Upper Sacramento River Winter Chinook Salmon Carcass Survey

2005 Annual Report

A U.S. Fish & Wildlife Service Report

Annual Report to

California Bay-Delta Authority
Ecosystem Restoration Program
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Abstract

The U.S. Fish & Wildlife Service conducts a supplementation program for Sacramento River winter Chinook salmon, an endangered species, at the Livingston Stone National Fish Hatchery. Since 1996, the U.S. Fish & Wildlife Service and the California Department of Fish and Game have cooperated on an annual survey of winter Chinook salmon returning to the upper Sacramento River (Upper Sacramento River winter Chinook salmon carcass survey). Provided in this report is a summary of the 2005 upper Sacramento River winter Chinook salmon carcass survey, including: (1) an evaluation of the winter Chinook salmon supplementation program at the Livingston Stone National Fish Hatchery, and (2) a genetic run identification of the spawning population.

An estimated 3,103 hatchery-origin winter Chinook salmon returned to the upper Sacramento River in 2005. This represents an estimated increase of 2,899 fish over what would have been produced if the fish used as brood stock in the Livingston Stone National Fish Hatchery supplementation program had been allowed to spawn naturally. Recoveries of hatchery-origin carcasses included many coded-wire tag codes indicating that the returning hatchery-origin winter Chinook salmon descended from different family groups and likely maintained the genetic diversity of the parent stock. Abundance of hatchery-origin female carcasses was bimodal with the highest peak in abundance occurring approximately two and a half weeks later than natural-origin female carcasses.

Length of age-2 hatchery-origin males was not significantly different than that of age-2 natural-origin males. Too few grilse hatchery-origin females were collected for size comparison to grilse natural-origin females. Age-3 natural-origin fish could not be distinguished from age-4 fish using length-frequency analysis and hatchery fish did not return as age-4 so length comparisons between adults could not be made. The proportion of hatchery-origin males and females returning as grilse was not different from natural-origin males and females. Considerably more females were recovered overall for both hatchery- and natural-origin fish. Hatchery-origin winter Chinook salmon were not more likely to return as males compared to natural-origin winter Chinook salmon. Hatchery- and natural-origin winter Chinook salmon carcasses were distributed similarly throughout the survey area. Hatchery- and natural-origin females appeared to have equal spawning success based on the numbers of pre-spawn mortalities.

Introduction

In 2005, the U.S. Fish & Wildlife Service (Service) and the California Department of Fish and Game (CDFG) conducted a survey of adult winter Chinook salmon *Oncorhynchus tshawytscha* carcasses in the upper Sacramento River. Primary objectives of the upper Sacramento River winter Chinook salmon carcass survey (carcass survey) were to (1) collect information on several important life history attributes of winter Chinook salmon, including: age and gender composition of the spawning population, pre-spawning mortality rate, and temporal and spatial distribution of spawning, (2) collect data useful in evaluating the winter Chinook salmon supplementation program at the Livingston Stone National Fish Hatchery (NFH), and (3) estimate the abundance of winter Chinook salmon returning to the upper Sacramento River. The following report is submitted to satisfy annual requirements of the Service, including objectives one and two. A complimentary report has been prepared by the CDFG to address objectives one and three. Together, these reports satisfy the reporting responsibilities for the fifth year of this project funded by the California Bay-Delta Authority, formerly CalFed.

Background

The Sacramento River supports four distinct "runs" of Chinook salmon: fall, late-fall, spring, and winter. Adult winter Chinook salmon begin their migration in freshwater from November through June in an immature reproductive state. They migrate into the upper reaches of the Sacramento River, hold in cool waters released from Shasta Dam, and spawn from May through August between the city of Red Bluff (river mile [RM] 245) and the Keswick Dam (RM 302), the upper limit of migration. Most winter Chinook salmon spawn at age three, with the remainder spawning at ages two and four (Hallock and Fisher 1985; Fisher 1994). Virtually all of the grilse (age-2) are males, commonly known as "jacks."

Winter Chinook salmon have been listed as endangered under the Endangered Species Act since 1994 (59 Federal Register 440) due to a small abundance of returning adults and a declining population trend (Figure 1). In 1989, the Service began propagating winter Chinook salmon to supplement natural production and to protect against extinction. The winter Chinook supplementation program was initially located at the Coleman NFH on Battle Creek, a tributary of the Sacramento River. In 1998, the program was moved to a new facility at the base of Shasta Dam, Livingston Stone NFH, to improve imprinting and adult returns to the main stem Sacramento River.

The Sacramento River winter Chinook salmon recovery plan (National Marine Fisheries Service 1997) specified delisting criteria of a mean annual spawning abundance of 10,000 females and a cohort replacement rate greater than one for 13 consecutive years. The recovery plan also stipulated that a monitoring system, with an estimation error less than 25%, must be in place to estimate abundance of spawning winter Chinook salmon. Beginning in 1996, the Service and CDFG began cooperating on a carcass survey to improve the precision of population estimates of winter Chinook salmon through the use of a mark-recapture estimator.

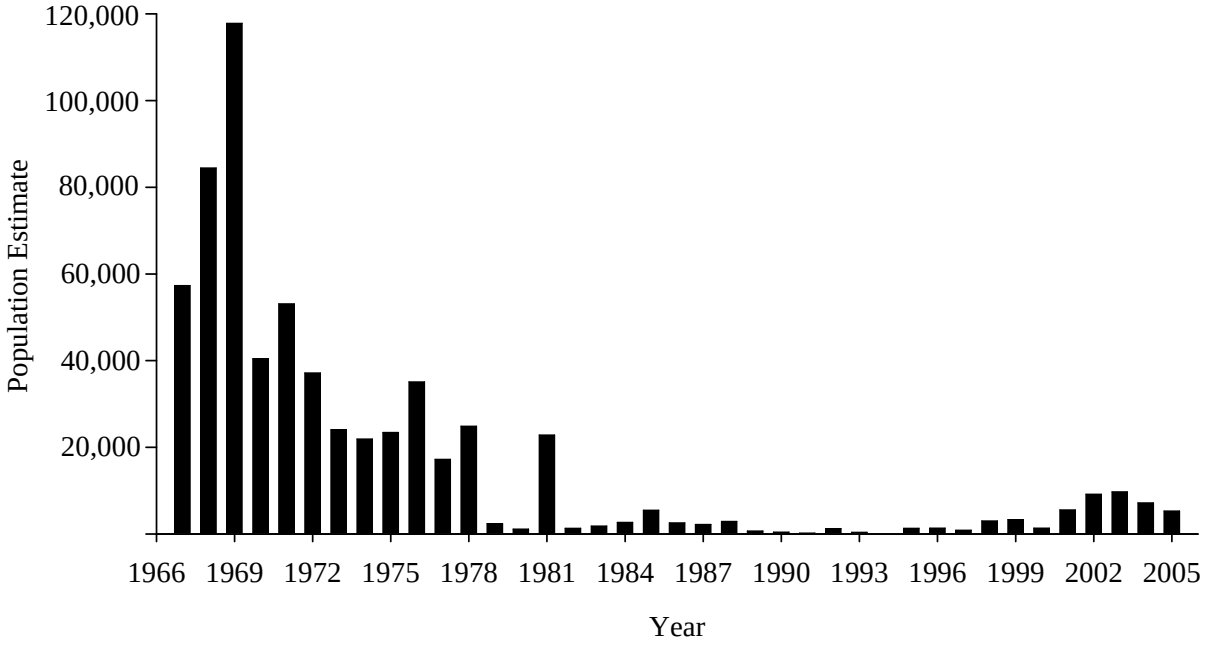

Figure 1. Population abundance estimates for Sacramento River winter Chinook salmon from 1967-2005. Estimates were determined from adult counts made at the Red Bluff Diversion Dam, California.

Study Area

The 2005 carcass survey was conducted on the upper Sacramento River, California and was designed to encompass the primary spawning areas of winter Chinook salmon. The survey area covered approximately 29 miles of the Sacramento River and was divided into four reaches (Figure 2): reach 1 extended from the Keswick Dam (RM 302) to the Anderson-Cottonwood Irrigation District (ACID) Diversion Dam (RM 298.5); reach 2 extended from the ACID Dam to the Cypress Street Bridge in Redding, California (RM 295); reach 3 extended from the Cypress Street Bridge to Plywood Riffle (RM 287), and reach 4 extended from Plywood Riffle to the mouth of Cottonwood Creek (RM 273.3).

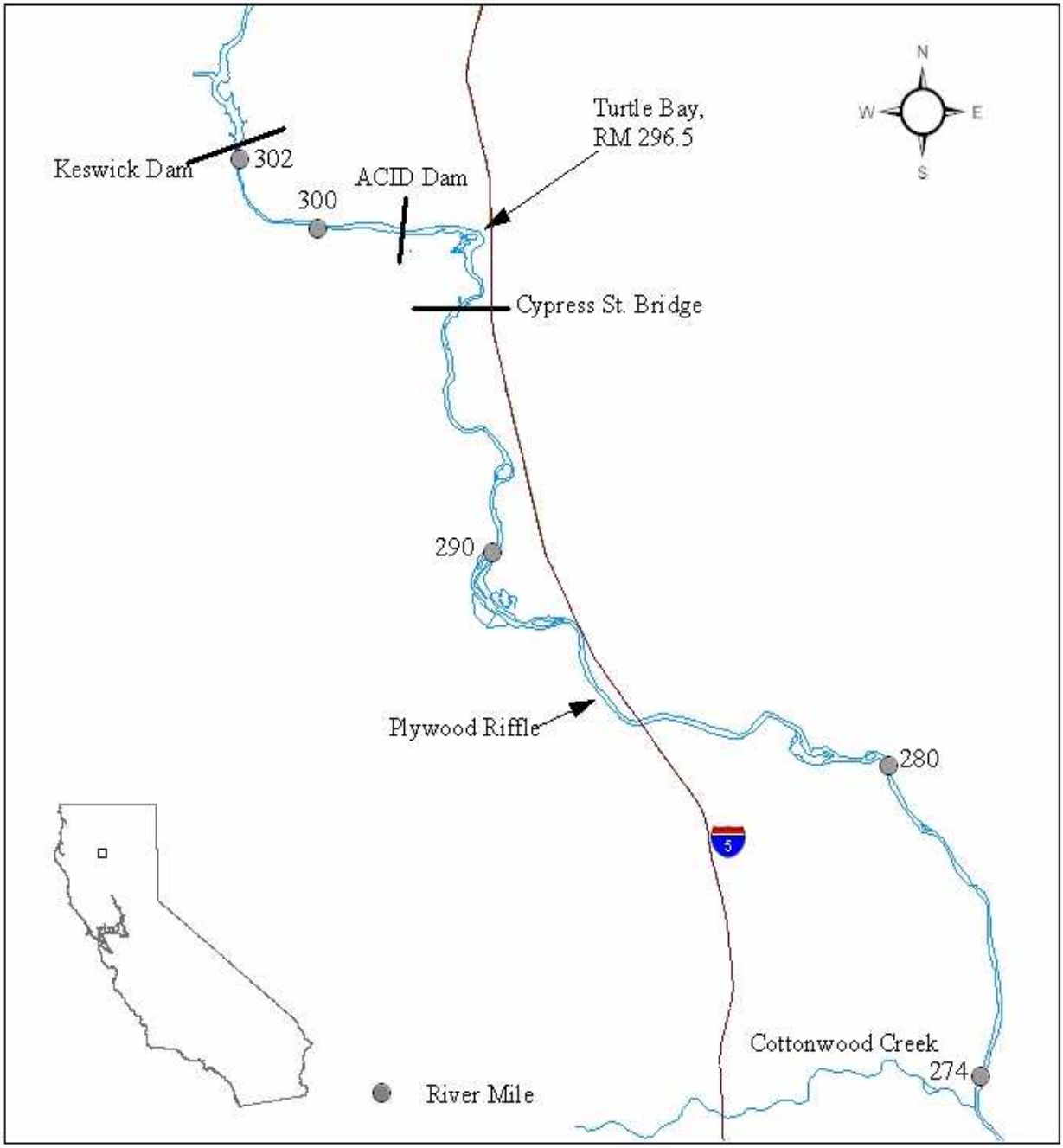

Figure 2. Upper Sacramento River and the 2005 winter Chinook salmon carcass survey sampling area. Reach 1 extended from the Keswick Dam (RM 302) to the Anderson-Cottonwood Irrigation District (ACID) Diversion Dam (RM 298.5); reach 2 extended from the ACID Dam to the Cypress Street Bridge in Redding, California (RM 295); reach 3 extended from the Cypress Street Bridge to Plywood Riffle (RM 287); and reach 4 extended from Plywood Riffle to the mouth of Cottonwood Creek (RM 273.3).

Methods

Carcass Recoveries

The carcass survey was designed to include the entire winter Chinook spawning period and was conducted daily from 28 April 2005 through 2 September 2005 in 3-day cycles: reach 4 on the first day; reach 3 on the second day, and reaches 2 then 1 on the third day. The order that reaches were sampled was constant throughout the survey. The survey was conducted with multiple boats, each having one observer and one operator. Two boats surveyed from opposite shorelines to the middle of the river. Additional boats assisted in areas of high carcass deposition. Carcasses were collected using a 5 meter pole with a five-pronged gig attached. Reach 4 was added in 2004 as a supplemental survey area to determine if a higher proportion of males would be found downstream from the general survey area. This reach was again surveyed in 2005 for the same reason and was surveyed regularly throughout the survey period.

Data gathered included: date, location (reach, RM, and latitude and longitude), carcass condition (fresh or non-fresh), gender, spawn status (spawned, unspawned, and unknown), fork length (FL), and adipose fin status (absent, present, or unknown). Carcasses were considered to be fresh if they had two clear eyes or one clear eye and firm body texture. Spawn status of females was defined as *spawned* (abdomen extremely flaccid or very few eggs remaining), *unspawned* (abdomen firm and swollen or many eggs remaining), or *unknown* (indeterminable spawn status, usually due to predation on the carcass). The spawn status of males was always categorized as unknown. Adipose fin status was used to determine origin: hatchery-origin or natural-origin. A carcass missing an adipose fin was assumed to be of hatchery-origin and an intact adipose fin was assumed to indicate natural-origin. The head was collected from all hatchery-origin carcasses for coded-wire tag extraction in the laboratory. In addition, the head from carcasses with an adipose fin status of "unknown" was collected for examination for a coded-wire tag. These carcasses were later tallied as hatchery-origin if they contained a coded-wire tag.

To evaluate the winter Chinook supplementation program at Livingston Stone NFH, hatchery- and natural-origin fish were compared to determine the extent to which the following metrics were similar: spatial distribution, spawn timing, gender composition, spawn status, body size, and age composition. Length of hatchery-origin fish was determined from fresh carcasses containing a readable coded-wire tag. Age composition of hatchery-origin fish was determined from all carcasses containing a readable coded-wire tag. Analyses of spatial distribution, spawn timing, gender composition, and spawn status of hatchery-origin fish included data from fresh carcasses with a clipped adipose fin and those with an "unknown" adipose fin clip that contained a coded-wire tag. For natural-origin fish, all analyses were conducted with data collected from fresh carcasses without an adipose fin clip.

- Spatial Distribution, by RM, of hatchery- and natural-origin winter Chinook was evaluated considering female carcasses only. Overall, frequency distributions were visually compared and examined for substantial differences. Additionally, the proportions of hatchery- and natural-origin fish above and below the ACID Dam were compared using Yates' corrected Chi-square analysis. Spatial Distribution, by reach, of hatchery- and natural-origin winter Chinook was evaluated considering male and female

carcasses. The proportion of hatchery- and natural-origin fish in reaches 1, 2, and 3 was compared with that in reach 4 using Yates' corrected Chi-square analysis.

- Spawn Timing was evaluated by comparing temporal distributions of female carcass recoveries (hatchery- and natural-origin). The frequency of carcass recoveries was plotted against date and visually compared and examined for substantive differences.

- Gender Composition of hatchery- and natural-origin winter Chinook salmon was compared using Yates' corrected Chi-square analysis.

- Spawn status of female hatchery- and natural-origin winter Chinook was compared using Yates' corrected Chi-square analysis.

- Length of hatchery- and natural-origin carcasses was compared using a separate variance t-test on fork lengths (mm) of carcasses recovered, grouped by gender and age.

- Age Composition of hatchery-origin winter Chinook salmon was evaluated using brood year information obtained from coded-wire tag data. Age composition of natural-origin winter Chinook salmon was determined using length frequency histograms. By looking for logical breaks in the frequency distributions, a cutoff value was determined to distinguish between grilse (age-2) and adults (≥ age-3) for both males and females. Age of hatchery- and natural-origin winter Chinook salmon was compared using Yates' corrected Chi-square analysis.

Genetic Analyses

In addition to the above analyses, a tissue sample was collected from the fin or operculum of all hatchery-origin carcasses and from natural-origin carcasses that were not extremely decayed for later genetic analysis. When a large number of fresh natural-origin carcasses were present, tissue samples were collected from a subsample of these carcasses (e.g. one out of every three suitable carcasses); otherwise a tissue sample was taken from all suitable carcasses.

A genetic-based run assignment was used to classify carcasses as either "winter-run" or "non-winter-run" Chinook (University of California – Davis Bodega Marine Laboratory 2001) and to determine gender (Du et al. 1993). Genetic analyses were conducted at the Service's Conservation Genetics Laboratory (CGL) located at the Abernathy Fish Technology Center in Longview, Washington. Based on data from previous years, we hypothesized that nearly all Chinook salmon carcasses recovered during the peak winter Chinook spawning period would be identified as winter Chinook whereas non-winter Chinook carcasses were more likely to be recovered during the early and late segments of the run. Therefore, genetic analyses were conducted on all samples collected during the early (i.e., April and May) and late (i.e., August and September) segments of the run and a random sub-sample of tissues from the peak spawning period (i.e., June and July).

The results of the genetic-based run assignment were used to estimate the percentage of natural-origin Chinook salmon carcasses that were winter-run. The total estimate was calculated from a summation of monthly estimates of the number of winter-run; based on the number of natural-

origin carcasses recovered in each month, the proportion of samples analyzed for each month, and the proportion of carcasses determined to be winter-run.

Using Qiagen Spin Columns, DNA was extracted following manufacturer protocols for animal tissue. Tissue samples were analyzed at a suite of seven microsatellite markers that were selected for their diagnostic power in distinguishing winter Chinook from other Chinook salmon populations (University of California – Davis Bodega Marine Laboratory 2001). Following the methods described by Banks et al. (1999) and Greig and Banks (1999), extracted samples were amplified at 7 microsatellite loci combined into three multiplexed polymerase chain reactions (PCRs): MSA (Ots9, Ots2), MSB (Ots3M, Ots10, One13), and MSC (Ots104 and Ots107). The PCRs were run on MJ Research thermal cyclers using conditions developed at the University of California – Davis Bodega Marine Laboratory and standardized at the CGL. Amplified samples were run on Applied Biosystem's 3100 Genetic Analyzer and analyzed using the Genotyper® software. Overall genotypes were converted to GENEPOP format and individual population assignments determined with the WHICHRUN program (Banks and Eichert 2000). Samples were run 2 or 3 times to confirm genotypes.

Run assignments (winter or non-winter) were based on log-of-the-odds (LOD) scores generated using the computer software WHICHRUN based on a likelihood ratio of average probability of the critical population (winter-run) over the next most likely population from the baseline. Chinook receiving an LOD score ≥ 2 were assigned as winter-run; with those receiving a score < 2 assigned as non-winter. An additional marker, growth hormone pseudogene (GHpsi), was also included as a gender determinate marker. This marker, originally developed by Du et al. (1993), was optimized at the CGL. For this marker, the presence of a 273 base pair allele was indicative of a male Chinook and its absence indicative of a female. A PCR positive was included in all reactions to prevent a failed PCR from being incorrectly assigned as female.

Demographic Benefit of Hatchery Supplementation

The primary objective of the winter Chinook salmon supplementation program at Livingston Stone NFH is to increase abundance of the naturally spawning population. To evaluate attainment of this objective, we compared the estimated contribution of the hatchery supplementation program to the estimated return had the hatchery brood stock been allowed to spawn naturally.

The winter Chinook salmon escapement that would have been produced by the hatchery brood stock had they been allowed to spawn naturally was estimated based on age composition information for winter Chinook salmon (Hallock and Fisher 1985) and recent winter Chinook salmon population estimates based on the Jolly-Seber mark-recapture method (Appendix A-1; Snider et al. 2001 and 2002; Killam 2004 and 2006). Next, we estimated the hatchery-origin winter Chinook salmon escapement due to the existing supplementation program (Appendix A-2). The number of non-fresh hatchery-origin winter Chinook salmon carcasses was expanded based on the proportion of fresh hatchery-origin carcass recoveries among all fresh recoveries. This estimate plus the fresh hatchery-origin carcass recoveries was then expanded to include carcasses believed to have been present, but not observed, during the carcass survey based on the Jolly-Seber mark-recapture method (Killam 2006). Hatchery-origin fish retained at Livingston Stone NFH for use as brood stock and those with an undetermined "freshness" were then

accounted for. The estimate of total clipped hatchery-origin fish was then expanded to include hatchery-origin fish that did not receive an adequate fin clip (estimated from mark retention data). The two estimates arrived at from the calculations contained in Appendices A-1 and A-2 above, were then compared to determine the numerical contribution of the hatchery supplementation program to the 2005 winter Chinook run size (Appendix A-3).

Results

Carcass Recoveries

A total of 8,772 carcasses were observed, including 1,486 hatchery-origin, 7,207 natural-origin, and 79 of unknown-origin. Biological data (i.e.; date, location, carcass condition, gender, spawn status, fork length, and adipose fin status) were collected from all hatchery- and unknown-origin carcasses and from 3,224 fresh natural-origin carcasses. One thousand four hundred sixty of the hatchery-origin, 642 fresh natural-origin, and 78 unknown-origin carcasses were tissue sampled.

Coded-Wire Tag Recoveries

The head was collected from 1,468 hatchery-origin and 78 unknown-origin carcasses (Table 1). Additionally, no attempt was made to collect a head from ten hatchery-origin carcasses, usually a result of animal predation on the carcass, and an additional nine heads were lost prior to any attempt at tag excising (8 hatchery-origin and 1 unknown-origin). A readable coded-wire tag was recovered from 1,262 heads (Appendix B). Of these, 1,261 were from brood year 2001, 2002, or 2003 winter Chinook salmon reared at Livingston Stone NFH (Figure 3, Table 2, Appendix C). In addition, one tag (code 062756) was recovered from a brood year 2002 spring Chinook salmon reared at the CDFG Feather River Hatchery. Data from this fish were excluded from all tables, figures, and analyzes.

Two hundred sixty five decoded tags were from progeny of winter Chinook salmon captive brood stock: 243 from brood year 2002 (72 of code 051297, 108 of code 051298, and 63 of code 053737) and 22 from brood year 2003 (5 of code 051995, 10 of code 051996, and 7 of code 051997). Of the 78 carcasses originally collected as “unknown” origin, based on the adipose fin, 12 contained a coded-wire tag and were reclassified as hatchery-origin. Of the 668 heads collected from non-fresh hatchery-origin carcasses, 82.3% (n = 553) contained a coded-wire tag. For the 796 heads collected from fresh hatchery-origin carcasses, 87.2% (n = 694) contained a coded-wire tag. Among fresh and non-fresh hatchery-origin carcasses, there was a difference in the percent of carcasses containing a coded-wire tag (Yates corrected Chi square: df = 1; P = 0.022). The freshness of three hatchery-origin carcasses was not determined; all contained a coded-wire tag.

Spatial Distribution

The largest concentration of fresh female hatchery-origin carcasses (29.3%) was found at Turtle Bay (RM 296.5) followed by RM 299 (20.0%) and RM 298 (9.8%; Figure 4). The largest concentration of fresh female natural-origin carcasses (32.3%) was also found at Turtle Bay (RM 296.5) but followed by RM 297 (13.3%) and RM 299 (11.4%). The proportion of carcasses above the ACID dam (RM 298.5) was different for hatchery-origin (40.0%) and natural-origin (28.4%) carcasses (Yates corrected Chi square: df = 1; P < 0.001).

Overall, a greater proportion of males (8.2%) were collected in reach 4 than females (1.0%; Yates corrected Chi square: df = 1; $P < 0.001$). This disparity was present among natural-origin (Yates corrected Chi square: df = 1; $P < 0.001$) and hatchery-origin carcasses (Yates corrected Chi square: df = 1; $P < 0.001$).

Table 1. Number of samples with a readable coded-wire tag (CWT), no tag detected (NTD), and tag lost before being read (Lost) from winter Chinook salmon heads collected during the 2005 upper Sacramento River carcass survey. See text for description of 'Carcass condition' and 'Adipose fin'.

Gender	Carcass condition	Adipose Fin	CWT	NTD	Lost	Total
Female	Fresh	Hatchery	508	86	1	595
Female	Fresh	Unknown	3	27	0	30
Female	Non-fresh	Hatchery	405	96	0	501
Female	Non-fresh	Unknown	5	31	0	36
Female	Unknown	Hatchery	2	0	0	2
Male	Fresh	Hatchery	182	16	0	198
Male	Fresh	Unknown	2	4	0	6
Male	Non-fresh	Hatchery	148	19	0	167
Male	Non-fresh	Unknown	2	3	0	5
Male	Unknown	Hatchery	1	0	0	1
Unknown	Fresh	Hatchery	2	0	0	2
Unknown	Non-fresh	Hatchery	1	0	0	1
Unknown	Non-fresh	Unknown	0	1	0	1
			1261	283	1	1545

Table 2. Coded-wire tag (CWT) codes inserted into fish released from Livingston Stone National Fish Hatchery during brood years 2001 - 2003 (tag numbers correspond to those reported in Figure 3). *CWT codes that were used for the progeny of captive brood stock held at the University of California-Davis Bodega Marine Laboratory.

Broodyear 2001		Broodyear 2002		Broodyear 2003	
Tag Number	CWT Code	Tag Number	CWT Code	Tag Number	CWT Code
1	0501020507	29	051276	64	051679
2	0501030705*	30	051277	65	051964
3	0501030706	31	051278	66	051965
4	0501030707	32	051279	67	051966
5	0501030708	33	051280	68	051967
6	0501030709	34	051281	69	051968
7	0501030801	35	051282	70	051969
8	0501030802	36	051283	71	051970
9	0501030803	37	051284	72	051971
10	0501030804	38	051285	73	051972
11	0501030805	39	051286	74	051973
12	0501030806	40	051287	75	051974
13	0501030807	41	051288	76	051975
14	0501030808	42	051289	77	051976
15	0501030809	43	051290	78	051977
16	0501030901	44	051291	79	051978
17	0501030902	45	051292	80	051979
18	0501030903	46	051293	81	051980
19	0501030904	47	051294	82	051981
20	0501030905	48	051295	83	051982
21	0501030906	49	051296	84	051983
22	0501030907	50	051297*	85	051984
23	0501030908	51	051298*	86	051985
24	0501030909	52	051299	87	051986
25	0501040101	53	051364	88	051987
26	0501040102	54	051365	89	051988
27	0501040103	55	051366	90	051989
28	0501040104	56	051367	91	051990
		57	051368	92	051991
		58	051369	93	051992
		59	051370	94	051993
		60	051371	95	051994*
		61	051372	96	051995*
		62	051373	97	051996*
		63	053737*	98	051997*

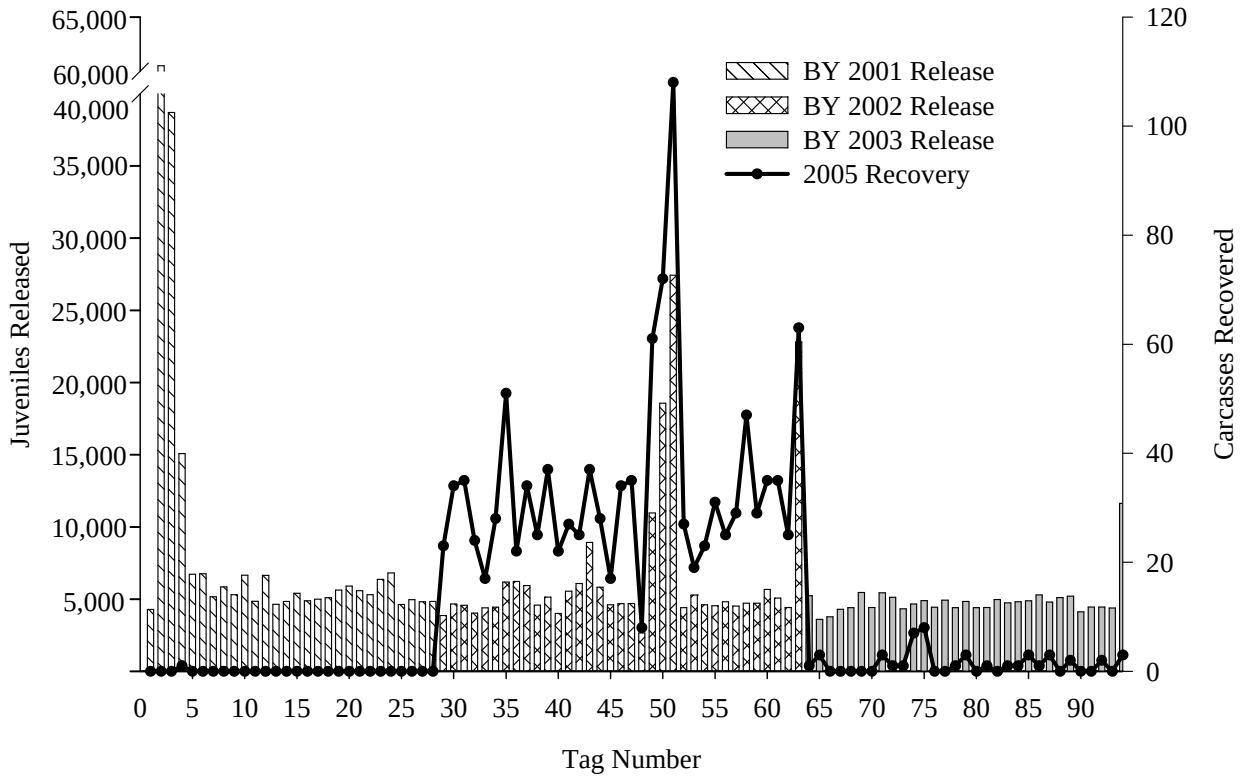

Figure 3. Number of carcass recoveries observed during the 2005 upper Sacramento River winter Chinook salmon carcass survey, and the corresponding juvenile release numbers, by tag code (each tag number corresponds to an individual tag code listed in Table 2)and brood year (BY).

Spawn Timing
Spawn timing of natural-origin fish, as evidenced by fresh female carcasses, followed a fairly normal (bell-shaped) distribution (Figure 5). Spawn timing of hatchery-origin fish was bimodal (Figure 5). The first mode occurred at a time similar to the peak carcass recovery of female natural-origin carcasses. The timing of the second mode (which was also the peak of hatchery-origin carcass recovery) occurred about two and a half weeks later than the peak of natural-origin carcass recoveries.

Gender Composition
Gender composition between natural-origin and hatchery-origin carcasses was nearly identical (Yates' corrected Chi square: df = 1; P = 0.935). Among fresh hatchery-origin carcasses, 25.6% (n = 206) were male and 74.4% (n = 600) were female. Fresh natural-origin carcasses consisted of 25.8% (n = 831) male and 74.2% (n = 2,393) female. Gender was not determined for two hatchery-origin carcasses.

Spawn status
Of the fresh female hatchery-origin carcasses recovered, 576 (96.0%) were classified as spawned and 24 (4.0%) as unspawned. For recovered fresh female natural-origin carcasses, 2,357 (98.5%) were classified as spawned and 35 (1.5%) as unspawned. The proportion of spawned and unspawned hatchery- and natural-origin females was statistically different (Yates' corrected Chi square: df = 1; P <0.001). The spawn status was not determined for one natural-origin female carcass. Spawn status was not determined for males.

Length
No fresh grilse (age-2) hatchery-origin females were collected. Adult hatchery-origin females averaged 743 mm (n = 509, range = 440-880 mm, SD = 48.3). Hatchery-origin males averaged 551 mm (n = 38, range = 450-650 mm, SD = 47.3) for grilse and 849 mm (n = 145, range = 680-1,020 mm, SD = 61.5) for adults (Figure 6).

Using length-frequency analyses, we estimated that natural-origin females <590 mm were grilse and ≥590 mm were adults (Figure 6). Natural-origin males <680 mm were categorized as grilse and ≥680 mm as adults. Natural-origin females averaged 536 mm (n = 8, range = 450-580, SD = 41.0) for grilse and 761 mm (n = 2,384, range = 590-1,010 mm, SD = 47.5) for adults. Length was not measured for one adult female carcass. The fork length of natural-origin males averaged 555 mm (n = 132, range = 410-660 mm, SD = 53.7) for grilse and 876 mm (n = 699, range = 680-1,130 mm, SD = 65.2) for adults.

Grilse hatchery-origin males were not significantly different in length than grilse natural-origin males (separate variance t-test: df = 67.0; P = 0.611). Lengths between natural-origin and hatchery-origin adults were not compared because natural-origin age-3 fish could not be distinguished from age-4 fish using length-frequency analysis and hatchery-origin fish did not return as age-4.

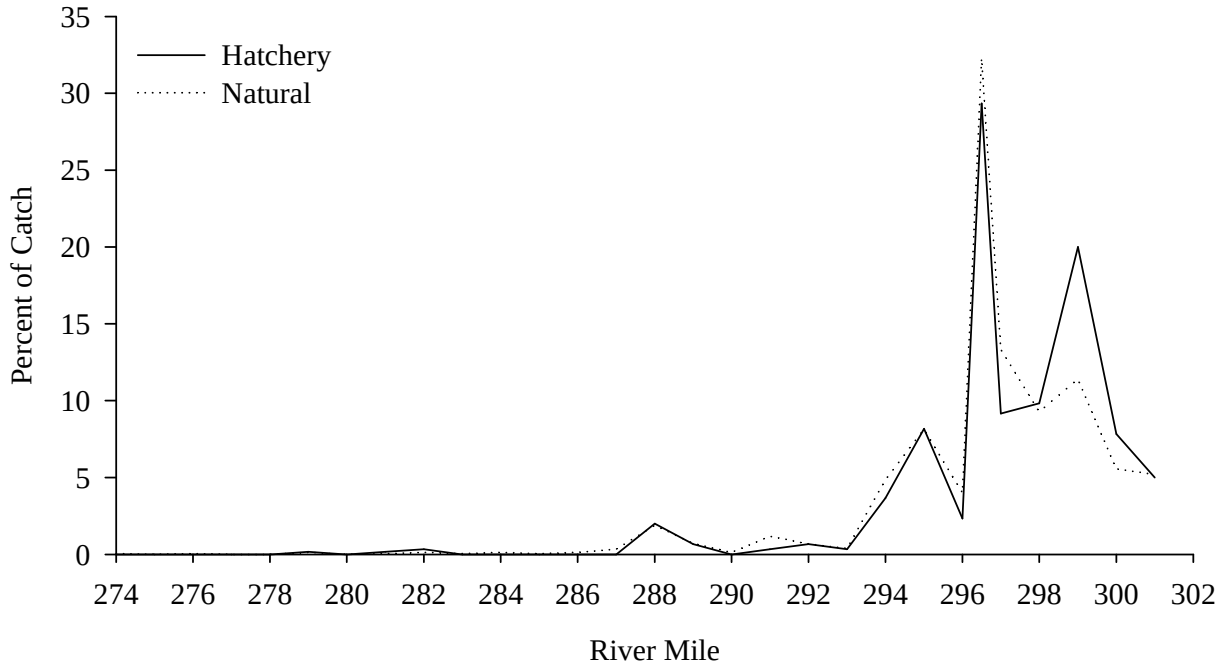

Figure 4. Spatial distribution of fresh female carcasses collected during the 2005 upper Sacramento River winter Chinook salmon carcass survey with an adipose fin clip (Hatchery) and without an adipose fin clip (Natural).

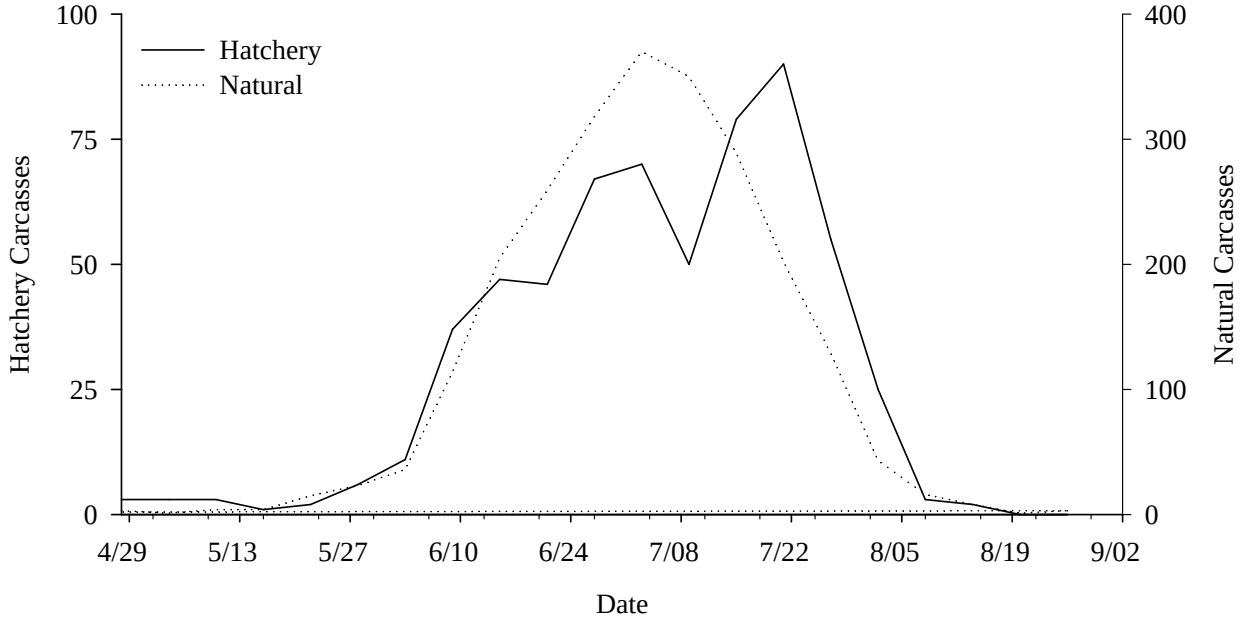

Figure 5. Date of collection of fresh female carcasses recovered during the 2005 upper Sacramento River winter Chinook salmon carcass survey with an adipose fin clip (Hatchery) and without an adipose fin clip (Natural)

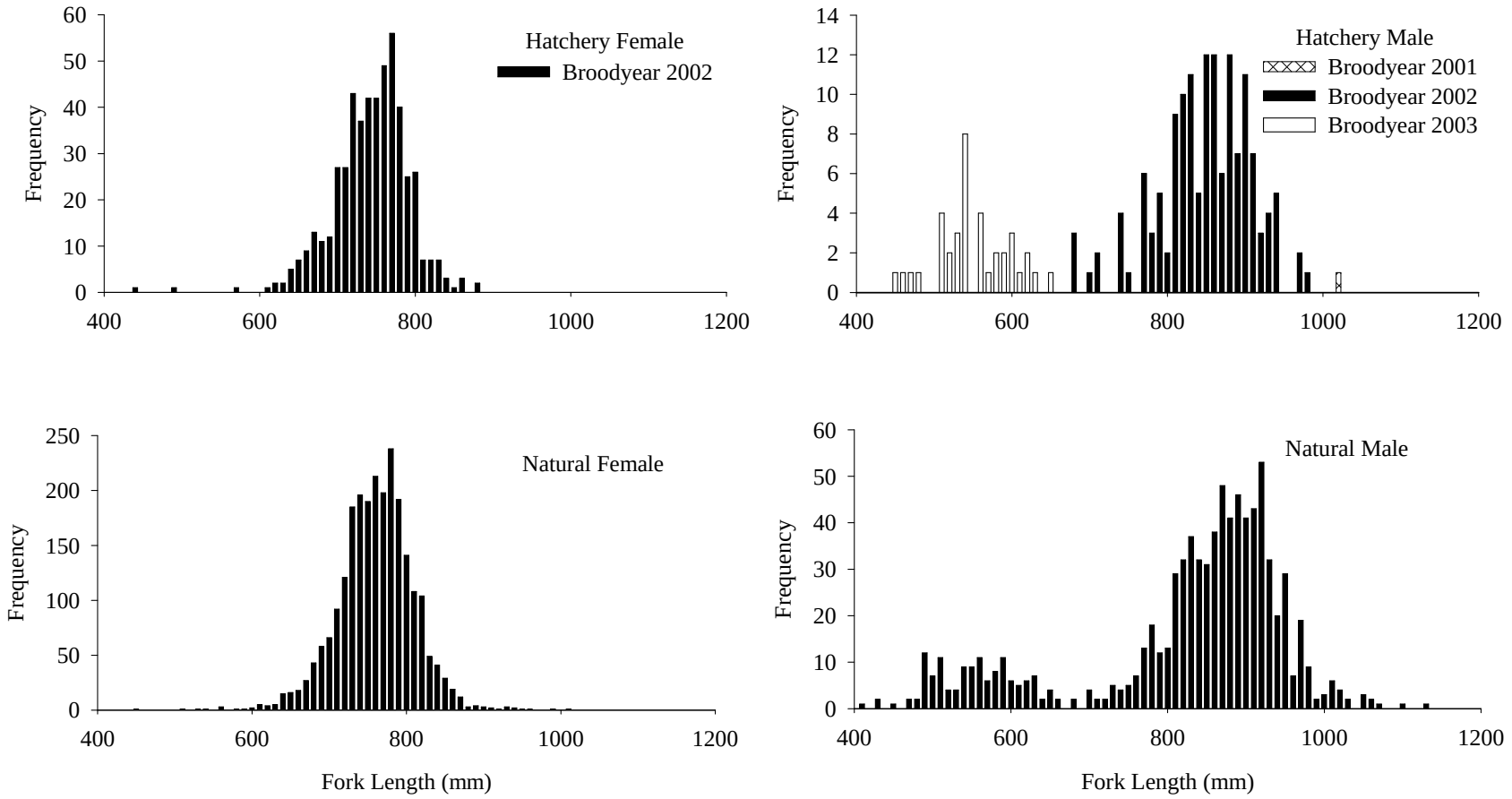

Figure 6. Length-frequency distribution of winter Chinook salmon collected during the 2005 upper Sacramento River winter Chinook salmon carcass survey. Data is presented for males and females with an adipose fin clip (Hatchery Male, Hatchery Female) and without an adipose fin clip (Natural Male, Natural Female). Estimated length of a natural female grilse was < 580 mm fork length. Estimated length of a natural male grilse was < 670 mm fork length.

Age Composition
Hatchery-origin carcasses consisted of 5.3% (n = 67) grilse and 94.7% (n = 1,190 total; n = 1,189 age-3 and n = 1 age-4) adult, based on recovered coded-wire tags. Hatchery-origin females consisted of 0.1% (n = 1) grilse and 99.9% (n = 922 total; all age-3) adult, whereas hatchery-origin male carcasses were 19.8% (n = 66) grilse and 80.2% (n = 268 total; n = 267 age-3 and n = 1 age-4) adult.

Natural-origin carcasses consisted of 4.4% (n = 142) grilse and 95.6% (n = 3,081) adult, as estimated from length-frequency histograms (Figure 6). Natural-origin female carcasses were 0.3% (n = 8) grilse and 99.7% (n = 2,384) adult, whereas, natural-origin males consisted of 16.1% (n = 134) grilse and 83.9% (n = 697) adult. A maximum size for age-3 fish and a minimum size for age-4 fish could not be estimated from the length-frequency data.

The proportion of hatchery-origin females and males returning as grilse was not significantly different from natural-origin females (Yates' corrected Chi square, df = 1, p = 0.454) and males (Yates' corrected Chi square: df = 1; p = 0.161).

Genetic Analyses
Tissue samples were collected from 1,467 fresh carcasses (789 hatchery-origin, 641 natural-origin, and 37 of unknown origin). Of these tissue samples, 267 samples from natural-origin carcasses were sent to the CGL with 215 (80.5%) amplifying at the minimum critical loci sufficient to make a run determination (Appendix D).

Based on an LOD greater than two, 92% of the natural-origin carcasses recovered during May – August 2005 were winter-run Chinook salmon. The steady increase in proportion of winter Chinook carcasses recovered in May and the steady decrease of carcasses recovered in August, suggest that the 2005 carcass survey adequately sampled the winter-run from a temporal standpoint (Figure 7). The first and last carcass genetically identified as winter-run was collected on 30 April 2005 and 28 August 2005, respectively.

Gender was determined genetically and then compared to the phenotype observed during the carcass survey, which was assumed to be without error. Gender was determined genetically for 232 of the tissue samples with 207 (89.2%) of these samples genetically identifying correctly.

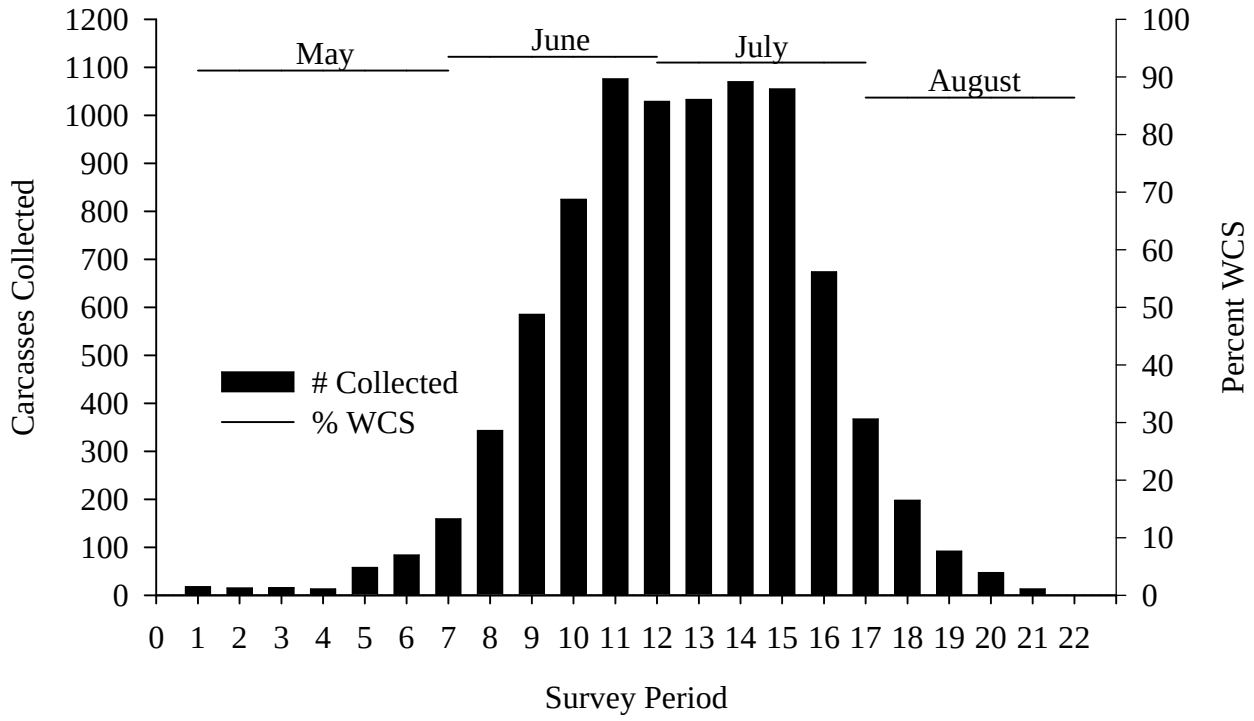

Figure 7. Total number of carcasses collected during the 2005 upper Sacramento River winter Chinook salmon carcass survey and percentage of tissue samples genetically identified (LOD ≥ 2, see text for explanation) as winter Chinook salmon (WCS). The 2005 carcass survey was conducted from 28 April through 2 September 2005. One 'survey period' is equal to two surveys of each Reach 1 through Reach 4 (two survey cycles, 6 days).

Demographic Benefit of Hatchery Supplementation

We estimated that 3,103 hatchery-origin winter Chinook salmon returned in 2005 (Appendices A1-A3). Additionally, we estimated that the Chinook salmon adults used as hatchery brood stock at the Livingston Stone NFH in 2001 - 2003 would have resulted in 204 adult returns in 2005 had they been allowed to reproduce naturally. The results of our analyses indicate that the Service's winter Chinook salmon supplementation program increased escapement to the upper Sacramento River by 2,899 fish, or a 1,420% increase relative to what would have been produced if the brood stock had been allowed to spawn naturally.

Discussion

Carcass Recoveries

The Service's winter Chinook salmon supplementation program was moved from the Coleman NFH to the Livingston Stone NFH in 1998. The primary reason for moving the supplementation program to the Sacramento River main stem was to improve homing of hatchery-origin fish to the main stem spawning areas used by natural-origin winter Chinook salmon. Most hatchery-origin winter Chinook salmon returned to Battle Creek when the program was located at the Coleman NFH. By incubating eggs and rearing juveniles at Livingston Stone NFH, it was believed that hatchery-origin winter Chinook salmon would be much more likely to return to spawning areas in the Sacramento River. Recoveries of hatchery-origin carcasses during the 2005 carcass survey show that hatchery-origin winter Chinook salmon from Livingston Stone NFH are imprinting and returning to spawning areas in the Sacramento River.

Coded-Wire Tag Recoveries

Hatchery-origin winter Chinook salmon recovered during the 2005 carcass survey were from Livingston Stone NFH brood years 2001, 2002, and 2003. Nearly all of the tag codes released from Livingston Stone NFH for brood year 2002 (age-3) were represented in the carcass recoveries. Each tag code represents an individual family group or a cluster of family groups, where a family group is defined as the progeny of an individual female and male mating. The recovery of many tag codes provides evidence that the genetic diversity of the parental stock was represented in the 2005 returns.

Spatial Distribution

The distribution of salmon carcasses was variable throughout the survey area, with areas of decreased velocity (pools) located below spawning areas typically showing a larger concentration of carcasses compared to areas of increased velocity (runs and riffles).
We assumed the spatial distribution of fresh female carcasses provides evidence of relative spawning locations equally for hatchery- and natural-origin winter Chinook. This assumption should be valid unless post-spawning behavioral differences exist between hatchery- and natural-origin winter Chinook.

Spatial distribution of hatchery- and natural-origin carcasses was remarkably similar throughout the survey area. The notable exception was the three miles immediately below Keswick Dam (RM 302), and extending down to the ACID Dam (RM 298.5), where a larger proportion of hatchery-origin carcasses were observed.

Spawn Timing

Recovery of female hatchery-origin carcasses was bimodal in 2005 (which may be a function of sample size and not a true biological effect), with the largest peak occurring approximately two and a half weeks later than for female natural-origin carcasses. We assume the temporal occurrence of fresh female carcass recoveries provides evidence of spawn timing for hatchery- and natural-origin winter Chinook salmon. We have no evidence to suggest differences exist in post-spawning longevity between hatchery- and natural-origin winter Chinook salmon.

Gender Composition

Males comprised 26% for both hatchery- and natural-origin carcass recoveries. These data suggest females are substantially more abundant or that the carcass survey may be biased against males. A greater abundance of females were recovered during the 2001 – 2004 carcass surveys as well. However, a skewed gender ratio is not supported by observations at the Keswick Dam and Red Bluff Diversion Dam fish traps. Since 2001, carcass survey staff have reported observing hatchery- and natural-origin spawned-out male Chinook salmon slowly swimming downstream while spawned-out females have been observed more frequently in the vicinity of newly constructed redds. These observations have led to the hypothesis that male Sacramento River winter Chinook salmon may exhibit a different post-spawn behavior than females. If males do tend to move downstream after spawning, they may be moving out of the survey area explaining the discrepancy in gender ratios between traps that capture pre-spawn fish (i.e., the traps at Red Bluff Diversion Dam and Keswick Dam) and the carcass survey. Consistent with this hypothesis, a greater proportion of male carcasses relative to female carcasses were recovered in the downstream-most reach of the survey area, although not in sufficient numbers to completely explain the differences in gender ratio. It is possible that males move even further downstream than sampled or exhibit some other behavioral difference. Additional research will be required to answer this question.

Spawn status

Hatchery-origin female carcasses were statistically more likely to be found unspawned when compared to natural-origin females; however, this difference was probably not biologically significant due to low numbers of both unspawned hatchery- and natural-origin female carcasses. Also, spawning success does not necessarily indicate that hatchery- and natural-origin fish are contributing equally to future generations. Several studies have shown that offspring from naturally reproducing hatchery-origin fish and matings between hatchery- and natural-origin fish may have lower survival than offspring of natural-origin fish (Waples 1991; Utter et al. 1993; Campton 1995). However, Ardren et al. (1999) found equal reproductive potential of hatchery- and natural-origin steelhead in the Hood River, Oregon. A literature review of Pacific Northwest salmonid hatcheries by Brannon et al. (2004) concluded that hatchery-origin fish, when properly propagated, have equal reproductive performance as wild fish. Rates of survival for progeny of naturally spawning hatchery-origin winter Chinook salmon in the upper Sacramento River are not known.

Length

Age-2 hatchery-origin males were not significantly different in length than age-2 natural-origin males. Age-3 and age-4 natural-origin fish could not be distinguished and hatchery-origin fish did not return at age-4 so length comparisons between adults were not made.

Age Composition

Hatchery- and natural-origin grilse carcasses were almost exclusively male and there was no difference in the percentage returning as grilse between hatchery-origin and natural-origin carcasses.

Genetic Analyses

The conservative criterion for classifying fish as winter-run Chinook, combined with the relatively high success rate (80.3%) in amplifying carcass DNA, provides compelling evidence that survey findings are descriptive of winter-run Chinook. The greater frequency of salmon identified as winter Chinook during the run peak (June and July), along with the smaller abundance of salmon at the beginning and end of the survey, suggests the winter Chinook salmon spawning period was adequately surveyed during the carcass survey. Gender determination using the GHpsi marker was accurate for the majority of carcasses tested. Compared to gender determinations based on phenotypic characteristics observed during the carcass survey, the GHpsi identified gender correctly 89% of the time.

Demographic benefit of hatchery supplementation

Hatchery-origin fish represented 19.6% of the total winter Chinook salmon spawning population in 2005. Additionally, hatchery supplementation resulted in over fourteen times the number of returns than if the fish collected for hatchery brood stock had been allowed to spawn naturally. The supplementation program succeeded in enhancing the run size of the winter Chinook salmon population in 2005.

Conclusions

Genetic analyses confirmed that data collected during the 2005 carcass survey were predominantly from winter-run Chinook salmon and that the winter-run was adequately surveyed spatially and temporally. The hatchery supplementation program at Livingston Stone NFH contributed about 20% of the estimated total return, and a representation of coded-wire tag recoveries across family groups suggested that the genetic diversity of the parental brood stock was represented in the 2005 returns. Spawning of hatchery- and natural-origin fish overlapped spatially but many hatchery-origin fish spawned about two and half weeks later than natural-origin spawners. The number of female pre-spawning mortalities was low for both hatchery- and natural-origin fish. Hatchery-origin and natural-origin returns were comprised of a similar proportion of age-2 males and these fish were also of similar length. Information collected in 2005 was consistent with the hypothesis that male winter-run Chinook salmon may exhibit different post-spawning behavior than females, affecting gender ratios estimated from the survey, but additional research will be required to resolve this issue.

Notes

Analysis of tissue samples collected during April of the late-fall Chinook salmon carcass survey conducted by the California Department of Fish and Game

The California Department of Fish and Game conducted a carcass survey for late-fall Chinook salmon (late-fall survey) from 14 December 2004 to the start of the winter Chinook salmon carcass survey (winter survey). The late-fall survey area covers much (RM 289 to 302) of the primary winter Chinook salmon spawning area covered during the winter survey. To determine if winter Chinook salmon may be spawning before the start of the winter survey, tissue samples collected during April of the late-fall survey were genetically analyzed to run. A total of 18 samples collected from 1 April through 29 April 2005 were analyzed (Table 3); 10 winter-run, 7 non-winter, and 1 with no call made. Of the three female carcasses identified as winter-run, only one was characterized as spawned (collected 26 April 2005). Considering all tissues collected in April (late-fall and winter survey), 65.0% (n = 13) were winter-run, 35.0% (n = 7) were non-winter, and one sample failed to sufficiently amplify.

Table 3. Genetic results of fin tissues collected from Chinook salmon carcasses during the 2005 upper Sacramento River late-fall Chinook salmon carcass survey conducted by the California Department of Fish and Game. Data presented includes sample collection date, sample number assigned by the Service, LOD score determined by the Abernathy Fish Technology Center, strain call (LOD > 2 for winter), gender observed during the carcass survey (Phenotype) and through genetic analysis of the growth hormone pseudogene marker (Genotype), and spawn condition.

				Gender		Spawn
Date	Sample #	LOD	Strain	Phenotype	Genotype	Condition
4/5/2005	05-10006	-0.6248	Non-Winter	Female	Female	Spawned
4/6/2005	05-10007	-5.0719	Non-Winter	Female	Female	Spawned
4/6/2005	05-10008	-7.3863	Non-Winter	Female	Female	Spawned
4/6/2005	05-10010	-4.3224	Non-Winter	Female	Female	Spawned
4/12/2005	05-10012	6.2758	Winter	Male	Male	Unknown
4/13/2005	05-10013	8.0309	Winter	Male	Male	Unknown
4/13/2005	05-10014	-6.8794	Non-Winter	Female	Female	Spawned
4/13/2005	05-10020	-6.8327	Non-Winter	Female	Female	Spawned
4/20/2005	05-10016	5.2712	Winter	Male	Male	Unknown
4/20/2005	05-10017	-6.9264	Non-Winter	Female	Female	Spawned
4/20/2005	05-10023	failed	No Call	Female	failed	Spawned
4/20/2005	05-10025	3.1643	Winter	Female	Female	Unspawned
4/20/2005	05-10021	8.3403	Winter	Male	Male	Unknown
4/20/2005	05-10022	6.1853	Winter	Female	Female	Unspawned
4/26/2005	05-10026	4.8062	Winter	Male	Male	Unknown
4/26/2005	05-10027	10.1845	Winter	Female	Male	Spawned
4/27/2005	05-10029	5.2536	Winter	Male	Male	Unknown
4/27/2005	05-10031	4.1347	Winter	Male	Female	Unknown

Inconsistencies between the Sacramento River winter Chinook salmon carcass survey and fish trapping at the Keswick Dam

Winter Chinook salmon brood stock collection at Keswick Dam Fish Trap
Keswick Dam (RM 302) is a barrier to fish passage and represents the upstream migration limit for anadromous salmonids in the Sacramento River. The fish trap at Keswick Dam is used to capture brood stock for the winter Chinook salmon supplementation program. Brood stock collection activities for winter Chinook salmon are conducted according to an annual Adult Collection Plan that identifies monthly brood stock collection targets for January through July. Winter Chinook salmon in excess of brood stock needs (or in excess of monthly targets) and non-winter Chinook salmon were returned to the Sacramento River either at Posse Grounds boat ramp (RM 297) or Caldwell Park boat ramp (RM 298), depending on flow. Fish were floy tagged before release into the river.

Spatial distribution of hatchery-origin carcasses
During 2005, hatchery-origin winter Chinook salmon (n = 276) comprised 58.0% of the 496 Chinook salmon trapped at the Keswick Dam Fish Trap (KDFT). During the carcass survey, fresh hatchery-origin carcasses (n = 808) represented only 19.5% of the total fresh carcasses (n = 4,145) recovered. These data suggest that hatchery-origin winter Chinook return to the terminus of migration in the Sacramento River at a higher rate than elsewhere in the river. This hypothesis is supported by the large proportion of hatchery winter Chinook salmon captured at the KDFT and by our 2005 carcass survey where hatchery Chinook salmon were found at a greater rate then natural Chinook salmon within the three miles immediately below Keswick Dam.

Recoveries of floy tagged fish released from the Keswick Dam Fish Trap
During 2005, a total of 283 genetically identified winter Chinook salmon were captured at the KDFT, floy tagged, and then released back into the Sacramento River. Thirty three of these tagged fish were subsequently recovered on the carcass survey (Table 4), for a recovery rate of 11.7%. This is in contrast to a recovery rate of approximately 39% for Chinook salmon that were tagged as part of the carcass survey mark-recapture estimate (Killam 2006). During the carcass survey, 4,584 adult natural-origin carcasses were tagged, of which 2,949 were subsequently recovered giving a recovery rate of 39.1%. Considering only fresh natural-origin carcasses, the recovery rate was similar with 2,066 recoveries out of a total of 3,104 fresh carcasses tagged (40.0%).

Several hypotheses have been proposed to explain the discrepancy between recovery rates for floy tagged fish released from the KDFT and carcasses tagged as part of the mark-recapture survey. These include: 1) live fish released from the KDFT may shed their floy tags during spawning activities, or post-spawning as their body condition deteriorates, 2) the fish released from the KDFT may spawn in the deep water areas immediately below Keswick Dam where their carcasses may be unlikely to be recovered due to the river's morphology, or 3) the fish released from the KDFT may fall back below the survey areas due to the stress of being captured, transported, tissue sampled, tagged, and released.

Recommendations

To address these issues, we recommend that additional research be conducted to assess the abundance and composition of that segment of the winter Chinook salmon population that returns to the uppermost section of the Sacramento River, between the Anderson-Cottonwood Irrigation District Diversion Dam and the Keswick Dam. Additional research using radio telemetry would allow the documentation of winter Chinook salmon movements in the upper Sacramento River. This study has the potential to provide valuable insights into possible biases associated with winter Chinook salmon population estimates in the upper Sacramento River based on the mark-recapture methods.

Table 4. Floy tag number and tag date for Chinook salmon captured at the Keswick Dam Fish Trap, location (name of boat ramp and river mile [RM]) and date they were released back into the Sacramento River, and location (RM) and date floy tagged carcass were recovered during the 2005 upper Sacramento River winter Chinook salmon carcass survey.

Floy Tag		Released			Recovered	
Number	Tag Date	Boat Ramp	RM	Date	RM	Date
W-480	12/28/2004	Posse Grounds	297	12/28/2004	297	4/30/2005
Y-011	1/11/2005	Posse Grounds	297	1/11/2005	293	5/8/2005
Y-068	1/11/2005	Posse Grounds	297	1/11/2005	297	7/26/2005
Y-126	1/25/2005	Posse Grounds	297	1/25/2005	296.5	6/26/2005
Y-130	1/25/2005	Posse Grounds	297	1/25/2005	296.5	7/14/2005
Y-147	2/1/2005	Posse Grounds	297	2/1/2005	277	6/3/2005
Y-184	2/8/2005	Posse Grounds	297	2/8/2005	296.5	7/29/2005
Y-219	2/8/2005	Posse Grounds	297	2/8/2005	292	7/16/2005
Y-237	2/8/2005	Posse Grounds	297	2/8/2005	300	6/26/2005
Y-241	2/8/2005	Posse Grounds	297	2/8/2005	299	6/23/2005
Y-251	2/8/2005	Posse Grounds	297	2/8/2005	296.5	8/1/2005
Y-263	2/8/2005	Posse Grounds	297	2/8/2005	299	7/17/2005
Y-353	2/22/2005	Posse Grounds	297	2/22/2005	288	7/13/2005
Y-415	3/15/2005	Posse Grounds	297	3/15/2005	281	5/8/2005
Y-466	3/22/2005	Posse Grounds	297	3/22/2005	298	8/4/2005
OR-010	4/12/2005	Caldwell Park	298	4/14/2005	296.5	7/26/2005
OR-053	4/26/2005	Caldwell Park	298	4/26/2005	293	7/19/2005
OR-075	4/26/2005	Caldwell Park	298	4/26/2005	299	7/17/2005
OR-102	5/10/2005	Caldwell Park	298	5/10/2005	278	6/6/2005
OR-113	5/10/2005	Caldwell Park	298	5/10/2005	298	6/2/2005
OR-128	5/10/2005	Caldwell Park	298	5/10/2005	295	7/4/2005
OR-157	6/7/2005	Caldwell Park	298	6/7/2005	297	6/20/2005
OR-167	6/14/2005	Caldwell Park	298	6/14/2005	288	6/28/2005
OR-171	6/14/2005	Caldwell Park	298	6/14/2005	296.5	6/29/2005
OR-190	6/14/2005	Caldwell Park	298	6/14/2005	297	6/23/2005
OR-198	6/21/2005	Caldwell Park	298	6/21/2005	274	7/9/2005
OR-233	6/28/2005	Caldwell Park	298	6/28/2005	296.5	7/8/2005
OR-238	6/28/2005	Caldwell Park	298	6/28/2005	296.5	7/17/2005
OR-251	6/28/2005	Caldwell Park	298	6/28/2005	298	7/17/2005
OR-262	7/12/2005	Caldwell Park	298	7/12/2005	298	7/29/2005
OR-266	7/12/2005	Caldwell Park	298	7/12/2005	295	7/31/2005
OR-275	7/12/2005	Caldwell Park	298	7/12/2005	297	7/23/2005
OR-286	7/19/2005	Caldwell Park	298	7/19/2005	296.5	8/4/2005

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Appendix A. Analysis of run size benefits resulting from the winter Chinook salmon supplementation program at Livingston Stone NFH based on the 2005 upper Sacramento River winter Chinook salmon carcass survey. Analysis includes estimation of winter Chinook salmon escapement in absence of a supplementation program (Appendix A-1), estimation of hatchery-origin winter Chinook salmon escapement with the existing supplementation program (Appendix A-2), and a comparison of these two estimates (Appendix A-3).

Appendix A-1. Estimation of the 2005 winter Chinook salmon escapement in absence of a supplementation program.

Methods and Equations

We estimated the number of natural-origin fish that would have returned without supplementation from Livingston Stone NFH. More specifically, we estimated the number of natural-origin offspring that would have been produced by fish retained for hatchery brood stock had these fish been allowed to spawn naturally. We first calculated the abundance of each age class (n_A):

$$n_A = JS_{Total} \times A_P \quad (1)$$

where,

JS_{Total} = total winter Chinook salmon population (as estimated by the Jolly-Seber method) and

A_P = proportion of each age class present in the overall population (assumed: 0.25 age-2, 0.67 age-3, and 0.08 age-4 [Hallock and Fisher 1985]).

Replacement rates for each age class (r_A) were then estimated:

$$r_A = n_A / JS_{BY} \quad (2)$$

where,

JS_{BY} = total winter Chinook salmon escapement estimate (as estimated by the Jolly-Seber method) for the corresponding brood year. For example, for fish returning in 2005 the corresponding brood year is: 2003 for age-2, 2002 for age-3, and 2001 for age-4.

For each age, we estimated the expected number of adult returns (N_{Age}) that would have resulted had the adults retained for brood stock in previous years been allowed to spawn naturally:

$$N_{Age} = r_A \times n_B \quad (3)$$

where,

n_B = number of adults retained as hatchery brood stock for the corresponding brood year. For example, for fish returning in 2005 the corresponding brood year is: 2003 for age-2, 2002 for age-3, and 2001 for age-4.

Summing across years, we estimated the total expected number of natural-origin adult returns (N_{Final}) that would have resulted had the adults retained for brood stock in previous years been allowed to spawn naturally:

$$N_{Final} = \Sigma\ (N_{Age}). \qquad (4)$$

Data and Calculations

	JS_{Total}	=	**15,839**	=	2005 Total escapement
2 year old	JS_{BY}	=	**8,218**	=	2003 Total escapement
3 year old	JS_{BY}	=	**7,464**	=	2002 Total escapement
4 year old	JS_{BY}	=	**8,224**	=	2001 Total escapement
2 year old	n_B	=	**109**	=	2003 Adult broodstock
3 year old	n_B	=	**96**	=	2002 Adult broodstock
4 year old	n_B	=	**98**	=	2001 Adult broodstock

Age Composition

P_{Total}	×	A_P	=	n_A		
15,839	×	0.25	=	**3,959.7500**	=	2005 , 2 year old escapement
15,839	×	0.67	=	**10,612.1300**	=	2005 , 3 year old escapement
15,839	×	0.08	=	**1,267.1200**	=	2005 , 4 year old escapement

Contribution Rate

n_A	/	P_{BY}	=	r_A		
3,959.7500	/	8,218	=	**0.4818**	=	2003 Contribution rate
10,612.1300	/	7,464	=	**1.4218**	=	2002 Contribution rate
1,267.1200	/	8,224	=	**0.1541**	=	2001 Contribution rate

Recruitment of Adults

r_A	×	n_B	=	N_{Age}		
0.4818	×	109	=	**52.5204**	=	2003 Adult Returns
1.4218	×	96	=	**136.4904**	=	2002 Adult Returns
0.1541	×	98	=	**15.0994**	=	2001 Adult Returns
				204.1103	=	**N_{Final}**

Appendix A-2. Estimated escapement of hatchery-origin winter Chinook salmon in the upper Sacramento River for 2005.

Methods and Equations

We estimated total abundance of hatchery-origin winter Chinook salmon returning to the upper Sacramento River in 2005 by using a series of expansions to correct for biases and incomplete counts associated with the carcass survey. Beginning with the number of hatchery-origin Chinook observed during the survey, we first expanded to include unrecognized fin clips and undetected coded-wire tags in non-fresh carcasses. Secondly, we expanded our estimate to include carcasses not observed during the survey. Thirdly, hatchery-origin fish that were captured for use as brood stock at the Livingston Stone NFH were added in to the estimate. Lastly, we expanded to include hatchery-origin fish that did not have a clipped adipose fin. Rationale and descriptions of these expansions are contained in the following sections:

1. Based on observations from previous years, we believe there is a decreased likelihood for recovering a coded-wire tag in non-fresh carcasses compared to fresh carcasses. We also believe an adipose fin clip is more likely to be identified among fresh carcasses compared to non-fresh carcasses. To account for these biases, we expanded non-fresh hatchery-origin carcasses recovered during the carcass survey based on the recovery rates observed for fresh hatchery-origin carcass recoveries ($H_{NF\text{-}Exp}$):

$$H_{NF\text{-}Exp} = (H_{F\text{-}Obs} \times T_{NF\text{-}Obs}) / T_{F\text{-}Obs} \quad (5)$$

where,

$H_{F\text{-}Obs}$ = number of fresh hatchery-origin carcasses,

$T_{NF\text{-}Obs}$ = total number of non-fresh hatchery- and natural-origin carcasses, and

$T_{F\text{-}Obs}$ = total number of fresh hatchery- and natural-origin carcasses recovered during the carcass survey.

2. We then expanded to include hatchery-origin carcasses believed to be present in the upper Sacramento River population but not observed during the survey (H_{Sac}). This expansion is based on the proportion of hatchery-origin carcasses observed during the carcass survey to the total estimated escapement of naturally reproducing winter Chinook salmon in the upper Sacramento River, based on the Jolly-Seber population estimate ($N_{J\text{-}S}$):

$$H_{Sac} = (H_{NF\text{-}Exp} + H_{F\text{-}Obs} + H_{Unk\text{-}Obs}) / T_{Obs} \times N_{J\text{-}S} \quad (6)$$

where,

$H_{Unk\text{-}Obs}$ = number of hatchery-origin carcasses with an unknown “freshness” and

T_{Obs} = the total number of carcasses observed during the carcass survey (including fresh and non-fresh and hatchery- and natural-origin carcasses).

3. Hatchery-origin fish that were captured for use as brood stock at the Livingston Stone NFH ($LSNFH_H$) were accounted for by adding them to H_{Sac}. This yielded the total number of adipose fin clipped hatchery-origin fish present in the upper Sacramento River and at the Livingston Stone NFH (H_{Clip}):

$$H_{Clip} = H_{Sac} + LSNFH_H \quad (7)$$

4. To account for non-adipose fin clipped hatchery-origin fish, we expanded H_{Clip} based on mark retention rates measured prior to release of juvenile winter Chinook. To accomplish this, we must first apportion H_{Clip} among each tag code recovered (CWT_{App}):

$$CWT_{App} = H_{Clip} \times (CWT_{Rec} / CWT_T) \quad (8)$$

where,

CWT_{Rec} = the number of coded-wire tags recovered for an individual tag code and

CWT_T = the total number of all coded-wire tags recovered.

5. We can now expand CWT_{App} to include all hatchery-origin fish without an adipose fin clip (CWT_{Final}) based on tag retention rates measured prior to release of juvenile winter Chinook.

$$CWT_{Final} = CWT_{App} / (J_{Clip} / J_{Obs}) \quad (9)$$

where,

J_{Clip} = the number of juveniles observed with an adipose fin clip during tag retention studies prior to release, by individual tag code and

J_{Obs} = the total number of juveniles observed during tag retention studies prior to release, by individual tag code.

6. Lastly, we sum CWT_{Final} to obtain our final hatchery-origin winter Chinook salmon population estimate (H_{Final}).

$$H_{Final} = \Sigma\, CWT_{Final} \quad (10)$$

Data

807	=	$H_{F\text{-}Obs}$	= Number of fresh hatchery carcass recoveries
4,624	=	$T_{NF\text{-}Obs}$	= Number of non-fresh hatchery and natural carcass recoveries
4,144	=	$T_{F\text{-}Obs}$	= Number of fresh hatchery and natural carcass recoveries
8,772	=	T_{Obs}	= Total carcasses observed during the carcass survey
15,835	=	$N_{J\text{-}S}$	= Total naturally reproducing winter Chinook salmon escapement
4	=	$LSNFH_H$	= Hatchery fish retained for LSNFH broodstock
3	=	H_{Unk}	= Total hatchery fish with unknown carcass condition

For calculations using 'Juvenile Tag Retention Data':

C = fish with an adipose fin clip
NC = fish with no adipose fin clip
T = fish with a coded-wire tag
NT = fish with no coded-wire tag

	CWT_{Rec}		Juvenile tag retention data			
CWTCode	Survey	LSNFH	T/C	NT/C	T/NC	NT/NC
0501030707	1	0	200	0	0	0
051276	23	3	194	6	0	0
051277	34	2	186	14	0	0
051278	35	1	194	6	0	0
051279	24	0	187	13	0	0
051280	17	1	192	8	0	0
051281	28	0	194	5	1	0
051282	51	0	182	17	1	0
051283	22	0	172	27	1	0
051284	34	0	182	18	0	0
051285	25	0	181	19	0	0
051286	37	2	195	5	0	0
051287	22	0	170	30	0	0
051288	27	0	180	20	0	0
051289	25	2	192	8	0	0
051290	38	0	181	18	1	0
051291	28	1	195	5	0	0
051292	17	0	190	10	0	0
051293	34	0	189	10	1	0
051294	35	2	191	9	0	0
051295	8	0	173	27	0	0
051296	61	1	190	10	0	0
051297	72	2	187	13	0	0
051298	108	2	193	2	5	0
051299	27	0	197	3	0	0
051364	19	0	181	19	0	0
051365	23	0	184	16	0	0
051366	31	0	194	6	0	0
051367	25	1	194	6	0	0
051368	29	0	197	3	0	0
051369	47	0	193	7	0	0
051370	29	0	196	1	3	0
051371	35	1	188	10	2	0
051372	35	1	195	4	1	0
051373	25	0	191	9	0	0
051679	1	0	200	0	0	0
051964	3	0	199	1	0	0
051970	3	0	199	1	0	0
051971	1	0	199	1	0	0
051972	1	0	199	1	0	0
051973	7	0	200	0	0	0
051974	8	0	199	1	0	0
051977	1	0	199	1	0	0
051978	3	0	199	1	0	0
051980	1	0	199	1	0	0
051982	1	0	198	2	0	0
051983	1	0	197	3	0	0
051984	3	0	200	0	0	0
051985	1	0	200	0	0	0
051986	3	0	198	0	2	0
051988	2	0	199	1	0	0
051991	2	0	198	2	0	0
051993	3	0	199	1	0	0
051995	5	0	198	2	0	0
051996	10	0	199	1	0	0
051997	7	0	195	5	0	0
053737	63	2	198	2	0	0
	1,261	24				

Calculations

1. Non-fresh carcass expansion based on fresh carcass recovery rate

$$\left(\frac{H_{F\text{-}Obs}}{807} \times \frac{T_{NF\text{-}Obs}}{4{,}624}\right) / \frac{T_{F\text{-}Obs}}{4{,}144} = \frac{H_{NF\text{-}Exp}}{\mathbf{900.4749}}$$

2. Expansion to include carcasses not observed

$$\left(\frac{H_{NF\text{-}Exp}}{900.4749} + \frac{H_{F\text{-}Obs}}{807} + \frac{H_{Unk}}{3}\right) / \frac{T_{Obs}}{8{,}772} \times \frac{N_{J\text{-}S}}{15{,}835} = \frac{H_{Sac}}{\mathbf{3087.7075}}$$

3. Addition of hatchery-origin fish retained for Livingston Stone NFH brood stock

$$\frac{H_{Sac}}{3087.7075} + \frac{LSNFH_H}{4} = \frac{H_{Clip}}{\mathbf{3091.7075}}$$

4. Apportioning by tag code

CWTCode	H_{Clip}		CWT_{Rec}		CWT_T		CWT_{App}
0501030707	: 3,091.7075	× (	1	/	1,285	) =	**2.4060**
051276	: 3,091.7075	× (	26	/	1,285	) =	**62.5559**
051277	: 3,091.7075	× (	36	/	1,285	) =	**86.6159**
051278	: 3,091.7075	× (	36	/	1,285	) =	**86.6159**
051279	: 3,091.7075	× (	24	/	1,285	) =	**57.7440**
051280	: 3,091.7075	× (	18	/	1,285	) =	**43.3080**
051281	: 3,091.7075	× (	28	/	1,285	) =	**67.3679**
051282	: 3,091.7075	× (	51	/	1,285	) =	**122.7059**
051283	: 3,091.7075	× (	22	/	1,285	) =	**52.9320**
051284	: 3,091.7075	× (	34	/	1,285	) =	**81.8039**
051285	: 3,091.7075	× (	25	/	1,285	) =	**60.1500**
051286	: 3,091.7075	× (	39	/	1,285	) =	**93.8339**
051287	: 3,091.7075	× (	22	/	1,285	) =	**52.9320**
051288	: 3,091.7075	× (	27	/	1,285	) =	**64.9619**
051289	: 3,091.7075	× (	27	/	1,285	) =	**64.9619**
051290	: 3,091.7075	× (	38	/	1,285	) =	**91.4279**
051291	: 3,091.7075	× (	29	/	1,285	) =	**69.7739**
051292	: 3,091.7075	× (	17	/	1,285	) =	**40.9020**
051293	: 3,091.7075	× (	34	/	1,285	) =	**81.8039**
051294	: 3,091.7075	× (	37	/	1,285	) =	**89.0219**
051295	: 3,091.7075	× (	8	/	1,285	) =	**19.2480**
051296	: 3,091.7075	× (	62	/	1,285	) =	**149.1719**
051297	: 3,091.7075	× (	74	/	1,285	) =	**178.0439**
051298	: 3,091.7075	× (	110	/	1,285	) =	**264.6598**
051299	: 3,091.7075	× (	27	/	1,285	) =	**64.9619**
051364	: 3,091.7075	× (	19	/	1,285	) =	**45.7140**
051365	: 3,091.7075	× (	23	/	1,285	) =	**55.3380**
051366	: 3,091.7075	× (	31	/	1,285	) =	**74.5859**
051367	: 3,091.7075	× (	26	/	1,285	) =	**62.5559**
051368	: 3,091.7075	× (	29	/	1,285	) =	**69.7739**
051369	: 3,091.7075	× (	47	/	1,285	) =	**113.0819**
051370	: 3,091.7075	× (	29	/	1,285	) =	**69.7739**
051371	: 3,091.7075	× (	36	/	1,285	) =	**86.6159**
051372	: 3,091.7075	× (	36	/	1,285	) =	**86.6159**
051373	: 3,091.7075	× (	25	/	1,285	) =	**60.1500**
051679	: 3,091.7075	× (	1	/	1,285	) =	**2.4060**
051964	: 3,091.7075	× (	3	/	1,285	) =	**7.2180**
051970	: 3,091.7075	× (	3	/	1,285	) =	**7.2180**
051971	: 3,091.7075	× (	1	/	1,285	) =	**2.4060**
051972	: 3,091.7075	× (	1	/	1,285	) =	**2.4060**
051973	: 3,091.7075	× (	7	/	1,285	) =	**16.8420**
051974	: 3,091.7075	× (	8	/	1,285	) =	**19.2480**
051977	: 3,091.7075	× (	1	/	1,285	) =	**2.4060**
051978	: 3,091.7075	× (	3	/	1,285	) =	**7.2180**
051980	: 3,091.7075	× (	1	/	1,285	) =	**2.4060**
051982	: 3,091.7075	× (	1	/	1,285	) =	**2.4060**
051983	: 3,091.7075	× (	1	/	1,285	) =	**2.4060**
051984	: 3,091.7075	× (	3	/	1,285	) =	**7.2180**
051985	: 3,091.7075	× (	1	/	1,285	) =	**2.4060**
051986	: 3,091.7075	× (	3	/	1,285	) =	**7.2180**
051988	: 3,091.7075	× (	2	/	1,285	) =	**4.8120**
051991	: 3,091.7075	× (	2	/	1,285	) =	**4.8120**
051993	: 3,091.7075	× (	3	/	1,285	) =	**7.2180**
051995	: 3,091.7075	× (	5	/	1,285	) =	**12.0300**
051996	: 3,091.7075	× (	10	/	1,285	) =	**24.0600**
051997	: 3,091.7075	× (	7	/	1,285	) =	**16.8420**
053737	: 3,091.7075	× (	65	/	1,285	) =	**156.3899**
							3,091.7075

5. Expansion to include hatchery-origin fish without an adipose fin clip

CWTCode	CWT_{App}	J_{Clip}	J_{Obs}	CWT_{Final}
0501030707	2.4060	200	200	**2.4060**
051276	62.5559	200	200	**62.5559**
051277	86.6159	200	200	**86.6159**
051278	86.6159	200	200	**86.6159**
051279	57.7440	200	200	**57.7440**
051280	43.3080	200	200	**43.3080**
051281	67.3679	199	200	**67.7065**
051282	122.7059	199	200	**123.3225**
051283	52.9320	199	200	**53.1979**
051284	81.8039	200	200	**81.8039**
051285	60.1500	200	200	**60.1500**
051286	93.8339	200	200	**93.8339**
051287	52.9320	200	200	**52.9320**
051288	64.9619	200	200	**64.9619**
051289	64.9619	200	200	**64.9619**
051290	91.4279	199	200	**91.8874**
051291	69.7739	200	200	**69.7739**
051292	40.9020	200	200	**40.9020**
051293	81.8039	199	200	**82.2150**
051294	89.0219	200	200	**89.0219**
051295	19.2480	200	200	**19.2480**
051296	149.1719	200	200	**149.1719**
051297	178.0439	200	200	**178.0439**
051298	264.6598	195	200	**271.4459**
051299	64.9619	200	200	**64.9619**
051364	45.7140	200	200	**45.7140**
051365	55.3380	200	200	**55.3380**
051366	74.5859	200	200	**74.5859**
051367	62.5559	200	200	**62.5559**
051368	69.7739	200	200	**69.7739**
051369	113.0819	200	200	**113.0819**
051370	69.7739	197	200	**70.8365**
051371	86.6159	198	200	**87.4908**
051372	86.6159	199	200	**87.0512**
051373	60.1500	200	200	**60.1500**
051679	2.4060	200	200	**2.4060**
051964	7.2180	200	200	**7.2180**
051970	7.2180	200	200	**7.2180**
051971	2.4060	200	200	**2.4060**
051972	2.4060	200	200	**2.4060**
051973	16.8420	200	200	**16.8420**
051974	19.2480	200	200	**19.2480**
051977	2.4060	200	200	**2.4060**
051978	7.2180	200	200	**7.2180**
051980	2.4060	200	200	**2.4060**
051982	2.4060	200	200	**2.4060**
051983	2.4060	200	200	**2.4060**
051984	7.2180	200	200	**7.2180**
051985	2.4060	200	200	**2.4060**
051986	7.2180	198	200	**7.2909**
051988	4.8120	200	200	**4.8120**
051991	4.8120	200	200	**4.8120**
051993	7.2180	200	200	**7.2180**
051995	12.0300	200	200	**12.0300**
051996	24.0600	200	200	**24.0600**
051997	16.8420	200	200	**16.8420**
053737	156.3899	200	200	**156.3899**

6. H_{Final} = **3,103.0309**

Appendix A-3. Comparison of estimated escapement with and without the supplementation program in the upper Sacramento River for 2005.

Methods and Equations

To determine the number of hatchery-origin winter Chinook salmon returning at each age (H_{Age}), we multiplied the estimated total hatchery-origin adults (H_{Final}) by the expected proportions returning at each age (Hallock and Fisher 1985):

$$H_{Age} = H_{Final} \times A_P. \quad (11)$$

We can then compare our estimated returns in absence of the supplementation program to returns with the existing program.

Data and Calculations

Appendix A-1

Age (yr)	$\mathbf{N_{Age}}$	
2 (from year 2003 adults)	**52.5204**	
3 (from year 2002 adults)	**136.4904**	
4 (from year 2001 adults)	**15.0994**	
	204.1103	= $\mathbf{N_{Final}}$

Appendix A-2

Age (yr)	$\mathbf{H_{Age}}$		H_{Final}		A_P
2 (from year 2003 adults)	**775.7577**	=	3103.0309	×	0.25
3 (from year 2002 adults)	**2,079.0307**	=	3103.0309	×	0.67
4 (from year 2001 adults)	**248.2425**	=	3103.0309	×	0.08

Comparison of Appendix A-1 and A-2

Age (year)	Natural	Hatchery	Percent Change
2	52.5	775.8	1,377.7
3	136.5	2,079.0	1,423.1
4	15.1	248.2	1,543.7
Total	**204**	**3,103**	**1,420**

An estimated 204 fish would have returned without the supplementation program (Appendix A-1), however, an estimated 3,103 hatchery-origin fish returned in 2005. Offspring of the winter Chinook salmon adults used as brood stock for propagation at Livingston Stone NFH produced a return 1,420% greater than the estimated escapement if these adults had been allowed to spawn naturally.

Appendix B. Recovery information for carcasses containing a coded-wire tag (CWT) collected during the 2005 upper Sacramento River winter Chinook salmon carcass survey. Data includes river mile (RM) of recovery and carcass gender, fork length (FL, mm), condition (see text [Methods] for description), and spawn status. All fish were winter Chinook salmon originating from Livingston Stone National Fish Hatchery.

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
4/30/2005	051279	299	Female	760	Fresh	Unspawned
4/30/2005	051296	297	Male	870	Fresh	Unknown
5/1/2005	051290	282	Female	860	Fresh	Unspawned
5/2/2005	051296	292	Male	900	Fresh	Unknown
5/2/2005	051368	292	Male	880	Fresh	Unknown
5/3/2005	051287	296.5	Male	850	Fresh	Unknown
5/3/2005	051297	300	Female	770	Fresh	Unspawned
5/4/2005	051286	274	Male	810	Fresh	Unknown
5/5/2005	051282	292	Female	740	Fresh	Unspawned
5/5/2005	051291	292	Female	750	Fresh	Unspawned
5/8/2005	051276	281	Female	720	Fresh	Unspawned
5/8/2005	051298	293	Female	790	Non-Fresh	Unspawned
5/9/2005	051282	299	Male	830	Fresh	Unknown
5/9/2005	051297	296.5	Male	800	Fresh	Unknown
5/12/2005	051365	301	Female	770	Fresh	Spawned
5/15/2005	051282	299	Female	750	Fresh	Unspawned
5/15/2005	051289	297	Female	790	Fresh	Unspawned
5/15/2005	051296	296.5	Male	820	Fresh	Unknown
5/18/2005	051373	296.5	Male	910	Fresh	Unknown
5/20/2005	051364	294	Female	770	Fresh	Unspawned
5/21/2005	051373	297	Male	890	Fresh	Unknown
5/22/2005	051298	280	Male	0	Fresh	Unknown
5/23/2005	051298	291	Female	720	Fresh	Unspawned
5/26/2005	051280	295	Female	800	Fresh	Unspawned
5/26/2005	051298	289	Male	820	Non-Fresh	Unknown
5/30/2005	051282	296.5	Female	760	Fresh	Spawned
5/30/2005	051286	301	Female	760	Fresh	Spawned
5/30/2005	051296	298	Male	820	Fresh	Unknown
5/30/2005	051297	296.5	Male	900	Fresh	Unknown
5/30/2005	051985	300	Male	600	Fresh	Unknown
6/2/2005	051281	300	Female	820	Fresh	Spawned
6/2/2005	051285	296.5	Male	890	Fresh	Unknown
6/2/2005	051290	297	Female	880	Fresh	Spawned
6/2/2005	051296	300	Female	710	Non-Fresh	Spawned
6/2/2005	051297	299	Female	740	Fresh	Spawned
6/4/2005	051290	295	Male	830	Fresh	Unknown

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
6/4/2005	051290	295	Male	770	Fresh	Unknown
6/5/2005	051276	296.5	Male	790	Fresh	Unknown
6/5/2005	051283	299	Female	770	Fresh	Spawned
6/5/2005	051284	296.5	Female	730	Fresh	Spawned
6/5/2005	051290	299	Male	790	Fresh	Unknown
6/5/2005	051290	301	Female	740	Fresh	Spawned
6/5/2005	051296	298	Female	770	Non-Fresh	Spawned
6/5/2005	051298	296.5	Female	770	Fresh	Spawned
6/5/2005	051366	296.5	Female	760	Fresh	Spawned
6/6/2005	051367	278	Female	770	Non-Fresh	Unspawned
6/8/2005	051282	298	Male	840	Fresh	Unknown
6/8/2005	051282	298	Female	720	Fresh	Spawned
6/8/2005	051283	296.5	Male	920	Non-Fresh	Unknown
6/8/2005	051286	300	Female	780	Fresh	Spawned
6/8/2005	051291	297	Female	670	Fresh	Spawned
6/8/2005	051295	300	Female	800	Fresh	Spawned
6/8/2005	051296	300	Female	780	Fresh	Spawned
6/8/2005	051297	297	Male	870	Non-Fresh	Unknown
6/8/2005	051297	299	Male	970	Fresh	Unknown
6/10/2005	051282	294	Female	720	Fresh	Spawned
6/10/2005	051290	296	Female	760	Fresh	Spawned
6/10/2005	051298	294	Female	780	Fresh	Spawned
6/10/2005	051373	288	Male	910	Fresh	Unknown
6/10/2005	051373	296	Male	870	Non-Fresh	Unknown
6/10/2005	051986	294	Male	450	Fresh	Unknown
6/11/2005	051277	297	Female	740	Fresh	Spawned
6/11/2005	051282	296.5	Female	730	Fresh	Spawned
6/11/2005	051282	296.5	Female	700	Fresh	Spawned
6/11/2005	051282	300	Male	810	Fresh	Unknown
6/11/2005	051284	300	Female	770	Fresh	Spawned
6/11/2005	051286	300	Female	770	Fresh	Spawned
6/11/2005	051289	298	Female	760	Fresh	Unspawned
6/11/2005	051293	296.5	Male	810	Non-Fresh	Unknown
6/11/2005	051296	296.5	Female	700	Non-Fresh	Spawned
6/11/2005	051296	296.5	Female	750	Non-Fresh	Spawned
6/11/2005	051296	300	Female	770	Fresh	Spawned
6/11/2005	051296	300	Female	760	Fresh	Spawned
6/11/2005	051296	300	Female	790	Non-Fresh	Spawned
6/11/2005	051297	299	Male	800	Fresh	Unknown
6/11/2005	051368	296	Male	890	Non-Fresh	Unknown
6/11/2005	051368	297	Female	770	Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
6/11/2005	051368	297	Male	880	Non-Fresh	Unknown
6/11/2005	051368	299	Male	850	Fresh	Unknown
6/11/2005	051371	296	Male	900	Fresh	Unknown
6/11/2005	051373	301	Female	710	Fresh	Spawned
6/11/2005	053737	296.5	Female	740	Fresh	Spawned
6/11/2005	053737	296.5	Female	750	Fresh	Spawned
6/12/2005	051283	279	Female	780	Fresh	Spawned
6/13/2005	051282	288	Male	850	Non-Fresh	Unknown
6/13/2005	051282	294	Female	910	Non-Fresh	Spawned
6/13/2005	051282	295	Male	790	Fresh	Unknown
6/13/2005	051284	294	Male	830	Fresh	Unknown
6/13/2005	051296	289	Female	770	Fresh	Spawned
6/13/2005	051296	295	Female	740	Fresh	Spawned
6/13/2005	051371	295	Male	880	Fresh	Unknown
6/14/2005	051276	296.5	Male	830	Non-Fresh	Unknown
6/14/2005	051277	299	Female	760	Fresh	Spawned
6/14/2005	051282	296.5	Female	780	Non-Fresh	Spawned
6/14/2005	051282	296.5	Female	720	Non-Fresh	Spawned
6/14/2005	051282	297	Female	760	Non-Fresh	Spawned
6/14/2005	051282	298	Female	790	Fresh	Spawned
6/14/2005	051282	298	Female	710	Fresh	Spawned
6/14/2005	051282	299	Male	780	Non-Fresh	Unknown
6/14/2005	051284	296.5	Female	770	Non-Fresh	Spawned
6/14/2005	051284	298	Female	640	Fresh	Spawned
6/14/2005	051286	296.5	Female	790	Fresh	Unspawned
6/14/2005	051287	297	Female	820	Non-Fresh	Spawned
6/14/2005	051290	296.5	Female	800	Non-Fresh	Spawned
6/14/2005	051290	296.5	Male	850	Fresh	Unknown
6/14/2005	051290	296.5	Male	940	Fresh	Unknown
6/14/2005	051294	299	Female	760	Fresh	Spawned
6/14/2005	051296	296.5	Female	730	Non-Fresh	Spawned
6/14/2005	051296	296.5	Female	620	Fresh	Unspawned
6/14/2005	051296	299	Female	810	Non-Fresh	Spawned
6/14/2005	051296	299	Female	770	Fresh	Spawned
6/14/2005	051297	298	Female	680	Fresh	Spawned
6/14/2005	051297	299	Male	900	Fresh	Unknown
6/14/2005	051298	296.5	Female	740	Fresh	Spawned
6/14/2005	051298	297	Female	780	Non-Fresh	Spawned
6/14/2005	051298	299	Female	770	Fresh	Spawned
6/14/2005	051298	300	Female	790	Non-Fresh	Spawned
6/14/2005	051299	296.5	Male	840	Non-Fresh	Unknown

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
6/14/2005	051299	299	Female	770	Non-Fresh	Spawned
6/14/2005	051364	299	Male	860	Non-Fresh	Unknown
6/14/2005	051366	296.5	Female	790	Fresh	Spawned
6/14/2005	051369	300	Female	760	Fresh	Spawned
6/14/2005	051372	296.5	Male	820	Non-Fresh	Unknown
6/14/2005	053737	296.5	Female	720	Fresh	Unspawned
6/14/2005	053737	296.5	Female	760	Non-Fresh	Spawned
6/16/2005	051283	295	Male	740	Fresh	Unknown
6/16/2005	051294	295	Female	790	Fresh	Unspawned
6/16/2005	051296	295	Female	840	Fresh	Spawned
6/16/2005	051297	295	Male	890	Fresh	Unknown
6/16/2005	051298	291	Male	830	Fresh	Unknown
6/16/2005	051368	295	Male	910	Non-Fresh	Unknown
6/16/2005	051372	288	Female	710	Fresh	Unspawned
6/16/2005	051373	289	Female	780	Fresh	Spawned
6/17/2005	051277	297	Male	810	Fresh	Unknown
6/17/2005	051277	300	Female	760	Fresh	Spawned
6/17/2005	051282	301	Female	770	Fresh	Spawned
6/17/2005	051284	296.5	Female	610	Non-Fresh	Spawned
6/17/2005	051284	296.5	Female	750	Fresh	Spawned
6/17/2005	051284	296.5	Female	800	Non-Fresh	Spawned
6/17/2005	051284	301	Female	770	Fresh	Spawned
6/17/2005	051285	297	Male	860	Fresh	Unknown
6/17/2005	051285	300	Female	760	Non-Fresh	Spawned
6/17/2005	051286	296.5	Female	800	Fresh	Spawned
6/17/2005	051286	296.5	Female	720	Fresh	Spawned
6/17/2005	051286	297	Male	920	Non-Fresh	Unknown
6/17/2005	051290	296.5	Male	880	Non-Fresh	Unknown
6/17/2005	051290	297	Female	780	Fresh	Spawned
6/17/2005	051291	299	Female	790	Fresh	Spawned
6/17/2005	051295	299	Female	770	Fresh	Spawned
6/17/2005	051296	296.5	Female	740	Non-Fresh	Spawned
6/17/2005	051296	296.5	Male	880	Fresh	Unknown
6/17/2005	051296	299	Male	700	Non-Fresh	Unknown
6/17/2005	051296	300	Female	710	Fresh	Spawned
6/17/2005	051297	296.5	Male	850	Fresh	Unknown
6/17/2005	051297	299	Male	890	Fresh	Unknown
6/17/2005	051298	296.5	Female	820	Fresh	Spawned
6/17/2005	051298	300	Female	800	Fresh	Spawned
6/17/2005	051364	296.5	Female	720	Fresh	Spawned
6/17/2005	051373	296.5	Male	890	Fresh	Unknown

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
6/17/2005	051373	296.5	Male	810	Fresh	Unknown
6/17/2005	0501030707	297	Male	1020	Fresh	Unknown
6/18/2005	051296	287	Female	730	Non-Fresh	Spawned
6/18/2005	051986	283	Male	480	Non-Fresh	Unknown
6/19/2005	051286	291	Male	740	Fresh	Unknown
6/19/2005	051287	294	Male	840	Fresh	Unknown
6/19/2005	051287	296	Female	810	Non-Fresh	Unspawned
6/19/2005	051288	295	Female	710	Fresh	Spawned
6/19/2005	051296	291	Female	680	Non-Fresh	Spawned
6/19/2005	051296	296	Male	820	Fresh	Unknown
6/19/2005	051364	288	Male	900	Fresh	Unknown
6/19/2005	051369	289	Male	880	Fresh	Unknown
6/19/2005	051373	295	Male	870	Non-Fresh	Unknown
6/19/2005	051373	295	Male	850	Fresh	Unknown
6/19/2005	053737	295	Female	780	Fresh	Spawned
6/20/2005	051276	299	Male	780	Non-Fresh	Unknown
6/20/2005	051276	299	Female	670	Fresh	Spawned
6/20/2005	051277	299	Female	720	Fresh	Unspawned
6/20/2005	051282	296.5	Female	790	Fresh	Spawned
6/20/2005	051282	296.5	Female	730	Fresh	Spawned
6/20/2005	051282	301	Male	790	Non-Fresh	Unknown
6/20/2005	051284	296.5	Female	830	Fresh	Unspawned
6/20/2005	051284	296.5	Female	780	Fresh	Spawned
6/20/2005	051284	298	Female	760	Fresh	Spawned
6/20/2005	051284	299	Female	760	Fresh	Spawned
6/20/2005	051285	296.5	Female	840	Fresh	Spawned
6/20/2005	051285	298	Female	730	Fresh	Spawned
6/20/2005	051286	299	Female	820	Fresh	Spawned
6/20/2005	051286	299	Female	770	Fresh	Spawned
6/20/2005	051286	301	Female	790	Fresh	Spawned
6/20/2005	051287	297	Female	800	Fresh	Spawned
6/20/2005	051288	297	Male	750	Non-Fresh	Unknown
6/20/2005	051293	296.5	Male	830	Fresh	Unknown
6/20/2005	051296	299	Female	810	Non-Fresh	Spawned
6/20/2005	051296	299	Female	800	Non-Fresh	Spawned
6/20/2005	051296	300	Female	700	Fresh	Spawned
6/20/2005	051298	296	Male	910	Unknown	Unknown
6/20/2005	051298	296.5	Male	810	Fresh	Unknown
6/20/2005	051298	296.5	Male	910	Non-Fresh	Unknown
6/20/2005	051298	296.5	Female	680	Fresh	Spawned
6/20/2005	051298	299	Female	720	Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
6/20/2005	051298	299	Female	660	Non-Fresh	Spawned
6/20/2005	051298	300	Female	770	Fresh	Spawned
6/20/2005	051299	296.5	Female	710	Fresh	Spawned
6/20/2005	051364	297	Male	880	Fresh	Unknown
6/20/2005	051367	296.5	Female	810	Fresh	Unspawned
6/20/2005	051368	296.5	Male	940	Fresh	Unknown
6/20/2005	051368	299	Male	920	Fresh	Unknown
6/20/2005	051368	299	Female	780	Non-Fresh	Spawned
6/20/2005	051368	301	Female	680	Fresh	Spawned
6/20/2005	051369	296.5	Female	820	Fresh	Spawned
6/20/2005	051370	299	Female	750	Fresh	Spawned
6/20/2005	051373	297	Male	880	Fresh	Unknown
6/20/2005	053737	296.5	Female	740	Fresh	Spawned
6/21/2005	051290	286	Female	740	Non-Fresh	Unspawned
6/21/2005	051298	282	Female	730	Fresh	Spawned
6/22/2005	051279	293	Male	830	Non-Fresh	Unknown
6/22/2005	051280	294	Female	770	Fresh	Unspawned
6/22/2005	051283	289	Male	910	Fresh	Unknown
6/22/2005	051284	294	Male	860	Fresh	Unknown
6/22/2005	051287	290	Male	900	Fresh	Unknown
6/22/2005	051290	294	Female	770	Fresh	Spawned
6/22/2005	051296	295	Female	760	Fresh	Spawned
6/22/2005	051296	296	Female	780	Fresh	Spawned
6/22/2005	051298	292	Male	820	Fresh	Unknown
6/22/2005	051299	288	Female	740	Non-Fresh	Spawned
6/22/2005	051369	294	Male	860	Non-Fresh	Unknown
6/22/2005	051369	295	Female	720	Fresh	Spawned
6/22/2005	051371	288	Male	880	Non-Fresh	Unknown
6/22/2005	051373	288	Male	830	Non-Fresh	Unspawned
6/22/2005	051973	296	Male	500	Non-Fresh	Unknown
6/23/2005	051276	300	Male	800	Non-Fresh	Unknown
6/23/2005	051277	297	Male	880	Non-Fresh	Unknown
6/23/2005	051277	297	Male	820	Fresh	Unknown
6/23/2005	051278	301	Female	720	Fresh	Spawned
6/23/2005	051282	296.5	Male	780	Fresh	Unknown
6/23/2005	051282	298	Male	880	Fresh	Unknown
6/23/2005	051284	296.5	Female	780	Fresh	Spawned
6/23/2005	051286	296.5	Male	850	Non-Fresh	Unknown
6/23/2005	051289	296.5	Male	900	Non-Fresh	Unknown
6/23/2005	051290	296.5	Female	710	Non-Fresh	Spawned
6/23/2005	051291	297	Male	770	Fresh	Unknown

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
6/23/2005	051294	299	Female	720	Fresh	Spawned
6/23/2005	051295	300	Female	740	Fresh	Spawned
6/23/2005	051296	296.5	Female	740	Non-Fresh	Spawned
6/23/2005	051296	300	Female	730	Non-Fresh	Spawned
6/23/2005	051297	296.5	Female	730	Non-Fresh	Spawned
6/23/2005	051297	296.5	Female	700	Fresh	Spawned
6/23/2005	051297	297	Female	790	Non-Fresh	Spawned
6/23/2005	051298	299	Female	800	Fresh	Spawned
6/23/2005	051367	296.5	Female	780	Non-Fresh	Spawned
6/23/2005	051367	298	Female	760	Fresh	Spawned
6/23/2005	051368	297	Female	700	Fresh	Spawned
6/23/2005	051368	297	Female	740	Fresh	Spawned
6/24/2005	051276	285	Female	850	Non-Fresh	Spawned
6/24/2005	051290	287	Male	850	Fresh	Unknown
6/25/2005	051284	296	Male	860	Non-Fresh	Unknown
6/25/2005	051286	293	Male	870	Non-Fresh	Unknown
6/25/2005	051286	295	Female	750	Fresh	Spawned
6/25/2005	051291	295	Female	760	Non-Fresh	Spawned
6/25/2005	051296	296	Female	730	Non-Fresh	Spawned
6/25/2005	051297	289	Female	800	Fresh	Spawned
6/25/2005	051297	295	Female	770	Fresh	Spawned
6/25/2005	051364	291	Male	860	Fresh	Unknown
6/25/2005	051366	295	Male	770	Fresh	Unknown
6/25/2005	051367	288	Male	900	Non-Fresh	Unknown
6/25/2005	051373	295	Male	820	Fresh	Unknown
6/25/2005	051973	289	Male	510	Fresh	Unknown
6/26/2005	051277	301	Female	720	Non-Fresh	Spawned
6/26/2005	051282	296.5	Female	660	Fresh	Spawned
6/26/2005	051282	296.5	Female	740	Fresh	Spawned
6/26/2005	051283	296.5	Female	720	Fresh	Spawned
6/26/2005	051285	297	Female	770	Fresh	Spawned
6/26/2005	051286	299	Female	720	Fresh	Spawned
6/26/2005	051286	300	Female	800	Fresh	Spawned
6/26/2005	051289	296.5	Female	760	Non-Fresh	Spawned
6/26/2005	051289	297	Male	910	Non-Fresh	Unknown
6/26/2005	051289	299	Female	800	Non-Fresh	Spawned
6/26/2005	051290	296.5	Female	790	Non-Fresh	Spawned
6/26/2005	051290	296.5	Female	840	Non-Fresh	Spawned
6/26/2005	051290	298	Female	770	Fresh	Spawned
6/26/2005	051290	300	Male	840	Non-Fresh	Unknown
6/26/2005	051291	296.5	Female	770	Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
6/26/2005	051293	299	Female	710	Non-Fresh	Spawned
6/26/2005	051294	297	Female	790	Fresh	Spawned
6/26/2005	051294	298	Female	730	Fresh	Spawned
6/26/2005	051296	296.5	Female	690	Fresh	Spawned
6/26/2005	051296	296.5	Female	820	Non-Fresh	Spawned
6/26/2005	051296	296.5	Female	700	Non-Fresh	Spawned
6/26/2005	051296	296.5	Female	730	Fresh	Spawned
6/26/2005	051296	297	Female	810	Non-Fresh	Spawned
6/26/2005	051296	300	Female	780	Fresh	Spawned
6/26/2005	051297	296.5	Male	800	Non-Fresh	Unknown
6/26/2005	051297	297	Female	810	Non-Fresh	Spawned
6/26/2005	051298	296.5	Female	740	Non-Fresh	Spawned
6/26/2005	051298	296.5	Female	780	Non-Fresh	Spawned
6/26/2005	051298	299	Male	830	Non-Fresh	Unknown
6/26/2005	051298	299	Male	880	Fresh	Unknown
6/26/2005	051364	299	Male	900	Fresh	Unknown
6/26/2005	051366	300	Female	680	Non-Fresh	Spawned
6/26/2005	051367	297	Female	770	Non-Fresh	Spawned
6/26/2005	051368	296.5	Female	730	Fresh	Spawned
6/26/2005	051368	299	Female	720	Fresh	Spawned
6/26/2005	051368	299	Female	790	Fresh	Spawned
6/26/2005	051369	296.5	Male	890	Fresh	Unknown
6/26/2005	051370	296	Female	730	Fresh	Spawned
6/26/2005	051370	296.5	Female	790	Fresh	Spawned
6/26/2005	051370	296.5	Female	780	Non-Fresh	Spawned
6/26/2005	051370	296.5	Male	870	Non-Fresh	Unknown
6/26/2005	051370	297	Female	800	Fresh	Spawned
6/26/2005	051372	297	Female	730	Fresh	Spawned
6/26/2005	051373	296.5	Female	740	Non-Fresh	Spawned
6/26/2005	051373	296.5	Female	690	Non-Fresh	Spawned
6/26/2005	051373	300	Female	750	Fresh	Spawned
6/26/2005	051974	300	Male	600	Fresh	Unknown
6/26/2005	053737	300	Female	730	Non-Fresh	Spawned
6/28/2005	051276	288	Female	720	Fresh	Spawned
6/28/2005	051279	296	Male	840	Non-Fresh	Unknown
6/28/2005	051282	289	Male	810	Non-Fresh	Unknown
6/28/2005	051285	294	Female	740	Fresh	Spawned
6/28/2005	051286	288	Male	810	Fresh	Unknown
6/28/2005	051288	294	Female	670	Fresh	Spawned
6/28/2005	051290	294	Male	830	Fresh	Unknown
6/28/2005	051290	296	Male	780	Fresh	Unknown

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
6/28/2005	051293	288	Male	860	Non-Fresh	Unknown
6/28/2005	051298	288	Female	740	Non-Fresh	Spawned
6/28/2005	051298	288	Female	860	Non-Fresh	Spawned
6/28/2005	051367	288	Male	900	Fresh	Spawned
6/28/2005	051368	295	Female	740	Fresh	Spawned
6/28/2005	051996	295	Male	610	Non-Fresh	Unknown
6/28/2005	053737	296	Female	0	Fresh	Spawned
6/29/2005	051276	296.5	Male	810	Fresh	Unknown
6/29/2005	051276	296.5	Female	700	Fresh	Spawned
6/29/2005	051278	296.5	Female	710	Fresh	Spawned
6/29/2005	051278	296.5	Female	630	Fresh	Spawned
6/29/2005	051278	296.5	Male	770	Fresh	Unknown
6/29/2005	051278	298	Female	740	Fresh	Spawned
6/29/2005	051282	296.5	Female	700	Non-Fresh	Spawned
6/29/2005	051282	296.5	Female	780	Non-Fresh	Spawned
6/29/2005	051282	296.5	Female	720	Non-Fresh	Spawned
6/29/2005	051282	298	Male	820	Fresh	Unknown
6/29/2005	051282	301	Female	760	Fresh	Spawned
6/29/2005	051283	297	Female	720	Non-Fresh	Spawned
6/29/2005	051283	299	Female	750	Non-Fresh	Spawned
6/29/2005	051284	296.5	Female	810	Fresh	Spawned
6/29/2005	051284	297	Female	750	Fresh	Spawned
6/29/2005	051285	296.5	Female	760	Non-Fresh	Spawned
6/29/2005	051285	296.5	Female	750	Fresh	Spawned
6/29/2005	051286	296.5	Female	740	Non-Fresh	Spawned
6/29/2005	051286	298	Female	740	Non-Fresh	Spawned
6/29/2005	051286	301	Male	890	Fresh	Unknown
6/29/2005	051289	296.5	Female	740	Non-Fresh	Spawned
6/29/2005	051289	296.5	Female	730	Non-Fresh	Spawned
6/29/2005	051289	297	Female	770	Non-Fresh	Spawned
6/29/2005	051289	299	Male	940	Non-Fresh	Unknown
6/29/2005	051290	296.5	Female	720	Non-Fresh	Spawned
6/29/2005	051290	298	Female	780	Fresh	Spawned
6/29/2005	051290	298	Female	710	Fresh	Spawned
6/29/2005	051290	299	Female	740	Non-Fresh	Spawned
6/29/2005	051291	298	Female	790	Non-Fresh	Spawned
6/29/2005	051291	299	Female	800	Fresh	Spawned
6/29/2005	051292	301	Female	760	Fresh	Spawned
6/29/2005	051294	296.5	Female	750	Non-Fresh	Spawned
6/29/2005	051294	297	Male	870	Non-Fresh	Unknown
6/29/2005	051296	296.5	Female	790	Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
6/29/2005	051296	297	Female	740	Non-Fresh	Spawned
6/29/2005	051296	300	Female	710	Non-Fresh	Spawned
6/29/2005	051297	299	Female	800	Fresh	Spawned
6/29/2005	051298	296.5	Female	790	Non-Fresh	Spawned
6/29/2005	051298	299	Female	710	Fresh	Spawned
6/29/2005	051366	296.5	Female	730	Fresh	Spawned
6/29/2005	051366	296.5	Male	900	Non-Fresh	Unknown
6/29/2005	051366	296.5	Male	850	Non-Fresh	Unknown
6/29/2005	051366	296.5	Female	740	Non-Fresh	Spawned
6/29/2005	051369	296.5	Female	730	Non-Fresh	Spawned
6/29/2005	051369	296.5	Male	860	Fresh	Unknown
6/29/2005	051369	296.5	Female	720	Non-Fresh	Spawned
6/29/2005	051369	296.5	Female	710	Non-Fresh	Spawned
6/29/2005	051370	297	Female	740	Fresh	Spawned
6/29/2005	051370	301	Female	670	Fresh	Spawned
6/29/2005	051372	296.5	Male	770	Fresh	Unknown
6/29/2005	051373	299	Female	670	Non-Fresh	Spawned
6/29/2005	051995	299	Male	560	Fresh	Unknown
6/29/2005	053737	296.5	Female	760	Non-Fresh	Unspawned
6/29/2005	053737	296.5	Female	820	Non-Fresh	Spawned
6/29/2005	053737	300	Female	750	Fresh	Spawned
6/30/2005	051282	282	Female	750	Non-Fresh	Spawned
6/30/2005	051366	287	Male	680	Fresh	Unknown
7/1/2005	051277	290	Male	880	Fresh	Unknown
7/1/2005	051279	295	Female	770	Non-Fresh	Spawned
7/1/2005	051282	296	Male	840	Non-Fresh	Unknown
7/1/2005	051283	294	Male	920	Non-Fresh	Unknown
7/1/2005	051284	295	Female	780	Fresh	Spawned
7/1/2005	051285	295	Male	840	Fresh	Unknown
7/1/2005	051286	295	Male	830	Non-Fresh	Unknown
7/1/2005	051287	291	Male	850	Non-Fresh	Unknown
7/1/2005	051291	296	Male	860	Fresh	Unknown
7/1/2005	051293	289	Male	880	Fresh	Unknown
7/1/2005	051296	294	Female	700	Fresh	Spawned
7/1/2005	051296	296	Female	700	Non-Fresh	Spawned
7/1/2005	051297	295	Female	800	Non-Fresh	Spawned
7/1/2005	051298	294	Female	730	Fresh	Spawned
7/1/2005	051365	293	Female	740	Fresh	Spawned
7/1/2005	051370	295	Male	830	Non-Fresh	Unknown
7/1/2005	051978	289	Male	530	Fresh	Unknown
7/1/2005	051997	288	Male	560	Non-Fresh	Unknown

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
7/2/2005	051276	296.5	Female	690	Fresh	Spawned
7/2/2005	051277	297	Female	730	Fresh	Spawned
7/2/2005	051277	298	Female	740	Non-Fresh	Spawned
7/2/2005	051278	296.5	Female	750	Fresh	Spawned
7/2/2005	051281	301	Female	740	Fresh	Spawned
7/2/2005	051284	296.5	Male	930	Fresh	Unknown
7/2/2005	051286	299	Female	730	Fresh	Spawned
7/2/2005	051287	296.5	Female	750	Fresh	Spawned
7/2/2005	051287	296.5	Female	800	Fresh	Spawned
7/2/2005	051287	297	Female	760	Fresh	Spawned
7/2/2005	051288	299	Female	790	Fresh	Spawned
7/2/2005	051289	296.5	Female	780	Fresh	Spawned
7/2/2005	051289	298	Female	800	Fresh	Spawned
7/2/2005	051289	299	Female	800	Fresh	Spawned
7/2/2005	051293	296.5	Female	750	Fresh	Spawned
7/2/2005	051293	299	Female	780	Fresh	Unspawned
7/2/2005	051294	296.5	Female	770	Fresh	Spawned
7/2/2005	051294	298	Female	750	Fresh	Spawned
7/2/2005	051294	299	Female	750	Fresh	Spawned
7/2/2005	051295	296.5	Female	810	Fresh	Spawned
7/2/2005	051295	300	Female	740	Fresh	Spawned
7/2/2005	051296	296.5	Female	740	Non-Fresh	Spawned
7/2/2005	051296	296.5	Unknown	740	Fresh	Spawned
7/2/2005	051297	297	Female	780	Non-Fresh	Spawned
7/2/2005	051298	296.5	Female	690	Fresh	Spawned
7/2/2005	051298	299	Female	800	Non-Fresh	Spawned
7/2/2005	051298	299	Female	760	Fresh	Spawned
7/2/2005	051299	296.5	Female	770	Fresh	Spawned
7/2/2005	051365	296.5	Female	730	Non-Fresh	Spawned
7/2/2005	051366	299	Female	800	Fresh	Spawned
7/2/2005	051367	296.5	Female	760	Non-Fresh	Spawned
7/2/2005	051367	299	Female	440	Fresh	Spawned
7/2/2005	051370	296.5	Female	750	Fresh	Spawned
7/2/2005	051371	297	Male	910	Fresh	Unknown
7/2/2005	051371	299	Female	720	Non-Fresh	Spawned
7/2/2005	051372	296	Female	660	Fresh	Spawned
7/2/2005	051373	296.5	Female	760	Fresh	Spawned
7/2/2005	051373	300	Male	910	Non-Fresh	Unknown
7/2/2005	051373	301	Female	740	Fresh	Spawned
7/2/2005	053737	296.5	Female	760	Fresh	Spawned
7/2/2005	053737	296.5	Female	770	Unknown	Unspawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
7/2/2005	053737	296.5	Female	700	Fresh	Spawned
7/2/2005	053737	299	Female	760	Non-Fresh	Unspawned
7/2/2005	053737	299	Female	710	Fresh	Spawned
7/3/2005	051290	280	Male	880	Non-Fresh	Unknown
7/3/2005	051298	278	Male	770	Fresh	Unknown
7/3/2005	051299	277	Male	910	Non-Fresh	Unknown
7/3/2005	051971	285	Male	550	Non-Fresh	Unknown
7/4/2005	051276	295	Female	690	Fresh	Spawned
7/4/2005	051277	295	Male	790	Non-Fresh	Unknown
7/4/2005	051282	289	Male	740	Fresh	Unknown
7/4/2005	051283	293	Female	830	Fresh	Spawned
7/4/2005	051287	294	Female	720	Fresh	Spawned
7/4/2005	051287	295	Male	870	Fresh	Unknown
7/4/2005	051288	288	Female	770	Non-Fresh	Spawned
7/4/2005	051289	295	Male	880	Fresh	Unknown
7/4/2005	051293	289	Male	820	Fresh	Unknown
7/4/2005	051293	294	Male	910	Fresh	Unknown
7/4/2005	051297	295	Female	760	Fresh	Spawned
7/4/2005	051298	288	Male	850	Fresh	Unknown
7/4/2005	051298	294	Male	860	Fresh	Unknown
7/4/2005	051298	295	Male	860	Fresh	Unknown
7/4/2005	051364	295	Female	780	Fresh	Spawned
7/4/2005	051366	295	Female	760	Fresh	Spawned
7/4/2005	051366	295	Male	710	Fresh	Unknown
7/4/2005	051371	296	Female	690	Non-Fresh	Spawned
7/4/2005	051978	289	Male	560	Fresh	Unknown
7/4/2005	051984	289	Male	560	Fresh	Unknown
7/4/2005	062756	294	Male	830	Fresh	Unknown
7/5/2005	051279	301	Female	790	Non-Fresh	Spawned
7/5/2005	051280	296.5	Female	780	Fresh	Spawned
7/5/2005	051281	296.5	Female	760	Fresh	Spawned
7/5/2005	051281	297	Female	800	Fresh	Spawned
7/5/2005	051281	298	Female	810	Fresh	Spawned
7/5/2005	051281	300	Female	760	Non-Fresh	Spawned
7/5/2005	051282	296.5	Female	650	Non-Fresh	Spawned
7/5/2005	051282	297	Female	730	Fresh	Spawned
7/5/2005	051282	298	Female	710	Non-Fresh	Spawned
7/5/2005	051282	300	Female	750	Non-Fresh	Spawned
7/5/2005	051283	296.5	Female	800	Non-Fresh	Spawned
7/5/2005	051283	296.5	Female	780	Non-Fresh	Spawned
7/5/2005	051283	299	Female	760	Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
7/5/2005	051284	299	Female	760	Fresh	Spawned
7/5/2005	051285	296	Female	770	Fresh	Spawned
7/5/2005	051288	296.5	Female	750	Non-Fresh	Spawned
7/5/2005	051288	297	Female	790	Fresh	Spawned
7/5/2005	051290	298	Female	720	Non-Fresh	Spawned
7/5/2005	051290	299	Female	730	Fresh	Spawned
7/5/2005	051291	296.5	Female	770	Fresh	Spawned
7/5/2005	051293	296.5	Female	770	Fresh	Spawned
7/5/2005	051293	296.5	Male	880	Non-Fresh	Unknown
7/5/2005	051293	299	Female	660	Fresh	Spawned
7/5/2005	051295	296.5	Male	790	Non-Fresh	Unknown
7/5/2005	051296	298	Female	780	Fresh	Spawned
7/5/2005	051297	296.5	Male	890	Non-Fresh	Unknown
7/5/2005	051297	296.5	Female	830	Fresh	Spawned
7/5/2005	051297	296.5	Female	740	Fresh	Spawned
7/5/2005	051297	298	Male	860	Fresh	Unknown
7/5/2005	051297	299	Female	710	Fresh	Spawned
7/5/2005	051297	299	Female	750	Fresh	Spawned
7/5/2005	051298	296.5	Female	700	Fresh	Spawned
7/5/2005	051298	300	Female	770	Fresh	Spawned
7/5/2005	051298	301	Female	740	Non-Fresh	Spawned
7/5/2005	051299	297	Female	800	Non-Fresh	Spawned
7/5/2005	051365	296.5	Female	740	Non-Fresh	Spawned
7/5/2005	051368	297	Male	840	Fresh	Unknown
7/5/2005	051369	299	Male	840	Non-Fresh	Unknown
7/5/2005	051369	299	Female	760	Fresh	Spawned
7/5/2005	051369	301	Female	710	Fresh	Spawned
7/5/2005	051373	296.5	Female	680	Fresh	Spawned
7/5/2005	051986	297	Male	530	Fresh	Unknown
7/6/2005	051282	276	Male	890	Non-Fresh	Unknown
7/6/2005	051371	281	Male	800	Non-Fresh	Unknown
7/6/2005	051997	282	Male	510	Fresh	Unknown
7/6/2005	053737	281	Male	740	Non-Fresh	Unknown
7/7/2005	051282	293	Female	780	Non-Fresh	Spawned
7/7/2005	051284	290	Male	810	Non-Fresh	Unknown
7/7/2005	051285	288	Male	780	Fresh	Unknown
7/7/2005	051286	295	Female	780	Non-Fresh	Spawned
7/7/2005	051288	288	Female	710	Non-Fresh	Spawned
7/7/2005	051288	295	Female	690	Fresh	Spawned
7/7/2005	051291	294	Female	690	Non-Fresh	Spawned
7/7/2005	051297	289	Female	790	Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
7/7/2005	051297	295	Female	790	Fresh	Spawned
7/7/2005	051297	295	Female	800	Fresh	Spawned
7/7/2005	051298	291	Female	620	Non-Fresh	Spawned
7/7/2005	051298	293	Male	870	Fresh	Unknown
7/7/2005	051364	289	Male	920	Non-Fresh	Unknown
7/7/2005	051364	294	Male	910	Non-Fresh	Unknown
7/7/2005	051366	294	Male	840	Non-Fresh	Unknown
7/7/2005	051995	295	Male	550	Non-Fresh	Unknown
7/8/2005	051278	296.5	Female	740	Non-Fresh	Spawned
7/8/2005	051278	297	Female	740	Fresh	Spawned
7/8/2005	051281	297	Female	780	Fresh	Spawned
7/8/2005	051282	296	Female	730	Fresh	Spawned
7/8/2005	051283	296.5	Female	700	Fresh	Spawned
7/8/2005	051283	299	Female	760	Non-Fresh	Spawned
7/8/2005	051286	296.5	Female	760	Non-Fresh	Spawned
7/8/2005	051286	298	Female	800	Fresh	Spawned
7/8/2005	051289	299	Female	720	Fresh	Spawned
7/8/2005	051291	296.5	Female	740	Non-Fresh	Spawned
7/8/2005	051291	296.5	Female	730	Non-Fresh	Spawned
7/8/2005	051291	297	Male	810	Fresh	Unknown
7/8/2005	051292	296.5	Female	760	Fresh	Spawned
7/8/2005	051292	296.5	Female	710	Fresh	Spawned
7/8/2005	051292	299	Male	870	Fresh	Unknown
7/8/2005	051293	296.5	Male	900	Fresh	Unknown
7/8/2005	051293	297	Female	750	Fresh	Spawned
7/8/2005	051294	296.5	Female	750	Fresh	Spawned
7/8/2005	051294	298	Female	760	Non-Fresh	Spawned
7/8/2005	051294	299	Female	760	Fresh	Spawned
7/8/2005	051294	299	Female	730	Fresh	Spawned
7/8/2005	051297	296.5	Male	860	Fresh	Unknown
7/8/2005	051297	296.5	Female	800	Non-Fresh	Spawned
7/8/2005	051297	296.5	Female	830	Fresh	Spawned
7/8/2005	051297	296.5	Female	820	Fresh	Spawned
7/8/2005	051297	299	Female	800	Fresh	Spawned
7/8/2005	051297	299	Female	740	Fresh	Spawned
7/8/2005	051298	297	Female	780	Fresh	Spawned
7/8/2005	051298	298	Male	890	Non-Fresh	Unknown
7/8/2005	051298	299	Female	800	Fresh	Spawned
7/8/2005	051298	299	Female	680	Non-Fresh	Spawned
7/8/2005	051298	299	Male	750	Non-Fresh	Unknown
7/8/2005	051299	297	Female	660	Non-Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
7/8/2005	051299	298	Female	740	Non-Fresh	Spawned
7/8/2005	051365	296.5	Female	700	Fresh	Spawned
7/8/2005	051366	296.5	Female	800	Fresh	Spawned
7/8/2005	051366	296.5	Male	930	Fresh	Unknown
7/8/2005	051366	296.5	Male	860	Fresh	Unknown
7/8/2005	051366	301	Female	720	Non-Fresh	Spawned
7/8/2005	051367	297	Female	780	Fresh	Spawned
7/8/2005	051368	296.5	Male	930	Fresh	Unknown
7/8/2005	051368	297	Female	700	Non-Fresh	Spawned
7/8/2005	051368	299	Female	770	Fresh	Spawned
7/8/2005	051369	299	Female	690	Fresh	Spawned
7/8/2005	051369	300	Female	780	Non-Fresh	Spawned
7/8/2005	051370	299	Female	760	Fresh	Unspawned
7/8/2005	051371	296.5	Male	920	Fresh	Unknown
7/8/2005	051371	299	Male	900	Fresh	Unknown
7/8/2005	051372	299	Female	770	Fresh	Spawned
7/8/2005	051996	296	Male	620	Fresh	Unknown
7/8/2005	053737	296.5	Male	680	Fresh	Unknown
7/8/2005	053737	299	Female	780	Fresh	Spawned
7/8/2005	053737	300	Female	730	Non-Fresh	Spawned
7/9/2005	051292	284	Male	860	Fresh	Unknown
7/9/2005	051366	276	Male	790	Fresh	Unknown
7/9/2005	051993	281	Male	540	Fresh	Unknown
7/10/2005	051283	292	Female	850	Fresh	Spawned
7/10/2005	051286	293	Male	920	Fresh	Unknown
7/10/2005	051290	294	Female	760	Non-Fresh	Spawned
7/10/2005	051293	291	Male	850	Fresh	Unknown
7/10/2005	051294	294	Female	770	Non-Fresh	Spawned
7/10/2005	051296	295	Female	610	Fresh	Spawned
7/10/2005	051298	288	Male	890	Non-Fresh	Unknown
7/10/2005	051298	294	Male	940	Fresh	Unknown
7/10/2005	051367	295	Female	680	Fresh	Spawned
7/10/2005	051368	288	Female	760	Non-Fresh	Spawned
7/10/2005	051369	288	Male	760	Non-Fresh	Unknown
7/10/2005	051369	295	Female	730	Fresh	Spawned
7/10/2005	051371	294	Female	760	Fresh	Spawned
7/10/2005	051977	292	Male	580	Fresh	Unknown
7/10/2005	051993	289	Male	470	Fresh	Unknown
7/10/2005	051996	294	Male	610	Fresh	Unknown
7/11/2005	051277	296.5	Female	730	Non-Fresh	Spawned
7/11/2005	051277	296.5	Female	730	Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
7/11/2005	051280	298	Female	750	Fresh	Spawned
7/11/2005	051283	297	Female	750	Non-Fresh	Spawned
7/11/2005	051284	296.5	Female	780	Non-Fresh	Spawned
7/11/2005	051284	296.5	Female	800	Non-Fresh	Spawned
7/11/2005	051285	296.5	Female	810	Fresh	Spawned
7/11/2005	051286	296.5	Female	750	Fresh	Spawned
7/11/2005	051288	296	Female	720	Fresh	Spawned
7/11/2005	051288	296.5	Male	720	Non-Fresh	Unknown
7/11/2005	051293	297	Female	770	Fresh	Spawned
7/11/2005	051294	296.5	Male	680	Fresh	Unknown
7/11/2005	051296	296.5	Male	830	Non-Fresh	Unknown
7/11/2005	051296	297	Male	700	Fresh	Unknown
7/11/2005	051296	297	Unknown	800	Non-Fresh	Spawned
7/11/2005	051296	298	Female	740	Fresh	Spawned
7/11/2005	051296	299	Female	740	Fresh	Spawned
7/11/2005	051297	296.5	Female	830	Fresh	Spawned
7/11/2005	051297	298	Female	800	Non-Fresh	Spawned
7/11/2005	051298	296	Female	730	Non-Fresh	Spawned
7/11/2005	051298	296	Male	940	Fresh	Unknown
7/11/2005	051298	296.5	Female	760	Fresh	Spawned
7/11/2005	051298	296.5	Male	830	Fresh	Unknown
7/11/2005	051298	296.5	Female	740	Non-Fresh	Spawned
7/11/2005	051298	296.5	Female	690	Non-Fresh	Spawned
7/11/2005	051298	297	Female	730	Fresh	Spawned
7/11/2005	051298	301	Female	660	Fresh	Spawned
7/11/2005	051299	296.5	Female	750	Fresh	Spawned
7/11/2005	051364	297	Female	770	Fresh	Spawned
7/11/2005	051366	301	Female	770	Fresh	Spawned
7/11/2005	051367	296.5	Female	790	Fresh	Spawned
7/11/2005	051367	296.5	Female	830	Non-Fresh	Spawned
7/11/2005	051367	296.5	Female	770	Fresh	Spawned
7/11/2005	051369	297	Female	760	Fresh	Spawned
7/11/2005	051369	300	Female	760	Non-Fresh	Spawned
7/11/2005	051371	296.5	Female	800	Fresh	Spawned
7/11/2005	051372	296.5	Male	910	Fresh	Unknown
7/11/2005	051372	297	Female	780	Fresh	Spawned
7/11/2005	051373	296.5	Male	880	Fresh	Unknown
7/11/2005	051964	296	Male	510	Non-Fresh	Unknown
7/11/2005	053737	296.5	Female	770	Non-Fresh	Spawned
7/11/2005	053737	296.5	Female	710	Non-Fresh	Unspawned
7/11/2005	053737	298	Female	800	Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
7/12/2005	051297	281	Male	830	Non-Fresh	Unknown
7/12/2005	051298	279	Male	830	Fresh	Unknown
7/12/2005	051368	282	Male	830	Fresh	Unknown
7/12/2005	051368	286	Female	740	Non-Fresh	Spawned
7/12/2005	051369	286	Male	860	Fresh	Unknown
7/12/2005	051371	279	Male	910	Non-Fresh	Unknown
7/12/2005	051974	285	Male	580	Non-Fresh	Unknown
7/12/2005	051996	286	Male	490	Non-Fresh	Unknown
7/12/2005	053737	287	Male	720	Non-Fresh	Unknown
7/13/2005	051276	296	Female	770	Fresh	Spawned
7/13/2005	051278	295	Female	670	Non-Fresh	Spawned
7/13/2005	051286	288	Female	690	Non-Fresh	Spawned
7/13/2005	051291	295	Female	860	Fresh	Spawned
7/13/2005	051291	295	Female	740	Fresh	Spawned
7/13/2005	051292	295	Female	740	Fresh	Spawned
7/13/2005	051294	294	Female	0	Fresh	Spawned
7/13/2005	051297	294	Female	770	Non-Fresh	Spawned
7/13/2005	051366	295	Male	690	Non-Fresh	Unknown
7/13/2005	051974	289	Male	570	Non-Fresh	Unknown
7/13/2005	051995	295	Male	540	Fresh	Unknown
7/13/2005	051996	292	Male	630	Fresh	Unknown
7/14/2005	051277	296.5	Female	730	Non-Fresh	Spawned
7/14/2005	051282	296.5	Female	660	Fresh	Spawned
7/14/2005	051284	296.5	Female	730	Fresh	Spawned
7/14/2005	051284	296.5	Female	770	Non-Fresh	Spawned
7/14/2005	051284	296.5	Female	700	Non-Fresh	Spawned
7/14/2005	051286	296.5	Female	830	Non-Fresh	Spawned
7/14/2005	051286	296.5	Female	720	Non-Fresh	Spawned
7/14/2005	051287	299	Female	720	Fresh	Spawned
7/14/2005	051291	296.5	Female	770	Fresh	Spawned
7/14/2005	051293	296.5	Male	940	Fresh	Unknown
7/14/2005	051293	299	Female	620	Fresh	Spawned
7/14/2005	051294	298	Female	740	Non-Fresh	Spawned
7/14/2005	051295	296.5	Female	730	Fresh	Spawned
7/14/2005	051296	296	Female	720	Fresh	Spawned
7/14/2005	051297	296.5	Male	980	Fresh	Unknown
7/14/2005	051297	298	Female	720	Fresh	Spawned
7/14/2005	051298	296.5	Male	850	Fresh	Unknown
7/14/2005	051298	296.5	Female	740	Fresh	Spawned
7/14/2005	051299	296.5	Female	720	Fresh	Spawned
7/14/2005	051299	297	Female	730	Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
7/14/2005	051364	296.5	Female	780	Fresh	Spawned
7/14/2005	051365	296.5	Female	730	Non-Fresh	Spawned
7/14/2005	051369	298	Female	760	Fresh	Spawned
7/14/2005	051370	296.5	Female	700	Non-Fresh	Spawned
7/14/2005	051371	296.5	Male	970	Fresh	Unknown
7/14/2005	051371	296.5	Female	770	Non-Fresh	Spawned
7/14/2005	051373	299	Female	770	Fresh	Spawned
7/14/2005	051970	296.5	Male	520	Fresh	Unknown
7/14/2005	051972	297	Male	580	Fresh	Unknown
7/14/2005	051973	297	Male	550	Non-Fresh	Unknown
7/14/2005	051974	299	Male	590	Fresh	Unknown
7/14/2005	051991	298	Male	480	Fresh	Unknown
7/14/2005	053737	298	Female	780	Non-Fresh	Spawned
7/15/2005	051281	280	Male	830	Non-Fresh	Unknown
7/15/2005	051293	281	Female	740	Non-Fresh	Spawned
7/15/2005	051369	287	Female	780	Non-Fresh	Spawned
7/15/2005	051371	287	Male	840	Fresh	Unknown
7/15/2005	051974	277	Male	520	Non-Fresh	Unknown
7/16/2005	051279	295	Female	710	Non-Fresh	Spawned
7/16/2005	051281	288	Female	740	Fresh	Spawned
7/16/2005	051281	295	Male	770	Non-Fresh	Unknown
7/16/2005	051285	295	Female	760	Non-Fresh	Spawned
7/16/2005	051286	295	Female	860	Fresh	Spawned
7/16/2005	051291	295	Female	800	Non-Fresh	Spawned
7/16/2005	051292	295	Male	670	Non-Fresh	Unknown
7/16/2005	051292	295	Female	730	Non-Fresh	Spawned
7/16/2005	051294	292	Female	750	Non-Fresh	Spawned
7/16/2005	051295	294	Female	790	Non-Fresh	Spawned
7/16/2005	051297	293	Male	850	Non-Fresh	Unknown
7/16/2005	051298	292	Male	820	Non-Fresh	Unknown
7/16/2005	051299	288	Female	710	Fresh	Spawned
7/16/2005	051299	288	Male	930	Non-Fresh	Unknown
7/16/2005	051364	294	Female	750	Non-Fresh	Spawned
7/16/2005	051368	288	Female	670	Non-Fresh	Spawned
7/16/2005	051372	295	Male	880	Non-Fresh	Unknown
7/16/2005	051373	295	Female	840	Non-Fresh	Spawned
7/16/2005	051974	295	Male	650	Fresh	Unknown
7/16/2005	051982	288	Male	540	Non-Fresh	Unknown
7/16/2005	051997	288	Male	540	Fresh	Unknown
7/16/2005	053737	288	Female	760	Non-Fresh	Spawned
7/16/2005	053737	291	Female	760	Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
7/17/2005	051276	297	Female	750	Fresh	Spawned
7/17/2005	051276	297	Female	750	Fresh	Spawned
7/17/2005	051276	301	Female	710	Fresh	Spawned
7/17/2005	051277	296.5	Male	840	Non-Fresh	Unknown
7/17/2005	051277	297	Female	740	Fresh	Spawned
7/17/2005	051277	299	Female	680	Non-Fresh	Spawned
7/17/2005	051278	296.5	Male	680	Non-Fresh	Unknown
7/17/2005	051278	296.5	Male	760	Non-Fresh	Unknown
7/17/2005	051278	301	Female	850	Non-Fresh	Spawned
7/17/2005	051279	297	Female	650	Fresh	Spawned
7/17/2005	051279	300	Female	760	Non-Fresh	Spawned
7/17/2005	051283	299	Female	780	Non-Fresh	Spawned
7/17/2005	051284	296.5	Female	700	Non-Fresh	Spawned
7/17/2005	051284	299	Female	740	Fresh	Spawned
7/17/2005	051285	298	Female	740	Non-Fresh	Spawned
7/17/2005	051285	299	Female	730	Non-Fresh	Spawned
7/17/2005	051288	296.5	Female	640	Fresh	Spawned
7/17/2005	051288	300	Female	760	Fresh	Spawned
7/17/2005	051289	298	Male	850	Fresh	Unknown
7/17/2005	051290	300	Female	790	Fresh	Spawned
7/17/2005	051291	299	Female	700	Non-Fresh	Spawned
7/17/2005	051292	299	Female	740	Fresh	Spawned
7/17/2005	051292	300	Male	920	Non-Fresh	Unknown
7/17/2005	051293	298	Female	720	Non-Fresh	Spawned
7/17/2005	051293	301	Female	750	Non-Fresh	Spawned
7/17/2005	051294	296.5	Female	780	Non-Fresh	Spawned
7/17/2005	051296	296.5	Female	790	Non-Fresh	Spawned
7/17/2005	051296	299	Female	730	Non-Fresh	Spawned
7/17/2005	051297	296.5	Female	780	Fresh	Spawned
7/17/2005	051297	296.5	Male	850	Non-Fresh	Unknown
7/17/2005	051297	296.5	Female	740	Fresh	Spawned
7/17/2005	051297	299	Female	770	Fresh	Spawned
7/17/2005	051298	297	Female	690	Fresh	Spawned
7/17/2005	051298	298	Male	800	Non-Fresh	Unknown
7/17/2005	051298	298	Female	820	Non-Fresh	Spawned
7/17/2005	051298	299	Male	750	Fresh	Unknown
7/17/2005	051298	299	Male	890	Non-Fresh	Unknown
7/17/2005	051298	299	Female	750	Non-Fresh	Spawned
7/17/2005	051298	299	Male	910	Fresh	Unknown
7/17/2005	051298	301	Female	760	Non-Fresh	Spawned
7/17/2005	051299	296.5	Female	780	Non-Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
7/17/2005	051299	299	Female	760	Fresh	Spawned
7/17/2005	051299	299	Female	700	Non-Fresh	Spawned
7/17/2005	051364	296.5	Female	760	Fresh	Spawned
7/17/2005	051365	298	Female	770	Non-Fresh	Spawned
7/17/2005	051365	298	Female	780	Fresh	Spawned
7/17/2005	051366	296.5	Female	670	Non-Fresh	Spawned
7/17/2005	051366	300	Female	800	Non-Fresh	Spawned
7/17/2005	051368	299	Female	730	Non-Fresh	Spawned
7/17/2005	051368	299	Unknown	750	Fresh	Spawned
7/17/2005	051368	300	Female	740	Fresh	Spawned
7/17/2005	051369	296.5	Female	730	Non-Fresh	Spawned
7/17/2005	051369	299	Female	710	Non-Fresh	Spawned
7/17/2005	051370	297	Female	810	Fresh	Spawned
7/17/2005	051370	298	Male	750	Non-Fresh	Unknown
7/17/2005	051370	299	Female	700	Fresh	Spawned
7/17/2005	051370	301	Female	830	Fresh	Spawned
7/17/2005	051370	301	Female	720	Fresh	Spawned
7/17/2005	051372	298	Female	710	Non-Fresh	Spawned
7/17/2005	051996	299	Male	540	Fresh	Unknown
7/17/2005	053737	296.5	Male	820	Non-Fresh	Unknown
7/17/2005	053737	299	Male	870	Non-Fresh	Unknown
7/17/2005	053737	299	Female	780	Fresh	Spawned
7/18/2005	051286	283	Female	770	Non-Fresh	Spawned
7/18/2005	051366	284	Male	770	Non-Fresh	Unknown
7/18/2005	051368	286	Male	740	Non-Fresh	Unknown
7/19/2005	051279	288	Female	700	Non-Fresh	Spawned
7/19/2005	051279	295	Female	740	Non-Fresh	Spawned
7/19/2005	051281	294	Male	930	Fresh	Unknown
7/19/2005	051282	295	Male	890	Non-Fresh	Unknown
7/19/2005	051282	295	Female	760	Non-Fresh	Spawned
7/19/2005	051289	295	Female	790	Non-Fresh	Spawned
7/19/2005	051292	296	Female	740	Non-Fresh	Spawned
7/19/2005	051297	292	Female	760	Non-Fresh	Spawned
7/19/2005	051297	294	Female	710	Fresh	Spawned
7/19/2005	051297	295	Female	680	Fresh	Spawned
7/19/2005	051298	295	Female	690	Non-Fresh	Spawned
7/19/2005	051366	295	Female	650	Fresh	Spawned
7/19/2005	051366	295	Female	750	Fresh	Spawned
7/19/2005	051366	295	Male	900	Non-Fresh	Unknown
7/19/2005	051369	288	Female	650	Fresh	Spawned
7/19/2005	051369	288	Female	750	Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
7/19/2005	051369	294	Female	760	Fresh	Spawned
7/19/2005	051370	288	Female	700	Fresh	Spawned
7/19/2005	051371	295	Female	740	Non-Fresh	Spawned
7/19/2005	051970	296	Male	530	Non-Fresh	Unknown
7/19/2005	051973	289	Male	510	Fresh	Unknown
7/19/2005	051984	288	Male	540	Fresh	Unknown
7/19/2005	051997	292	Male	510	Fresh	Unknown
7/19/2005	053737	295	Female	790	Fresh	Spawned
7/20/2005	051276	296.5	Male	820	Non-Fresh	Unknown
7/20/2005	051277	296.5	Female	750	Non-Fresh	Spawned
7/20/2005	051277	296.5	Female	800	Non-Fresh	Spawned
7/20/2005	051278	301	Female	680	Non-Fresh	Spawned
7/20/2005	051279	296.5	Male	830	Non-Fresh	Unknown
7/20/2005	051279	296.5	Male	820	Fresh	Unknown
7/20/2005	051280	300	Female	780	Fresh	Spawned
7/20/2005	051281	298	Female	760	Fresh	Spawned
7/20/2005	051281	301	Female	780	Fresh	Spawned
7/20/2005	051282	296.5	Female	670	Fresh	Spawned
7/20/2005	051282	299	Female	700	Fresh	Spawned
7/20/2005	051284	298	Female	650	Fresh	Spawned
7/20/2005	051285	299	Female	720	Fresh	Spawned
7/20/2005	051287	296.5	Female	740	Unknown	Spawned
7/20/2005	051287	296.5	Female	760	Non-Fresh	Spawned
7/20/2005	051289	297	Female	770	Non-Fresh	Spawned
7/20/2005	051289	297	Female	820	Non-Fresh	Spawned
7/20/2005	051290	296.5	Female	740	Fresh	Spawned
7/20/2005	051290	299	Female	830	Fresh	Spawned
7/20/2005	051291	296.5	Female	710	Non-Fresh	Spawned
7/20/2005	051296	300	Female	690	Non-Fresh	Spawned
7/20/2005	051297	298	Female	710	Non-Fresh	Spawned
7/20/2005	051297	299	Female	800	Non-Fresh	Spawned
7/20/2005	051297	299	Female	810	Fresh	Spawned
7/20/2005	051297	299	Female	770	Non-Fresh	Spawned
7/20/2005	051297	301	Female	740	Non-Fresh	Spawned
7/20/2005	051298	296.5	Female	750	Fresh	Spawned
7/20/2005	051298	298	Female	730	Fresh	Spawned
7/20/2005	051298	299	Female	780	Fresh	Spawned
7/20/2005	051299	298	Female	760	Fresh	Spawned
7/20/2005	051364	301	Female	760	Non-Fresh	Spawned
7/20/2005	051365	296.5	Female	670	Fresh	Spawned
7/20/2005	051366	297	Female	730	Non-Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
7/20/2005	051367	296	Female	750	Non-Fresh	Spawned
7/20/2005	051367	301	Female	750	Non-Fresh	Spawned
7/20/2005	051369	299	Female	710	Non-Fresh	Spawned
7/20/2005	051369	301	Female	660	Fresh	Spawned
7/20/2005	051370	300	Female	780	Fresh	Spawned
7/20/2005	051370	301	Female	790	Non-Fresh	Spawned
7/20/2005	051371	296.5	Female	800	Fresh	Spawned
7/20/2005	051371	297	Female	700	Fresh	Spawned
7/20/2005	051371	301	Female	780	Non-Fresh	Spawned
7/20/2005	051372	296.5	Female	700	Non-Fresh	Spawned
7/20/2005	051372	296.5	Female	740	Fresh	Spawned
7/20/2005	051372	299	Female	690	Fresh	Spawned
7/20/2005	051372	299	Male	870	Fresh	Unknown
7/20/2005	051372	299	Female	730	Fresh	Spawned
7/20/2005	051372	300	Female	750	Fresh	Spawned
7/20/2005	051964	298	Male	540	Non-Fresh	Unknown
7/20/2005	051974	300	Male	590	Non-Fresh	Unknown
7/20/2005	051995	296.5	Male	520	Fresh	Unknown
7/20/2005	053737	296.5	Male	790	Fresh	Unknown
7/20/2005	053737	300	Female	730	Fresh	Spawned
7/21/2005	051288	279	Male	500	Non-Fresh	Unknown
7/21/2005	051290	288	Female	740	Non-Fresh	Spawned
7/21/2005	051297	287	Female	750	Non-Fresh	Spawned
7/21/2005	051980	285	Male	560	Non-Fresh	Unknown
7/22/2005	051276	295	Male	770	Non-Fresh	Unknown
7/22/2005	051281	293	Female	750	Non-Fresh	Spawned
7/22/2005	051284	293	Female	710	Non-Fresh	Spawned
7/22/2005	051286	294	Male	850	Fresh	Unknown
7/22/2005	051287	295	Male	810	Non-Fresh	Unknown
7/22/2005	051287	295	Female	760	Fresh	Spawned
7/22/2005	051288	295	Female	760	Non-Fresh	Spawned
7/22/2005	051289	294	Male	840	Non-Fresh	Unknown
7/22/2005	051292	295	Female	660	Fresh	Spawned
7/22/2005	051293	293	Male	830	Fresh	Unknown
7/22/2005	051294	295	Female	750	Non-Fresh	Spawned
7/22/2005	051296	294	Female	670	Fresh	Spawned
7/22/2005	051297	296	Female	640	Non-Fresh	Spawned
7/22/2005	051299	288	Female	630	Non-Fresh	Spawned
7/22/2005	051364	294	Female	720	Fresh	Spawned
7/22/2005	051365	294	Female	720	Fresh	Spawned
7/22/2005	051366	295	Female	700	Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
7/22/2005	051369	288	Female	780	Non-Fresh	Spawned
7/22/2005	051372	296	Female	710	Non-Fresh	Spawned
7/22/2005	051974	295	Male	570	Fresh	Unknown
7/22/2005	051993	294	Male	620	Non-Fresh	Unknown
7/22/2005	051995	293	Male	520	Non-Fresh	Unknown
7/23/2005	051276	296.5	Female	740	Non-Fresh	Spawned
7/23/2005	051277	296.5	Female	720	Non-Fresh	Spawned
7/23/2005	051277	296.5	Female	680	Non-Fresh	Spawned
7/23/2005	051277	296.5	Female	770	Fresh	Spawned
7/23/2005	051277	297	Male	850	Non-Fresh	Unknown
7/23/2005	051277	299	Female	710	Fresh	Spawned
7/23/2005	051278	296.5	Female	720	Fresh	Spawned
7/23/2005	051278	296.5	Female	750	Non-Fresh	Spawned
7/23/2005	051278	299	Male	750	Non-Fresh	Unknown
7/23/2005	051278	300	Female	720	Fresh	Spawned
7/23/2005	051278	301	Female	730	Fresh	Spawned
7/23/2005	051279	296.5	Female	690	Non-Fresh	Spawned
7/23/2005	051279	296.5	Female	770	Non-Fresh	Spawned
7/23/2005	051280	297	Female	820	Fresh	Spawned
7/23/2005	051280	297	Female	770	Fresh	Spawned
7/23/2005	051280	297	Female	720	Non-Fresh	Spawned
7/23/2005	051281	296.5	Female	750	Fresh	Spawned
7/23/2005	051281	296.5	Male	900	Fresh	Unknown
7/23/2005	051283	301	Female	790	Non-Fresh	Spawned
7/23/2005	051284	296.5	Female	770	Non-Fresh	Spawned
7/23/2005	051284	298	Female	730	Fresh	Spawned
7/23/2005	051284	298	Female	730	Fresh	Spawned
7/23/2005	051285	296.5	Female	720	Fresh	Spawned
7/23/2005	051285	300	Female	780	Fresh	Spawned
7/23/2005	051286	296.5	Female	760	Fresh	Spawned
7/23/2005	051287	297	Female	720	Non-Fresh	Spawned
7/23/2005	051288	296.5	Female	740	Non-Fresh	Spawned
7/23/2005	051288	296.5	Female	750	Non-Fresh	Spawned
7/23/2005	051291	296.5	Female	800	Fresh	Spawned
7/23/2005	051291	298	Female	750	Fresh	Spawned
7/23/2005	051291	298	Female	770	Fresh	Spawned
7/23/2005	051292	296.5	Male	870	Fresh	Unknown
7/23/2005	051292	298	Female	760	Non-Fresh	Spawned
7/23/2005	051293	298	Female	820	Non-Fresh	Spawned
7/23/2005	051294	297	Female	740	Non-Fresh	Spawned
7/23/2005	051297	296.5	Female	680	Non-Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
7/23/2005	051297	299	Female	720	Non-Fresh	Spawned
7/23/2005	051297	299	Female	780	Fresh	Spawned
7/23/2005	051298	296.5	Female	690	Fresh	Spawned
7/23/2005	051298	296.5	Female	730	Non-Fresh	Spawned
7/23/2005	051298	296.5	Female	750	Fresh	Spawned
7/23/2005	051298	297	Male	930	Non-Fresh	Unknown
7/23/2005	051298	297	Female	710	Fresh	Spawned
7/23/2005	051298	298	Female	750	Fresh	Spawned
7/23/2005	051298	298	Female	740	Non-Fresh	Spawned
7/23/2005	051298	299	Female	790	Fresh	Spawned
7/23/2005	051298	299	Female	840	Non-Fresh	Spawned
7/23/2005	051298	300	Female	730	Non-Fresh	Spawned
7/23/2005	051364	296.5	Female	730	Non-Fresh	Spawned
7/23/2005	051365	299	Female	730	Non-Fresh	Spawned
7/23/2005	051365	299	Female	770	Fresh	Spawned
7/23/2005	051365	299	Female	800	Fresh	Spawned
7/23/2005	051367	298	Female	750	Fresh	Spawned
7/23/2005	051367	298	Female	700	Non-Fresh	Spawned
7/23/2005	051367	301	Female	720	Fresh	Spawned
7/23/2005	051369	299	Female	730	Fresh	Spawned
7/23/2005	051369	299	Female	690	Fresh	Spawned
7/23/2005	051369	300	Female	780	Non-Fresh	Spawned
7/23/2005	051369	300	Female	730	Non-Fresh	Spawned
7/23/2005	051369	300	Female	570	Fresh	Spawned
7/23/2005	051369	301	Female	760	Fresh	Spawned
7/23/2005	051370	299	Female	750	Non-Fresh	Spawned
7/23/2005	051370	301	Female	760	Non-Fresh	Spawned
7/23/2005	051371	297	Female	770	Fresh	Spawned
7/23/2005	051372	296.5	Female	670	Fresh	Spawned
7/23/2005	051372	297	Female	760	Fresh	Spawned
7/23/2005	051373	301	Female	720	Non-Fresh	Spawned
7/23/2005	051978	296.5	Male	540	Fresh	Unknown
7/23/2005	051988	298	Male	570	Non-Fresh	Unknown
7/23/2005	051996	296.5	Male	530	Fresh	Unknown
7/23/2005	051996	297	Male	580	Non-Fresh	Unknown
7/23/2005	053737	296.5	Female	670	Non-Fresh	Spawned
7/23/2005	053737	298	Female	800	Non-Fresh	Spawned
7/23/2005	053737	299	Female	630	Fresh	Spawned
7/23/2005	053737	299	Female	660	Fresh	Spawned
7/23/2005	053737	299	Male	740	Fresh	Unknown
7/23/2005	053737	299	Female	690	Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
7/23/2005	053737	300	Female	710	Fresh	Spawned
7/23/2005	053737	300	Female	640	Fresh	Spawned
7/24/2005	051278	287	Female	630	Non-Fresh	Spawned
7/24/2005	051292	287	Male	710	Non-Fresh	Unknown
7/24/2005	051364	287	Female	610	Non-Fresh	Spawned
7/24/2005	051367	283	Male	830	Non-Fresh	Unknown
7/25/2005	051277	294	Female	730	Non-Fresh	Spawned
7/25/2005	051278	294	Female	780	Fresh	Spawned
7/25/2005	051280	293	Female	790	Non-Fresh	Spawned
7/25/2005	051283	295	Female	760	Non-Fresh	Spawned
7/25/2005	051287	295	Female	780	Fresh	Spawned
7/25/2005	051288	292	Male	790	Non-Fresh	Unknown
7/25/2005	051290	294	Male	850	Fresh	Unknown
7/25/2005	051292	295	Female	700	Non-Fresh	Spawned
7/25/2005	051293	292	Male	830	Non-Fresh	Unknown
7/25/2005	051296	295	Female	740	Non-Fresh	Spawned
7/25/2005	051296	295	Female	710	Non-Fresh	Spawned
7/25/2005	051297	292	Female	610	Non-Fresh	Spawned
7/25/2005	051297	294	Female	750	Non-Fresh	Spawned
7/25/2005	051298	288	Female	710	Fresh	Spawned
7/25/2005	051298	295	Female	790	Fresh	Spawned
7/25/2005	051298	295	Female	700	Fresh	Spawned
7/25/2005	051364	296	Male	830	Non-Fresh	Unknown
7/25/2005	051365	288	Female	630	Non-Fresh	Spawned
7/25/2005	051367	295	Female	730	Fresh	Spawned
7/25/2005	051367	295	Male	920	Non-Fresh	Unknown
7/25/2005	051371	292	Male	730	Non-Fresh	Unknown
7/25/2005	051372	295	Female	680	Non-Fresh	Spawned
7/25/2005	051372	295	Female	750	Non-Fresh	Spawned
7/25/2005	051372	295	Female	770	Fresh	Spawned
7/25/2005	051372	295	Female	720	Non-Fresh	Spawned
7/25/2005	051970	289	Male	660	Non-Fresh	Unknown
7/25/2005	051991	292	Male	580	Non-Fresh	Unknown
7/25/2005	051997	292	Male	590	Fresh	Unknown
7/25/2005	053737	295	Female	760	Fresh	Spawned
7/26/2005	051277	296.5	Female	720	Non-Fresh	Spawned
7/26/2005	051277	297	Female	680	Non-Fresh	Spawned
7/26/2005	051278	299	Female	710	Fresh	Spawned
7/26/2005	051280	296.5	Female	790	Fresh	Spawned
7/26/2005	051280	296.5	Female	720	Fresh	Spawned
7/26/2005	051280	296.5	Female	780	Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
7/26/2005	051281	296.5	Female	680	Fresh	Spawned
7/26/2005	051281	299	Female	730	Non-Fresh	Spawned
7/26/2005	051282	300	Female	750	Non-Fresh	Spawned
7/26/2005	051283	297	Female	710	Non-Fresh	Spawned
7/26/2005	051285	296.5	Female	720	Non-Fresh	Spawned
7/26/2005	051285	298	Female	700	Fresh	Spawned
7/26/2005	051286	296.5	Female	750	Non-Fresh	Spawned
7/26/2005	051287	296.5	Female	710	Non-Fresh	Spawned
7/26/2005	051287	296.5	Female	730	Non-Fresh	Spawned
7/26/2005	051287	296.5	Female	670	Fresh	Spawned
7/26/2005	051288	296.5	Female	780	Fresh	Spawned
7/26/2005	051288	296.5	Female	740	Non-Fresh	Spawned
7/26/2005	051288	299	Female	750	Fresh	Spawned
7/26/2005	051289	297	Female	760	Non-Fresh	Spawned
7/26/2005	051291	296.5	Female	750	Non-Fresh	Spawned
7/26/2005	051291	297	Female	740	Non-Fresh	Spawned
7/26/2005	051292	300	Female	770	Fresh	Spawned
7/26/2005	051293	296.5	Female	730	Non-Fresh	Spawned
7/26/2005	051293	299	Female	710	Fresh	Spawned
7/26/2005	051293	301	Female	720	Non-Fresh	Spawned
7/26/2005	051294	296.5	Female	720	Fresh	Spawned
7/26/2005	051294	296.5	Female	680	Non-Fresh	Spawned
7/26/2005	051294	296.5	Female	670	Non-Fresh	Unspawned
7/26/2005	051297	296.5	Female	760	Non-Fresh	Spawned
7/26/2005	051297	296.5	Female	770	Non-Fresh	Spawned
7/26/2005	051297	298	Female	650	Fresh	Spawned
7/26/2005	051298	296.5	Female	820	Non-Fresh	Spawned
7/26/2005	051298	296.5	Female	710	Non-Fresh	Spawned
7/26/2005	051298	296.5	Female	720	Fresh	Spawned
7/26/2005	051298	298	Female	740	Non-Fresh	Spawned
7/26/2005	051298	298	Female	700	Fresh	Spawned
7/26/2005	051298	299	Female	710	Fresh	Spawned
7/26/2005	051299	296.5	Female	750	Non-Fresh	Unspawned
7/26/2005	051299	296.5	Female	690	Non-Fresh	Spawned
7/26/2005	051299	300	Female	770	Non-Fresh	Spawned
7/26/2005	051365	296	Female	790	Fresh	Spawned
7/26/2005	051365	296.5	Female	730	Fresh	Spawned
7/26/2005	051365	298	Female	720	Non-Fresh	Spawned
7/26/2005	051366	298	Female	700	Fresh	Spawned
7/26/2005	051367	296.5	Female	660	Non-Fresh	Spawned
7/26/2005	051368	296.5	Female	750	Non-Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
7/26/2005	051369	296.5	Female	760	Fresh	Spawned
7/26/2005	051369	296.5	Female	720	Non-Fresh	Spawned
7/26/2005	051369	299	Female	820	Fresh	Spawned
7/26/2005	051369	301	Female	700	Non-Fresh	Spawned
7/26/2005	051370	296.5	Female	680	Fresh	Spawned
7/26/2005	051370	300	Female	750	Fresh	Spawned
7/26/2005	051371	297	Female	770	Fresh	Spawned
7/26/2005	051372	297	Male	850	Non-Fresh	Unknown
7/26/2005	051372	297	Female	750	Non-Fresh	Spawned
7/26/2005	051372	300	Female	730	Non-Fresh	Spawned
7/26/2005	051973	296.5	Male	570	Non-Fresh	Unknown
7/26/2005	051983	296.5	Male	540	Fresh	Unknown
7/26/2005	053737	296.5	Female	710	Non-Fresh	Spawned
7/26/2005	053737	296.5	Female	710	Fresh	Spawned
7/26/2005	053737	297	Female	690	Fresh	Spawned
7/26/2005	053737	299	Female	750	Fresh	Spawned
7/26/2005	053737	299	Female	760	Fresh	Spawned
7/27/2005	051372	278	Male	710	Non-Fresh	Unknown
7/27/2005	051988	280	Male	600	Fresh	Unknown
7/28/2005	051278	291	Female	660	Non-Fresh	Spawned
7/28/2005	051280	296	Female	710	Non-Fresh	Spawned
7/28/2005	051285	291	Male	830	Non-Fresh	Unknown
7/28/2005	051298	294	Female	690	Non-Fresh	Spawned
7/28/2005	051369	295	Male	830	Fresh	Unknown
7/28/2005	051372	295	Female	720	Fresh	Spawned
7/29/2005	051276	296.5	Male	820	Fresh	Unknown
7/29/2005	051276	298	Female	700	Fresh	Spawned
7/29/2005	051277	296.5	Female	770	Fresh	Spawned
7/29/2005	051277	299	Female	640	Fresh	Spawned
7/29/2005	051278	296.5	Female	790	Fresh	Spawned
7/29/2005	051278	296.5	Female	670	Fresh	Spawned
7/29/2005	051278	299	Female	720	Fresh	Spawned
7/29/2005	051278	299	Female	700	Non-Fresh	Spawned
7/29/2005	051281	299	Female	740	Fresh	Spawned
7/29/2005	051285	296.5	Female	740	Fresh	Spawned
7/29/2005	051285	301	Female	800	Non-Fresh	Spawned
7/29/2005	051288	296.5	Female	700	Fresh	Spawned
7/29/2005	051288	301	Female	740	Non-Fresh	Spawned
7/29/2005	051289	299	Female	700	Fresh	Spawned
7/29/2005	051291	297	Female	750	Fresh	Spawned
7/29/2005	051291	299	Male	720	Non-Fresh	Unknown

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
7/29/2005	051293	297	Female	750	Fresh	Spawned
7/29/2005	051293	299	Female	750	Fresh	Spawned
7/29/2005	051294	298	Female	790	Non-Fresh	Spawned
7/29/2005	051297	296.5	Female	780	Non-Fresh	Unspawned
7/29/2005	051298	296.5	Female	770	Non-Fresh	Spawned
7/29/2005	051298	299	Female	680	Non-Fresh	Spawned
7/29/2005	051298	300	Female	720	Fresh	Spawned
7/29/2005	051298	301	Female	740	Non-Fresh	Spawned
7/29/2005	051299	298	Female	720	Non-Fresh	Spawned
7/29/2005	051299	299	Female	720	Non-Fresh	Spawned
7/29/2005	051365	299	Female	750	Fresh	Spawned
7/29/2005	051365	299	Female	710	Fresh	Spawned
7/29/2005	051366	301	Female	700	Non-Fresh	Spawned
7/29/2005	051367	298	Female	750	Non-Fresh	Spawned
7/29/2005	051369	296.5	Female	760	Fresh	Spawned
7/29/2005	051370	299	Female	770	Fresh	Spawned
7/29/2005	051371	296.5	Female	720	Non-Fresh	Spawned
7/29/2005	051371	296.5	Female	760	Non-Fresh	Spawned
7/29/2005	051371	296.5	Female	720	Fresh	Spawned
7/29/2005	051371	299	Female	710	Non-Fresh	Spawned
7/29/2005	051372	296.5	Female	740	Fresh	Spawned
7/29/2005	051997	300	Male	460	Fresh	Unknown
7/29/2005	053737	298	Female	730	Fresh	Spawned
7/29/2005	053737	298	Female	770	Non-Fresh	Spawned
7/29/2005	053737	298	Female	720	Fresh	Spawned
7/29/2005	053737	299	Female	780	Non-Fresh	Spawned
7/30/2005	051276	277	Male	850	Non-Fresh	Unknown
7/30/2005	051984	275	Male	620	Non-Fresh	Unknown
7/31/2005	051279	295	Male	800	Non-Fresh	Unknown
7/31/2005	051281	288	Male	880	Non-Fresh	Unknown
7/31/2005	051288	295	Female	720	Fresh	Spawned
7/31/2005	051298	292	Female	730	Non-Fresh	Spawned
7/31/2005	051298	295	Female	650	Non-Fresh	Spawned
7/31/2005	051367	295	Female	760	Non-Fresh	Spawned
7/31/2005	051371	295	Female	780	Non-Fresh	Spawned
7/31/2005	051371	295	Female	650	Non-Fresh	Spawned
7/31/2005	051996	295	Male	600	Non-Fresh	Unknown
8/1/2005	051276	296.5	Female	770	Fresh	Spawned
8/1/2005	051277	299	Female	740	Fresh	Spawned
8/1/2005	051278	298	Female	640	Non-Fresh	Spawned
8/1/2005	051279	296.5	Female	640	Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
8/1/2005	051279	299	Female	700	Fresh	Spawned
8/1/2005	051280	296.5	Female	750	Non-Fresh	Spawned
8/1/2005	051280	296.5	Female	770	Fresh	Spawned
8/1/2005	051280	300	Female	650	Fresh	Spawned
8/1/2005	051282	299	Female	490	Fresh	Spawned
8/1/2005	051283	301	Female	730	Non-Fresh	Spawned
8/1/2005	051288	299	Female	810	Non-Fresh	Spawned
8/1/2005	051288	299	Female	670	Non-Fresh	Spawned
8/1/2005	051293	296.5	Female	880	Fresh	Spawned
8/1/2005	051293	296.5	Female	750	Fresh	Spawned
8/1/2005	051293	296.5	Female	740	Fresh	Spawned
8/1/2005	051294	296.5	Female	770	Fresh	Spawned
8/1/2005	051294	296.5	Female	700	Fresh	Spawned
8/1/2005	051297	296.5	Female	700	Fresh	Spawned
8/1/2005	051298	297	Female	740	Non-Fresh	Spawned
8/1/2005	051298	298	Female	780	Fresh	Spawned
8/1/2005	051298	298	Female	720	Fresh	Spawned
8/1/2005	051298	298	Female	770	Non-Fresh	Spawned
8/1/2005	051299	299	Female	690	Non-Fresh	Spawned
8/1/2005	051365	298	Female	730	Non-Fresh	Spawned
8/1/2005	051365	298	Female	790	Fresh	Spawned
8/1/2005	051366	296.5	Female	660	Non-Fresh	Spawned
8/1/2005	051369	299	Female	770	Fresh	Spawned
8/1/2005	051369	299	Female	710	Fresh	Spawned
8/1/2005	051370	299	Female	750	Non-Fresh	Spawned
8/1/2005	051371	297	Female	760	Non-Fresh	Spawned
8/1/2005	051371	298	Female	740	Non-Fresh	Spawned
8/1/2005	051371	298	Female	760	Non-Fresh	Spawned
8/1/2005	051371	300	Female	720	Non-Fresh	Spawned
8/1/2005	051372	296.5	Female	750	Non-Fresh	Spawned
8/1/2005	051372	300	Female	730	Non-Fresh	Spawned
8/1/2005	051973	297	Male	560	Fresh	Unknown
8/1/2005	051973	298	Male	630	Non-Fresh	Unknown
8/1/2005	053737	296.5	Female	720	Non-Fresh	Spawned
8/1/2005	053737	296.5	Female	770	Non-Fresh	Spawned
8/1/2005	053737	298	Female	720	Non-Fresh	Spawned
8/1/2005	053737	298	Female	730	Fresh	Spawned
8/1/2005	053737	299	Female	700	Fresh	Spawned
8/3/2005	051278	295	Male	700	Non-Fresh	Unknown
8/3/2005	051290	296	Female	780	Non-Fresh	Spawned
8/3/2005	051297	294	Female	730	Non-Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
8/3/2005	051370	295	Female	720	Fresh	Spawned
8/4/2005	051277	296.5	Female	720	Non-Fresh	Spawned
8/4/2005	051277	296.5	Female	730	Non-Fresh	Spawned
8/4/2005	051278	298	Female	650	Fresh	Spawned
8/4/2005	051279	298	Female	720	Fresh	Spawned
8/4/2005	051280	296.5	Female	770	Fresh	Spawned
8/4/2005	051282	296.5	Female	760	Non-Fresh	Spawned
8/4/2005	051285	297	Female	660	Fresh	Spawned
8/4/2005	051288	297	Female	770	Non-Fresh	Spawned
8/4/2005	051289	298	Female	780	Fresh	Spawned
8/4/2005	051289	299	Female	710	Non-Fresh	Spawned
8/4/2005	051290	299	Female	740	Fresh	Spawned
8/4/2005	051294	297	Female	750	Non-Fresh	Spawned
8/4/2005	051294	298	Female	760	Non-Fresh	Spawned
8/4/2005	051294	298	Female	780	Non-Fresh	Spawned
8/4/2005	051297	298	Female	680	Non-Fresh	Spawned
8/4/2005	051297	300	Female	770	Non-Fresh	Spawned
8/4/2005	051298	296.5	Female	840	Fresh	Spawned
8/4/2005	051299	300	Female	720	Non-Fresh	Spawned
8/4/2005	051365	300	Female	750	Non-Fresh	Spawned
8/4/2005	051369	299	Female	790	Non-Fresh	Spawned
8/4/2005	051370	298	Female	750	Fresh	Spawned
8/4/2005	051371	299	Female	670	Fresh	Spawned
8/4/2005	051372	299	Female	670	Fresh	Spawned
8/4/2005	051997	296.5	Male	620	Fresh	Unknown
8/4/2005	053737	296.5	Female	680	Fresh	Spawned
8/4/2005	053737	296.5	Female	710	Fresh	Spawned
8/6/2005	051964	290	Male	540	Fresh	Unknown
8/7/2005	051277	296.5	Female	680	Non-Fresh	Spawned
8/7/2005	051278	297	Female	730	Fresh	Spawned
8/7/2005	051278	297	Male	710	Fresh	Unknown
8/7/2005	051278	299	Female	700	Fresh	Spawned
8/7/2005	051281	296.5	Female	770	Non-Fresh	Spawned
8/7/2005	051281	296.5	Female	670	Non-Fresh	Spawned
8/7/2005	051281	301	Female	690	Non-Fresh	Spawned
8/7/2005	051286	298	Female	730	Non-Fresh	Spawned
8/7/2005	051293	298	Female	720	Non-Fresh	Spawned
8/7/2005	051294	298	Female	730	Fresh	Spawned
8/7/2005	051294	298	Female	770	Fresh	Spawned
8/7/2005	051371	296.5	Female	680	Fresh	Spawned
8/7/2005	051372	296.5	Female	710	Non-Fresh	Spawned

Collection Date	CWT Code	RM	Sex	FL	Condition	Spawn Status
8/7/2005	053737	301	Female	650	Non-Fresh	Spawned
8/8/2005	051299	283	Female	780	Non-Fresh	Spawned
8/9/2005	051279	294	Male	810	Fresh	Unknown
8/9/2005	051289	294	Female	770	Fresh	Spawned
8/9/2005	051679	295	Male	580	Non-Fresh	Unknown
8/10/2005	051279	298	Female	630	Non-Fresh	Spawned
8/10/2005	051281	299	Female	780	Fresh	Spawned
8/10/2005	051294	298	Female	710	Non-Fresh	Spawned
8/10/2005	051298	299	Female	710	Non-Fresh	Spawned
8/10/2005	051371	299	Female	790	Non-Fresh	Spawned
8/10/2005	051372	299	Female	700	Non-Fresh	Spawned
8/10/2005	051996	298	Female	570	Non-Fresh	Spawned
8/10/2005	053737	298	Female	730	Non-Fresh	Spawned
8/10/2005	053737	299	Female	740	Non-Fresh	Spawned
8/12/2005	051369	294	Female	680	Non-Fresh	Spawned
8/13/2005	051281	296.5	Female	740	Fresh	Spawned
8/13/2005	051291	299	Female	780	Non-Fresh	Spawned
8/13/2005	051369	299	Female	710	Non-Fresh	Spawned
8/13/2005	051370	298	Female	710	Non-Fresh	Spawned
8/15/2005	051365	296	Female	720	Non-Fresh	Spawned
8/15/2005	053737	288	Female	750	Non-Fresh	Spawned
8/16/2005	051278	298	Female	720	Non-Fresh	Spawned
8/16/2005	051279	296.5	Female	690	Non-Fresh	Spawned
8/16/2005	051279	298	Female	680	Fresh	Spawned
8/16/2005	051279	299	Male	790	Non-Fresh	Unknown
8/16/2005	051281	298	Female	750	Non-Fresh	Spawned
8/16/2005	051281	299	Female	750	Non-Fresh	Spawned
8/16/2005	051281	299	Female	740	Non-Fresh	Spawned
8/16/2005	051293	299	Female	680	Non-Fresh	Spawned
8/18/2005	053737	288	Female	780	Non-Fresh	Spawned
8/19/2005	051278	296.5	Female	680	Non-Fresh	Spawned
8/19/2005	051278	301	Female	670	Fresh	Spawned
8/22/2005	051279	299	Female	730	Non-Fresh	Spawned
8/22/2005	051298	296.5	Female	730	Non-Fresh	Spawned
8/24/2005	051294	288	Female	710	Non-Fresh	Spawned
8/24/2005	051372	295	Female	610	Non-Fresh	Spawned

Appendix C. Winter Chinook salmon tag code groups released from Livingston Stone National Fish Hatchery during brood years (BY) 2001 - 2003. All fish were released at Lake Redding Park. Coded-wire tag (CWT) codes 0501030705, 051297, 051298, and 053737 were used for the progeny of captive brood stock held at the University of California-Davis Bodega Marine Laboratory. Average fork length (FL) is reported in millimeters and average weight in grams. Number released for each CWT is reported as (1) number released with an adipose fin clip (C) and CWT (T), (2) C and no CWT (NT), (3) No adipose fin clip (NC) and a T, and (4) NC and NT.

					Number Released			
BY	CWT Code	FL	Weight	Release Date	C/T	C/NT	NC/T	NC/NT
2001	0501020507	70	3.77	1/30/2002	4,263	0	0	21
2001	0501030705	75	4.65	1/30/2002	61,126	620	103	103
2001	0501030706	71	5.36	1/30/2002	36,947	1,528	174	55
2001	0501030707	85	6.84	1/30/2002	15,079	0	0	0
2001	0501030708	78	5.28	1/30/2002	6,053	673	0	0
2001	0501030709	77	5.11	1/30/2002	6,086	676	0	0
2001	0501030801	72	4.20	1/30/2002	5,009	103	52	0
2001	0501030802	80	5.67	1/30/2002	5,495	351	0	0
2001	0501030803	84	6.58	1/30/2002	4,882	424	0	0
2001	0501030804	78	5.33	1/30/2002	5,920	732	0	0
2001	0501030805	85	6.76	1/30/2002	4,705	146	0	0
2001	0501030806	77	5.27	1/30/2002	6,245	399	0	0
2001	0501030807	75	4.67	1/30/2002	4,499	139	0	0
2001	0501030808	73	4.26	1/30/2002	4,816	24	0	0
2001	0501030809	74	4.49	1/30/2002	5,194	216	0	0
2001	0501030901	78	5.26	1/30/2002	4,497	391	0	0
2001	0501030902	77	5.14	1/30/2002	4,673	325	0	0
2001	0501030903	77	4.98	1/30/2002	4,917	178	0	0
2001	0501030904	77	5.09	1/30/2002	5,339	253	28	0
2001	0501030905	76	4.89	1/30/2002	5,496	384	30	0
2001	0501030906	76	4.79	1/30/2002	5,156	362	56	0
2001	0501030907	76	4.85	1/30/2002	4,777	504	27	0

BY	CWT Code	FL	Weight	Release Date	Number Released			
					C/T	C/NT	NC/T	NC/NT
2001	0501030908	76	4.93	1/30/2002	5,731	573	32	32
2001	0501030909	75	4.72	1/30/2002	5,891	919	0	0
2001	0501040101	71	3.95	1/30/2002	4,610	23	0	0
2001	0501040102	73	4.28	1/30/2002	4,939	25	0	0
2001	0501040103	69	3.68	1/30/2002	4,676	48	96	0
2001	0501040104	69	3.62	1/30/2002	4,791	0	48	0
2002	051276	78	5.28	1/30/2003	3,756	116	0	0
2002	051277	71	4.41	1/30/2003	4,330	326	0	0
2002	051278	73	4.68	1/30/2003	4,429	137	0	0
2002	051279	73	4.54	1/30/2003	3,762	262	0	0
2002	051280	72	4.37	1/30/2003	4,224	176	0	0
2002	051281	80	5.60	1/30/2003	4,318	111	22	0
2002	051282	82	6.55	1/30/2003	5,626	525	31	0
2002	051283	79	6.77	1/30/2003	5,350	840	31	0
2002	051284	80	6.45	1/30/2003	5,410	535	0	0
2002	051285	86	7.84	1/30/2003	4,143	435	0	0
2002	051286	83	6.24	1/30/2003	5,005	128	0	0
2002	051287	79	6.37	1/30/2003	3,405	601	0	0
2002	051288	78	5.31	1/30/2003	4,992	555	0	0
2002	051289	78	4.98	1/30/2003	5,831	243	0	0
2002	051290	82	8.23	1/30/2003	8,086	804	45	0
2002	051291	74	4.69	1/30/2003	5,680	146	0	0
2002	051292	74	4.70	1/30/2003	4,377	230	0	0
2002	051293	74	4.43	1/30/2003	4,425	234	23	0
2002	051294	75	4.78	1/30/2003	4,489	212	0	0
2002	051295	91	8.46	1/30/2003	2,294	358	0	0
2002	051296	80	7.15	1/30/2003	10,425	549	0	0
2002	051297	72	5.09	1/30/2003	17,364	1,207	0	0

BY	CWT Code	FL	Weight	Release Date	Number Released			
					C/T	C/NT	NC/T	NC/NT
2002	051298	64	3.59	1/30/2003	26,472	274	686	0
2002	051299	83	6.62	1/30/2003	4,341	66	0	0
2002	051364	79	5.50	1/30/2003	4,778	502	0	0
2002	051365	79	5.12	1/30/2003	4,235	368	0	0
2002	051366	79	5.19	1/30/2003	4,403	136	0	0
2002	051367	82	6.10	1/30/2003	4,671	144	0	0
2002	051368	78	5.22	1/30/2003	4,451	68	0	0
2002	051369	75	5.03	1/30/2003	4,556	165	0	0
2002	051370	78	5.17	1/30/2003	4,621	24	71	0
2002	051371	72	4.82	1/30/2003	5,329	283	57	0
2002	051372	73	4.34	1/30/2003	4,948	102	25	0
2002	051373	77	5.17	1/30/2003	4,230	199	0	0
2002	053737	65	3.16	1/30/2003	22,576	228	0	0
2003	051679	79	5.46	2/5/2004	5,235	0	0	0
2003	051964	84	5.48	2/5/2004	3,574	18	0	0
2003	051965	95	9.25	2/5/2004	3,703	76	0	0
2003	051966	88	7.78	2/5/2004	4,251	43	0	0
2003	051967	87	7.15	2/5/2004	4,394	22	0	0
2003	051968	86	7.38	2/5/2004	5,438	27	0	0
2003	051969	92	8.37	2/5/2004	4,338	66	22	0
2003	051970	84	6.57	2/5/2004	5,411	27	0	0
2003	051971	84	6.19	2/5/2004	5,105	26	0	0
2003	051972	88	6.79	2/5/2004	4,315	22	0	0
2003	051973	88	7.75	2/5/2004	4,658	0	0	0
2003	051974	86	7.25	2/5/2004	4,878	25	0	0
2003	051975	88	7.41	2/5/2004	4,446	0	0	0
2003	051976	87	6.95	2/5/2004	4,928	0	0	0
2003	051977	87	7.26	2/5/2004	4,393	22	0	0

					Number Released			
BY	CWT Code	FL	Weight	Release Date	C/T	C/NT	NC/T	NC/NT
2003	051978	86	7.16	2/5/2004	4,823	24	0	0
2003	051979	84	6.92	2/5/2004	4,410	0	0	0
2003	051980	85	7.19	2/5/2004	4,400	22	0	0
2003	051981	82	5.71	2/5/2004	4,930	50	0	0
2003	051982	84	6.57	2/5/2004	4,689	47	0	0
2003	051983	84	6.52	2/5/2004	4,750	72	0	0
2003	051984	82	6.29	2/5/2004	4,889	0	0	0
2003	051985	76	5.18	2/5/2004	5,293	0	0	0
2003	051986	81	6.38	2/5/2004	4,749	0	48	0
2003	051987	90	8.26	2/5/2004	5,051	51	0	0
2003	051988	85	6.31	2/5/2004	5,180	26	0	0
2003	051989	83	5.92	2/5/2004	4,093	21	0	0
2003	051990	80	5.15	2/5/2004	4,433	22	0	0
2003	051991	84	6.68	2/5/2004	4,414	45	0	0
2003	051992	80	5.75	2/5/2004	4,367	22	0	0
2003	051993	88	6.82	2/5/2004	11,568	58	0	0
2003	051994	81	7.03	2/5/2004	10,969	281	0	0
2003	051995	78	5.53	2/5/2004	18,039	182	0	0
2003	051996	77	5.39	2/5/2004	17,630	89	0	0
2003	051997	72	4.69	2/5/2004	18,931	485	0	0

Appendix D. Genetic results of fin tissues collected from Chinook salmon carcasses during the 2005 upper Sacramento River winter Chinook salmon carcass survey. Data presented includes sample collection date, sample number assigned by the Service, LOD score determined by the Abernathy Fish Technology Center, strain call (LOD > 2 for winter), gender observed during the 2005 winter Chinook carcass survey (Phenotype), and gender determined through genetic analysis of the growth hormone pseudogene marker (Genotype).

				Gender	
Date	Sample #	LOD	Strain	Phenotype	Genotype
4/30/2005	05-10103	4.1466	Winter	Female	Female
4/30/2005	05-10102	5.3862	Winter	Female	Female
4/30/2005	05-15001	3.7602	Winter	Female	Female
5/3/2005	05-10106	5.0809	Winter	Male	Female
5/3/2005	05-15006	-9.1520	Non-Winter	Male	Female
5/6/2005	05-10108	9.2563	Winter	Male	Female
5/6/2005	05-15011	5.7292	Winter	Female	Female
5/11/2005	05-15015	7.5214	Winter	Female	Female
5/12/2005	05-10111	3.9170	Winter	Female	Female
5/12/2005	05-15016	3.4116	Winter	Female	Female
5/15/2005	05-10113	4.7954	Winter	Female	Female
5/20/2005	05-15020	3.9440	Winter	Female	Female
5/21/2005	05-15024	4.5580	Winter	Female	Female
5/21/2005	05-10116	failed		Male	
5/21/2005	05-10117	3.9275	Winter	Male	Male
5/21/2005	05-10118	3.1097	Winter	Female	Female
5/21/2005	05-15023	5.5959	Winter	Female	Female
5/22/2005	05-10120	4.1567	Winter	Male	Male
5/23/2005	05-10121	5.2688	Winter	Female	Female
5/23/2005	05-15026	4.8797	Winter	Female	Female
5/23/2005	05-15027	1.8980	Non-Winter	Female	Female
5/23/2005	05-15028	7.1120	Winter	Female	Female
5/24/2005	05-10125	failed		Male	
5/24/2005	05-10126	8.2676	Winter	Female	Female
5/24/2005	05-15029	failed		Female	
5/24/2005	05-10122	failed		Male	
5/24/2005	05-10123	7.9062	Winter	Female	Female
5/24/2005	05-10124	8.8495	Winter	Female	Female
5/26/2005	05-10127	-7.0826	Non-Winter	Female	Female
5/26/2005	05-10129	6.1399	Winter	Male	Male
5/26/2005	05-15030	failed		Male	
5/26/2005	05-15032	failed		Male	
5/27/2005	05-10137	failed		Male	

Date	Sample #	LOD	Strain	Gender	
				Phenotype	Genotype
5/27/2005	05-10138	1.2211	Non-Winter	Male	Male
5/27/2005	05-15034	5.8635	Winter	Female	Female
5/27/2005	05-10130	8.5085	Winter	Female	Female
5/27/2005	05-10131	3.1856	Winter	Female	Female
5/27/2005	05-10132	7.2658	Winter	Male	Male
5/27/2005	05-10133	3.8050	Winter	Male	Male
5/27/2005	05-10134	failed		Female	
5/27/2005	05-10135	failed		Male	
5/27/2005	05-10136	8.5649	Winter	Female	Female
5/27/2005	05-15033	2.3051	Winter	Female	Female
5/28/2005	05-10139	failed		Female	
5/28/2005	05-15035	3.8203	Winter	Female	Female
5/29/2005	05-10140	3.6158	Winter	Male	Male
5/29/2005	05-10141	failed		Male	
5/29/2005	05-15036	2.7226	Winter	Male	Male
5/29/2005	05-15037	3.8534	Winter	Male	Male
5/29/2005	05-15038	failed		Male	
5/30/2005	05-10149	3.3538	Winter	Female	Female
5/30/2005	05-10142	8.2896	Winter	Female	Female
5/30/2005	05-10143	3.0007	Winter	Male	Female
5/30/2005	05-10144	failed		Male	
5/30/2005	05-10145	failed		Male	
5/30/2005	05-10147	5.9134	Winter	Female	Female
5/30/2005	05-15039	7.7159	Winter	Female	Female
5/30/2005	05-15042	5.4610	Winter	Male	Female
5/30/2005	05-15043	4.3511	Winter	Female	Female
5/30/2005	05-15044	7.2524	Winter	Female	Female
5/30/2005	05-15045	3.7797	Winter	Male	Female
5/30/2005	05-15046	5.2981	Winter	Female	Female
6/1/2005	05-15048	4.0307	Winter	Male	Male
6/2/2005	05-15054	5.8755	Winter	Male	Male
6/2/2005	05-15055	failed		Female	
6/5/2005	05-15072	failed		Male	
6/5/2005	05-15076	failed		Male	
6/6/2005	05-15083	12.1320	Winter	Male	Male
6/7/2005	05-15084	3.8563	Winter	Male	Male
6/8/2005	05-15093	7.9994	Winter	Female	Female
6/8/2005	05-15095	2.1921	Winter	Female	Male
6/10/2005	05-15111	1.4688	Non-Winter	Female	Female
6/11/2005	05-15116	4.2365	Winter	Female	Female

				Gender	
Date	Sample #	LOD	Strain	Phenotype	Genotype
6/11/2005	05-15123	4.6216	Winter	Female	Female
6/11/2005	05-15132	3.5645	Winter	Female	Female
6/11/2005	05-15136	3.9298	Winter	Female	Female
6/11/2005	05-15137	2.5950	Winter	Female	Female
6/13/2005	05-15149	2.3034	Winter	Male	Male
6/14/2005	05-15166	failed		Male	
6/14/2005	05-15150	4.5618	Winter	Female	Female
6/14/2005	05-15202	5.8043	Winter	Female	Female
6/14/2005	05-15206	2.3065	Winter	Female	Female
6/14/2005	05-15209	6.6401	Winter	Female	Female
6/16/2005	05-15178	8.9242	Winter	Male	Male
6/16/2005	05-15180	11.3265	Winter	Female	Female
6/16/2005	05-15185	3.3560	Winter	Male	Female
6/16/2005	05-15190	4.4386	Winter	Female	Female
6/17/2005	05-15223	failed		Male	
6/17/2005	05-15243	failed		Female	
6/17/2005	05-10241	failed		Male	
6/18/2005	05-15246	8.0831	Winter	Female	Female
6/19/2005	05-15253	10.3495	Winter	Female	Female
6/20/2005	05-15279	4.2768	Winter	Female	Female
6/20/2005	05-15320	3.1184	Winter	Male	Female
6/20/2005	05-15261	3.7773	Winter	Male	Female
6/20/2005	05-15264	failed		Female	
6/20/2005	05-15265	4.0407	Winter	Female	Female
6/20/2005	05-15310	4.9787	Winter	Female	Female
6/21/2005	05-15287	-1.8013	Non-Winter	Female	Female
6/21/2005	05-15289	6.3180	Winter	Male	Male
6/22/2005	05-15292	failed		Male	
6/22/2005	05-15295	8.9031	Winter	Female	Female
6/22/2005	05-15337	failed		Male	
6/22/2005	05-15338	4.4846	Winter	Male	Female
6/23/2005	05-15371	5.0205	Winter	Female	Female
6/23/2005	05-15362	8.9202	Winter	Male	Male
6/24/2005	05-15379	3.6830	Winter	Female	Female
6/24/2005	05-15380	6.6781	Winter	Male	Male
6/25/2005	05-15385	failed		Male	
6/25/2005	05-15393	5.0549	Winter	Female	Female
6/26/2005	05-10424	4.1997	Winter	Male	Male
6/26/2005	05-15436	7.7163	Winter	Female	Female
6/26/2005	05-10401	9.9206	Winter	Male	Male

				Gender	
Date	Sample #	LOD	Strain	Phenotype	Genotype
6/26/2005	05-15353	4.4744	Winter	Female	Male
6/26/2005	05-15429	2.0771	Winter	Male	Male
6/26/2005	05-15432	failed		Male	
6/28/2005	05-10364	2.8263	Winter	Male	Male
6/28/2005	05-15449	3.6589	Winter	Female	Female
6/29/2005	05-10043	3.7445	Winter	Female	Female
6/29/2005	05-15405	failed		Female	
6/29/2005	05-15408	1.8571	Non-Winter	Female	Female
7/1/2005	05-15502	3.8908	Winter	Male	Male
7/1/2005	05-15511	5.6802	Winter	Female	Female
7/2/2005	05-10431	1.8643	Non-Winter	Female	Female
7/2/2005	05-15476	10.1650	Winter	Female	Female
7/4/2005	05-15516	4.1940	Winter	Female	Female
7/4/2005	05-15522	failed		Female	
7/4/2005	05-15532	3.6102	Winter	Male	Female
7/5/2005	05-15541	2.1122	Winter	Female	Female
7/5/2005	05-15543	1.6412	Non-Winter	Female	Female
7/5/2005	05-15699	failed		Female	
7/6/2005	05-15638	4.3540	Winter	Male	Female
7/7/2005	05-15611	3.4188	Winter	Female	Female
7/8/2005	05-15573	4.3109	Winter	Female	Female
7/8/2005	05-15582	4.7216	Winter	Male	Male
7/8/2005	05-15518	failed		Female	
7/8/2005	05-15640	5.7120	Winter	Male	Female
7/10/2005	05-15590	failed		Female	
7/10/2005	05-15709	5.6819	Winter	Male	Female
7/11/2005	05-15770	4.3596	Winter	Female	Female
7/11/2005	05-15772	4.1644	Winter	Female	Female
7/11/2005	05-15730	5.1076	Winter	Female	Female
7/13/2005	05-10597	6.2050	Winter	Female	Female
7/13/2005	05-15778	5.4445	Winter	Female	Female
7/14/2005	05-15808	5.4032	Winter	Male	Female
7/15/2005	05-15816	7.5491	Winter	Male	Male
7/16/2005	05-15819	6.7634	Winter	Female	Female
7/16/2005	05-15830	5.2712	Winter	Male	Female
7/16/2005	05-15831	failed		Female	
7/17/2005	05-15849	failed		Female	
7/17/2005	05-15766	5.1675	Winter	Male	Female
7/18/2005	05-15865	failed		Male	
7/19/2005	05-16108	5.6851	Winter	Female	Female

				Gender	
Date	Sample #	LOD	Strain	Phenotype	Genotype
7/20/2005	05-15886	failed		Female	
7/20/2005	05-16009	4.8923	Winter	Female	Female
7/20/2005	05-16013	9.3385	Winter	Female	Female
7/20/2005	05-16020	11.2562	Winter	Female	Female
7/20/2005	05-16025	5.2971	Winter	Female	Female
7/20/2005	05-16111	2.1892	Winter	Female	Female
7/21/2005	05-15941	failed		Male	
7/22/2005	05-15944	4.3839	Winter	Female	Female
7/23/2005	05-16148	0.3614	Non-Winter	Female	Female
7/24/2005	05-15975	4.5226	Winter	Male	Male
7/25/2005	05-16172	4.4325	Winter	Male	Male
7/25/2005	05-16173	4.9994	Winter	Female	Female
7/26/2005	05-16068	8.0443	Winter	Female	Female
7/26/2005	05-16077	2.9384	Winter	Female	Female
7/26/2005	05-16193	8.1625	Winter	Female	Female
7/28/2005	05-16220	2.9224	Winter	Female	Female
7/29/2005	05-16228	8.6303	Winter	Female	Female
7/31/2005	05-16230	failed		Female	
8/1/2005	05-16301	failed		Male	
8/1/2005	05-16303	2.3328	Winter	Female	Female
8/1/2005	05-16306	4.5949	Winter	Female	Female
8/1/2005	05-16308	2.3473	Winter	Female	Female
8/1/2005	05-16309	1.7584	Non-Winter	Female	Female
8/1/2005	05-16313	1.4633	Non-Winter	Female	Female
8/1/2005	05-16314	6.6635	Winter	Female	Female
8/1/2005	05-16315	2.2025	Winter	Female	Female
8/1/2005	05-16324	0.8104	Non-Winter	Female	Female
8/1/2005	05-16325	1.7543	Non-Winter	Male	Female
8/1/2005	05-16330	3.7736	Winter	Female	Female
8/1/2005	05-16331	9.9389	Winter	Female	Female
8/1/2005	05-15995	5.4138	Winter	Female	Female
8/1/2005	05-15997	2.8327	Winter	Female	Female
8/1/2005	05-15999	failed		Female	
8/1/2005	05-16083	0.7701	Non-Winter	Male	Female
8/1/2005	05-16084	3.9375	Winter	Male	Male
8/1/2005	05-16240	4.7793	Winter	Female	Female
8/1/2005	05-16242	7.7071	Winter	Female	Female
8/1/2005	05-16243	1.3104	Non-Winter	Male	Female
8/1/2005	05-16247	4.7274	Winter	Female	Female
8/1/2005	05-16250	7.5936	Winter	Male	Male

				Gender	
Date	Sample #	LOD	Strain	Phenotype	Genotype
8/1/2005	05-16251	5.6809	Winter	Female	Female
8/1/2005	05-16253	6.3258	Winter	Female	Female
8/2/2005	05-15891	3.2897	Winter	Female	Female
8/3/2005	05-10874	7.4802	Winter	Female	Female
8/3/2005	05-16261	6.1000	Winter	Female	Female
8/4/2005	05-10879	2.2043	Winter	Male	Male
8/4/2005	05-10916	failed		Female	
8/4/2005	05-10992	5.5242	Winter	Female	Female
8/4/2005	05-10993	6.5093	Winter	Female	Female
8/4/2005	05-16262	3.2239	Winter	Female	Female
8/4/2005	05-16264	3.0285	Winter	Female	Female
8/4/2005	05-16266	3.3558	Winter	Female	Female
8/4/2005	05-16267	6.2186	Winter	Female	Female
8/4/2005	05-16270	8.5751	Winter	Female	Female
8/4/2005	05-10903	7.4026	Winter	Female	Female
8/4/2005	05-10905	2.1756	Winter	Female	Female
8/4/2005	05-10910	6.9051	Winter	Female	Female
8/4/2005	05-10913	3.1816	Winter	Female	Female
8/4/2005	05-10914	7.5475	Winter	Female	Female
8/4/2005	05-15896	8.9839	Winter	Female	Female
8/4/2005	05-15897	2.3555	Winter	Female	Female
8/4/2005	05-15900	6.3147	Winter	Female	Female
8/4/2005	05-16392	failed		Female	
8/4/2005	05-16395	5.1912	Winter	Female	Female
8/4/2005	05-16396	failed		Female	
8/4/2005	05-16397	3.8427	Winter	Female	Female
8/4/2005	05-16398	6.1243	Winter	Female	Female
8/6/2005	05-16272	5.9822	Winter	Female	Female
8/6/2005	05-16273	5.9395	Winter	Female	Female
8/7/2005	05-10925	4.5208	Winter	Female	Female
8/7/2005	05-10973	failed		Female	
8/7/2005	05-10975	4.9704	Winter	Female	Female
8/7/2005	05-10976	failed		Female	
8/7/2005	05-10977	8.0410	Winter	Female	Female
8/7/2005	05-10978	8.0729	Winter	Female	Female
8/7/2005	05-10979	9.7914	Winter	Female	Female
8/7/2005	05-10982	3.7445	Winter	Female	Female
8/7/2005	05-16338	3.0361	Winter	Female	Female
8/7/2005	05-16339	failed		Female	
8/7/2005	05-10917	3.4232	Winter	Female	Female

				Gender	
Date	Sample #	LOD	Strain	Phenotype	Genotype
8/7/2005	05-10918	1.0385	Non-Winter	Female	Female
8/7/2005	05-10995	6.7081	Winter	Female	Female
8/7/2005	05-10996	5.2170	Winter	Female	Female
8/7/2005	05-16335	failed		Female	
8/9/2005	05-15895	0.9424	Non-Winter	Male	Male
8/9/2005	05-15898	2.9855	Winter	Female	Female
8/10/2005	05-16280	failed		Female	
8/10/2005	05-16281	6.1423	Winter	Male	Male
8/10/2005	05-16287	failed		Female	
8/10/2005	05-16344	failed		Female	
8/10/2005	05-16345	4.1997	Winter	Female	Female
8/10/2005	05-16346	4.2328	Winter	Female	Male
8/10/2005	05-16274	6.1132	Winter	Female	Female
8/10/2005	05-16275	6.2512	Winter	Female	Female
8/10/2005	05-16276	3.7814	Winter	Female	Female
8/10/2005	05-16341	4.5733	Winter	Female	Female
8/12/2005	05-16347	1.8035	Non-Winter	Female	Female
8/13/2005	05-16355	4.6681	Winter	Female	Female
8/13/2005	05-10935	failed		Female	
8/13/2005	05-10936	3.5248	Winter	Female	Female
8/13/2005	05-16348	2.3556	Winter	Female	Female
8/13/2005	05-16350	5.1722	Winter	Female	Female
8/16/2005	05-10985	6.8276	Winter	Female	Female
8/16/2005	05-10986	3.2980	Winter	Female	Female
8/16/2005	05-16358	8.7541	Winter	Female	Female
8/16/2005	05-16359	failed		Female	
8/16/2005	05-16364	3.7644	Winter	Female	Female
8/16/2005	05-10928	failed		Female	
8/16/2005	05-16357	4.2347	Winter	Female	Female
8/19/2005	05-10932	3.9231	Winter	Female	Female
8/22/2005	05-10934	7.0873	Winter	Female	Female
8/28/2005	05-10944	2.1128	Winter	Female	Female
8/28/2005	05-10943	-0.8966	Non-Winter	Female	Female
8/31/2005	05-10945	-3.5406	Non-Winter	Female	Female