.2542	0.7450	0.0007	1.0000
2004	Below Hwy. 101	0.0000	0.4376	0.5620	0.0004	1.0000
	Above Hwy. 101	0.0002	0.3959	0.6036	0.0002	1.0000
2005	Below Hwy. 101	0.0000	0.4473	0.5502	0.0025	1.0000
	Above Hwy. 101	0.0000	0.4429	0.5536	0.0034	1.0000

Table 3. Number of fish used to calculate the age composition for each year

Year	Unknown Scales Read	Known Scales Read	All Known Scales	Total Fish Used	Harvest
1987	64	21	60	124	1,694
1988	5	18	44	49	2,926
1989	284	25	73	357	4,775
1990	164	5	21	185	1,363
1992	56	0	3	59	396
1993	93	2	6	99	550
1994	79	2	16	95	527
1995	257	46	98	355	2,592
1996	87	15	97	184	5,934
1997	370	22	66	436	5,440
1998	509	31	59	568	2,340
1999	861	120	142	1,003	3,039
2000	514	78	264	778	3,206
2001	961	170	487	1,448	15,430
2002	1,720	217	355	2,075	12,044
2003	872	181	275	1,147	6,678
2004	672	51	78	750	6,666
2005	486	121	203	689	2,155

Table 4. Age composition of Yurok and lower river recreational harvests using jacks as determined by fork length cutoff.

Year	Area	Age				Total
		2	3	4	5	
1987	Below Hwy. 101	23	368	418	0	809
	Above Hwy. 101	25	515	345	0	885
1988	Below Hwy. 101	27	565	1,085	0	1,677
	Above Hwy. 101	20	615	537	77	1,249
1989	Below Hwy. 101	0	177	671	2	850
	Above Hwy. 101	0	106	3,819	0	3,925
1990	Below Hwy. 101	0	92	243	3	338
	Above Hwy. 101	0	244	780	1	1,025
1992	Below Hwy. 101	0	3	11	0	15
	Above Hwy. 101	0	89	285	7	381
1993	Below Hwy. 101	0	13	6	0	19
	Above Hwy. 101	0	363	163	6	531
1994	Below Hwy. 101	9	105	47	0	161
	Above Hwy. 101	17	71	267	11	366
1995	Below Hwy. 101	0	599	45	12	656
	Above Hwy. 101	0	1,523	373	39	1,936
1996	Below Hwy. 101	17	2,355	2,609	0	4,981
	Above Hwy. 101	12	293	648	0	953
1997	Below Hwy. 101	0	290	2,472	157	2,919
	Above Hwy. 101	0	251	2,135	135	2,521
1998	Below Hwy. 101	2	214	404	3	623
	Above Hwy. 101	0	462	1,245	10	1,717
1999	Below Hwy. 101	2	110	343	3	458
	Above Hwy. 101	0	475	1,460	1	1,936
	Lower River Recreational	41	410	193	2	645
2000	Below Hwy. 101	5	1,594	178	0	1,777
	Above Hwy. 101	8	986	433	2	1,429
2001	Below Hwy. 101	231	5,997	7,486	0	13,714
	Above Hwy. 101	20	530	1,166	0	1,716

Table 4 cont. Age composition of Yurok and lower river recreational harvests using jacks as determined by fork length cutoff.

Year	Area	Age				Total
		2	3	4	5	
2002	Below Hwy. 101	32	5,374	3,028	1	8,435
	Above Hwy. 101	94	2,287	1,228	0	3,609
2003	Below Hwy. 101	14	655	1,924	0	2,593
	Above Hwy. 101	0	1,039	3,043	3	4,085
2004	Below Hwy. 101	12	1,127	1,448	1	2,588
	Above Hwy. 101	17	1,608	2,452	1	4,078
2005	Below Hwy. 101	1	180	221	1	403
	Above Hwy. 101	12	771	963	6	1,752

Appendix A. Validation matrices for each year. The known age of the scale is listed across the top, and the read age down the side.

**Known Age**

Read age

<b>1987</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>2</b>	1	0	0	0
<b>3</b>	0	6	0	0
<b>4</b>	0	1	13	0
<b>5</b>	0	0	0	0

<b>1988</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>2</b>	0	0	0	0
<b>3</b>	0	10	0	0
<b>4</b>	0	0	8	0
<b>5</b>	0	0	0	0

<b>1989</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>2</b>	0	0	0	0
<b>3</b>	0	1	1	0
<b>4</b>	0	0	23	0
<b>5</b>	0	0	0	0

<b>1990</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>2</b>	0	0	0	0
<b>3</b>	0	1	0	0
<b>4</b>	0	0	2	1
<b>5</b>	0	0	0	1

<b>1992</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>2</b>	0	0	0	0
<b>3</b>	0	0	0	0
<b>4</b>	0	0	0	0
<b>5</b>	0	0	0	0

<b>1993</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>2</b>	0	0	0	0
<b>3</b>	0	2	0	0
<b>4</b>	0	0	0	0
<b>5</b>	0	0	0	0

<b>1994</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>2</b>	0	0	0	0
<b>3</b>	0	2	2	0
<b>4</b>	0	2	0	0
<b>5</b>	0	0	0	0

<b>1995</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>2</b>	0	0	0	0
<b>3</b>	0	35	0	0
<b>4</b>	0	8	2	0
<b>5</b>	0	0	0	1

<b>1996</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>2</b>	0	0	0	0
<b>3</b>	0	3	1	0
<b>4</b>	0	3	8	0
<b>5</b>	0	0	0	0

<b>1997</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>2</b>	0	0	0	0
<b>3</b>	0	0	1	0
<b>4</b>	0	1	19	0
<b>5</b>	0	0	0	1

<b>1998</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>2</b>	0	0	0	0
<b>3</b>	0	7	0	0
<b>4</b>	0	1	13	4
<b>5</b>	0	0	0	6

<b>1999</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>2</b>	1	0	0	0
<b>3</b>	0	25	3	0
<b>4</b>	0	11	78	2
<b>5</b>	0	0	0	1

**Known Age**

<b>2000</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>2</b>	0	0	0	0
<b>3</b>	0	48	1	0
	0	13	14	0
<b>5</b>	0	0	1	1

<b>2001</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>2</b>	0	0	0	0
<b>3</b>	0	44	6	0
<b>4</b>	0	2	118	0
<b>5</b>	0	0	0	0

Read age

<b>2002</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>2</b>	0	0	0	0
<b>3</b>	0	135	3	0
<b>4</b>	0	5	74	0
<b>5</b>	0	0	0	0

<b>2003</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>2</b>	0	0	0	0
<b>3</b>	0	48	1	0
<b>4</b>	0	8	120	1
<b>5</b>	0	0	1	2

<b>2004</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>2</b>	0	0	0	0
<b>3</b>	0	14	0	0
<b>4</b>	0	8	26	2
<b>5</b>	0	0	0	1

<b>2005</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>2</b>	0	0	0	0
<b>3</b>	0	46	1	0
<b>4</b>	0	3	65	0
<b>5</b>	0	0	0	6