



OXBOW FISH HATCHERY

2001 Fall Chinook Brood Year Report

**Kent Hills
Hatchery Assistant Manager**

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ABSTRACT

The Oxbow Fish Hatchery (OFH) was the site picked for the Idaho Power Company (IPC) fall chinook *Oncorhynchus tshawytscha* rearing project. Fall chinook eggs were available from Lyons Ferry Hatchery (LFH) for IPC mitigation. Idaho Power built two raceways at the hatchery (6-ft x 3-ft x 114-ft). A total of 178,409 eyed-eggs were acquired from Lyons Ferry Hatchery and transported to the OFH on December 10, 2001. These eggs were placed in Heath trays and incubated with 53.7° F water until button up. Fry were placed in the outside raceways on Feb 4 and 5, 2002 and raised on water from well #2 at a temperature of 56° F. A density index (Piper et al 1982) of .30 and a flow index (Piper et al 1982) of 1.0 were used as limiting criteria for changing flows and raceway volumes. All fall chinook were fed a diet of Moore-Clark feed. They were started on mash and ended consuming 1.5-mm pellets. We fed Moore-Clark enhanced beta glucan feed for two weeks before fin clipping. There was no elevated mortality after clipping due to stress or disease. Fry were raised on well water until reaching 100 fish per pound (fpp) and 200 gallons per minute (gpm) of well water to each raceway. At that point, river water was introduced. On May 21, 2002, 171,463 smolts were released below Hells Canyon Dam. They were 42 fpp at a length of 4.24 inches, and had a total weight of 4,082 pounds. On the day of release, the total raceway volume was 2,671 cubic feet and flows were 225 gpm of well water and 700 gpm of river water. The density index was .36 and the flow index was 1.03. The percent survival rate from eyed-egg stage to release was 96.2 %.

HATCHERY OVERVIEW

Introduction

The OFH is part of the IPC hatchery system and has been in operation since 1962. The OFH facility is owned and funded by IPC and operated by the Idaho Department of Fish and Game (Department). The OFH was constructed to mitigate for losses of anadromous fish resulting from the construction of Hells Canyon Complex on the Snake River. The OFH is currently a steelhead trout *Oncorhynchus mykiss* adult holding, spawning and egg rearing station. Spring chinook salmon are collected and held for transport to Rapid River Fish Hatchery (RRFH). The OFH has finished its second year of experimental rearing of fall chinook salmon.

Location

The OFH is located in Eastern Oregon and is adjacent to the confluence of Pine Creek and the Snake River at the Idaho Power village known as Oxbow, Oregon. Located at the eastern-most end of Oregon State Highway 86. It is approximately 67 highway miles east of Baker City, Oregon and approximately 150 highway miles northwest of Boise, Idaho.

Objectives

The primary objective of OFH is to trap and spawn adult steelhead, and trap spring chinook salmon that are transported to RRFH for spawning. This objective is to meet mitigation required by the Federal Energy Regulatory Commission (FERC) for adult anadromous fish returns to the upper Snake River. The mitigation objective for steelhead is to produce 1.3 million eyed eggs and ultimately produce 400,000 lbs of steelhead trout smolts annually. The mitigation objective for spring chinook is to produce 1,000,000 smolts annually. The mitigation objective for fall chinook is to raise 1,000,000 smolts annually for release.

Facility Description

Facilities at OFH include the following: a hatchery building containing an office, shop, and incubation room; four adult holding ponds including fish loading and off-loading facilities; an incubation water chilling unit; a spawning building; two fall chinook rearing raceways; a bio-aide dorm; an assistant hatchery managers' residence; and an off-site fish trap.

The hatchery building is a 28-ft x 60-ft, single-story metal structure partitioned into two main rooms. Half of the building consists of shop space, office space, and sleeping quarters, while the other half is for egg incubation. The incubation room has 384 incubation trays (Health

trays) in 24 stacks, giving it the capacity to incubate 3.4 million eggs. Two 8-ft square sheds attached to the main building provide storage.

Adult holding and production facilities include four holding ponds, a fish trap, and a fish transport truck. The four holding ponds are actually two large ponds separated into two smaller sections. The two larger divisions each measure 105-ft x 35-ft x 5-ft, or 36,750 cubic feet of holding area. The two smaller divisions measure 55-ft x 35-ft x 5-ft, providing 19,250 cubic feet of holding space. Two electric crowding racks provide the ability to consolidate the fish for handling. The adult fish trap facility consists of an attraction channel, the fish trap, and a loading hopper. The fish are removed from the trap after the loading hopper is hoisted 80 feet up to the fish transport truck.

The water chiller unit is enclosed by a 12-ft x 17-ft metal building to the western side of the hatchery building. The chiller has the capacity to chill 120 gpm to 40°F.

The spawning building is approximately 13-ft x 18-ft and is located adjacent to two of the holding ponds. It consists of a small building, part of which is recessed into the ground to provide holding areas for the fish that are to be spawned. The remaining portion of the building is at ground level where the females are spawned and the eggs processed. The walls are made of fiberglass panel doors which can be opened so that most of the inside area is exposed to the outside.

Fall chinook raceways were designed and constructed in November and December of 2001. These raceways are designed to act as small starting raceways that can be lengthened as the fish densities increase. Each raceway has a rearing space of 6-ft x 3-ft x 109-ft or a total volume of 1,671 cubic feet.

Staffing

One permanent Fish Hatchery Assistant Manager staffs OFH. Two four-month temporary Bio-aide positions and two eight-month temporary Bio-aide positions share the 3,785 hours budgeted for hatchery maintenance and operation.

Hatchery Improvements

The Department employees and IPC Oxbow maintenance personnel have performed work related to several hatchery improvements. The following projects may have been completed prior to this report and may not have been all-inclusive. Included for information purposes only, they are:

- 1) Redesign and install two new degassing towers to increase oxygen levels and release excess nitrogen and well water used in the fall chinook raceways.
- 2) Build a raceway screen to help in separating fish during tagging.

- 3) Install a separate holding tank outside the spawning building to hold fish that need to be worked with or returned to below Hells Canyon Dam.
- 4) A new truck was rented from the Department fleet system for use at the hatchery.
- 5) The metal tank located in the bottom of the spawning building was replaced by a concrete tank. A door was installed between the flume from the outside raceways and the building. This was done to help keep fish from being trapped on the flume with out water.

Water Supply

Operation Water Source

River water for fall chinook parr is pumped from the Snake River. Two 100-horsepower production pumps adjacent to the hatchery produce 17 cubic feet per second (cfs) of water each. One pump is powered from the Pine Creek substation, and the second pump is powered from the Oxbow power plant substation. Only one pump is required at a time. The other pump acts as an emergency backup. Water from the production pumps passes over a wedge-wire screen to filter out of organic matter from the river. Then the water flows through the river water head-box. The river water passes through a valve to control flow and enters the fall chinook head-box. At this point river water can be mixed with well water to adjust temperature before entering the raceways. Snake River water temperatures range from a winter low of 34° F to a late summer high of 72° F.

Incubation Water Source

Two wells provide the water for fall chinook incubation. One well (#1) serves as a primary water source, while the other well (#2) is an emergency backup with a separate power source. The primary well used for incubation water is a constant 54°F, while the backup is a constant 56°F. Well #1 is equipped with a 3-horsepower pump, capable of producing approximately 120 gpm. Well #2 has a 10- horsepower motor and it produces a constant 425 gpm. Water from this pump is used primarily for fall chinook production and as a backup water supply for the rearing building. Incubation water enters an elevated surge tank in the hatchery building before distribution through two 4-inch PVC water lines to the 24 incubator stacks.

Water temperatures

Water temperatures were tracked using Hobo™ temperature meters. One was located in the head-box, one in the river water inflow, and one in the tailrace of raceway B.

FALL SALMON PRODUCTION

Egg Development

The Department obtained 178,409 eyed-eggs from the LFH located in Starbuck, WA. Eyed eggs were picked up by Department personnel and transported to the OFH on December 10, 2001. Eight coolers were used to transport approximately 22,301 eyed-eggs per cooler. Ice was added to the coolers to maintain the correct water temperature during transport. Upon arrival at OFH, the temperature of the water in the coolers was measured and then warmed with well water as necessary prior to the eggs being disinfected. Eyed eggs were disinfected for approximately half an hour in a solution of well water and 100 ppm of Argentyne. After disinfecting, the eggs were placed in 63 Heath trays. Each tray received approximately 2,720 eggs. These eggs were incubated with 53.7° F water at approximately five gpm. After the first two days of incubation, the eggs were treated three times a week with a 15-minute drip treatment of 1,667-ppm formalin to retard *Saprolegnia fungus* growth. Dead eggs were picked at 794 temperature units (TU), 1,034 TUs, and 1,402 TUs. A total of 3,001 eggs were picked off before hatch. The percent survival from eyed egg to hatch was 98.3%.

Fry to Smolt Development

The OFH fall chinook raceways were designed to hold 125,000 parr in each raceway at 70 fpp. At the start of the project, it was not clear what the water temperature would be with a constant demand on the well or how soon river water would be required. The Integrated Hatchery Operations Team (IHOT) recommendations were adhered to as closely as possible. Flow and density indices are listed in Appendix 1. Growth was tracked each week and pound counts and lengths were recorded (Appendix 2). Fall Chinook were fed Moore-Clark feed from button up to release (Appendix 3). We used a combination of hand feeding and belt feeders to supply food to each raceway. Smolts were raised in the outside raceway on well water until reaching 100 fpp on March 21. At that time, 77 gpm of river water was introduced. The water temperature decreased from 56°F to 51°F. During the rearing period hatchery water temperatures were monitored at the head-box for river water, the raceway head-box for mixed water, and the well (Appendix 4).

Moore-Clark feed was used during this season for comparison with the data collected the first year. There was not a drastic drop in feed consumption this year when the river water was introduced to the raceways (Appendix 5). Moore-Clark feed containing beta glucan was fed for two weeks prior to marking. Moore-Clark research shows that beta glucan may help promote activation of the fishes immune system to combat the effects of stress such as fin marking. The fall chinook showed no increase in mortality after clipping. A total of 171,463 smolts, averaging 42 fpp and 4.24 inches in length, were released into the Snake River at the US Forest Service (USFS) boat ramp one mile below Hells Canyon Dam. Production summary data by month is shown in Appendix 6. The release date was approximately the same as last

year. This will help to evaluate constraints in reaching target size. The target date of June 1, 2002 was not used this year due to low snow pack and reduced flow in the Snake River corridor and the resulting effects on water temperature. Depending on conditions next year we will adjust release timing in 2003. The Department employees at the Eagle Fish Health Lab performed health checks on these fish prior to release.

Predators

Known predators included two kingfishers and two mink. The mink were trapped and released down river. They did not return to the hatchery. Since it was impossible to trap the kingfishers, camouflaged netting was placed over the raceways as a deterrent. In addition, the netting provided shade for the fish and reduced the risk of sunburn.

Fish Marking

Marking operations commenced on April 23 and were completed on April 26, 2002. All fall chinook were adipose fin clipped. In addition to fin-clipping, 1,000 were implanted with Passive Integrated Transponder (PIT) tags. On May 6, 2002, a clip evaluation was performed on 500 fish. Five were found with deep clips, two with partial ad-fins and one with a full ad-fin.

Fish Health

Disease Encountered and Treatment

No diseases were encountered during this brood year for fall chinook and brood steelhead. Antibiotic medicated feeds were not used during this brood year.

Organosomatic Index

The Organosomatic Index in this context is a measure of fish health developed as part of the Autopsy--Based Fish Health/Condition Assessment System (Goede, R. W., and S. Houghton. 1987). A Summary of the fish autopsy is shown in Appendix 7.

Acute Losses

Neither acute nor chronic losses were experienced during the 2001-2002 rearing cycle.

Other Assessments

Although production was almost doubled, fish health remained good. Since the addition of the degassing towers, gas bubble disease seems to be under control. *Ceratomyxa shasta* has still not been isolated from these fish.

Season Mortality

Mortalities were tracked daily and reported weekly (Appendix 8). This information was compared with mortality data for 2000 (Appendix 9).

Smolt Transport

Neil Ring Trucking Company from Buhl, Idaho transported the smolts below Hells Canyon Dam for release in two truckloads. The fish traveled well, with no mortalities.

Summary and Conclusion

This year completes the second year of the evaluation period to determine if fall chinook can be raised at OFH. The program was very successful both years. We concluded that the evaluation phase reached desired goals and the program can be expanded to achieve the mitigation requirements. The next phase of the evaluation will be to determine adult returns rate.

ACKNOWLEDGEMENTS

The staff at OFH would like to thank the Lyons Ferry Hatchery for providing eyed eggs and the IPC and Department employees that have contributed to the successful operation of the fall chinook project.

LITERATURE CITED

- Goede, R. W., and S. Houghton. 1987. ASUM: A Computer Program For The Autopsy-Based Fish Health/Condition Assessment System. Utah Division of Wildlife Resources Fisheries Experiment Station, 1465 West 200 North, Logan, Utah 84321.
- Piper, P. G., I. B. McElwain, L. E. Orme, J.P. McCraren, J.R. Leonard. 1982. Fish Hatchery Management. United States Department of the Interior Fish and Wildlife Service, Washington D. C.

APPENDICES

Appendix 1. Flow and Density Index for fall chinook rearing, 2002

Date	Volume	Flow	Flow index	Density index
2/6/02	616	160	0.69	0.18
2/11/02	616	160	0.84	0.22
2/18/02	1198	220	0.79	0.15
2/25/02	1198	300	0.76	0.19
3/4/02	1198	300	0.97	0.24
3/11/02	1198	375	0.98	0.31
3/18/02	1635.5	375	1.16	0.26
3/25/02	1635.5	452	1.15	0.32
4/1/02	2671.1	550	1.09	0.23
4/8/02	2671.1	792	0.81	0.24
4/15/02	2671.1	792	0.92	0.27
4/22/02	2671.1	792	1.01	0.30
4/29/02	2671.1	792	0.96	0.29
5/6/02	2671.1	925	0.95	0.33
5/13/02	2671.1	925	0.99	0.34
5/20/02	2671.1	925	1.03	0.36

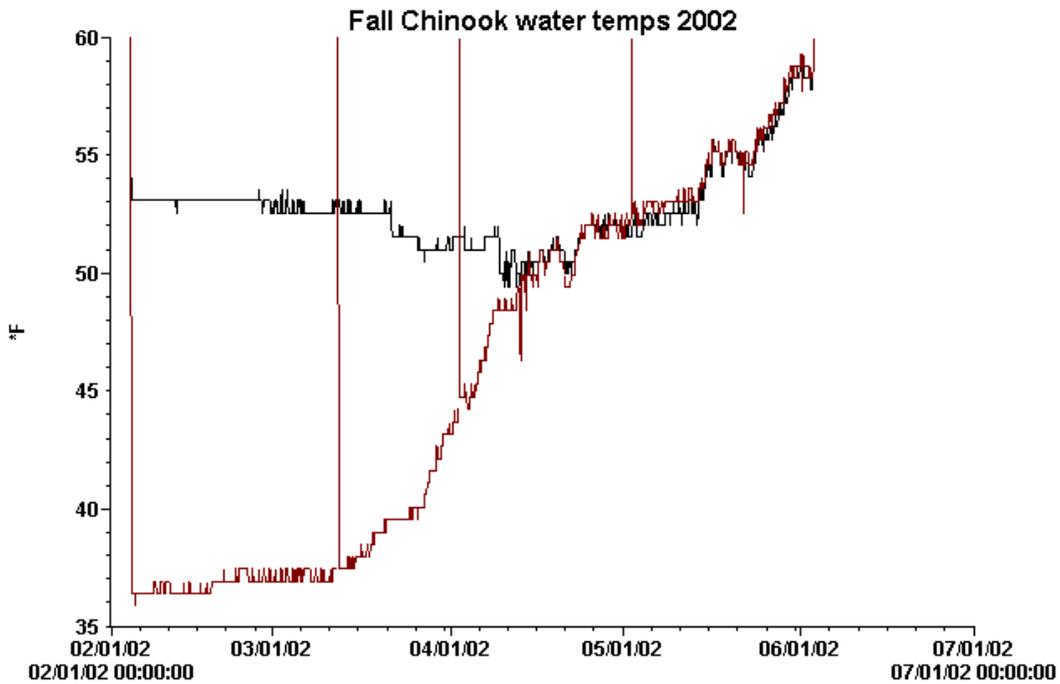
Appendix 2. Weight and Length for fall chinook, 2002

Date	Numbe of fish	Weigh (g)	Weigh (lb.)	Fish/g	Fish/lb	Average length	Minimum length	Maximum length	Standard Deviation
2/6	330	144	0.32	2.29	1040.4	38.62	36.0	43.0	1.63
2/11	306	172	0.38	1.78	807.70	40.64	38.0	45.0	1.44
2/18	371	296	0.65	1.25	569.03	44.46	40.0	49.0	2.09
2/25	313	378	0.83	0.83	375.93	51.06	47.0	56.0	2.03
3/4	324	544	1.20	0.60	270.40	55.60	51.0	61.0	2.21
3/11	315	756	1.67	0.42	189.17	63.16	59.0	67.0	2.14
3/18	385	1190	2.62	0.32	146.88	68.62	63.0	74.0	2.71
3/25	392	1524	3.36	0.26	116.78	71.88	66.0	80.0	3.73
4/1	346	1580	3.48	0.22	99.42	78.94	71.0	87.0	3.97
4/8	316	1708	3.76	0.19	84.00	80.84	74.0	94.0	4.45
4/15	305	2078	4.58	0.15	66.64	89.52	81.0	103.0	4.69
4/22	320	2460	5.42	0.13	59.06	91.96	83.0	105.0	5.72
4/29	372	2944	6.48	0.13	57.37	93.66	78.0	107.0	6.31
5/6	351	3214	7.08	0.11	49.58	99.62	90.0	114.0	5.83
5/13	346	3440	7.58	0.10	45.66	104.70	94.0	122.0	5.59
5/20	311	3340	7.36	0.09	42.27	107.62	92.0	128.0	7.60

Appendix 3. Moore-Clark feed used during 2002.

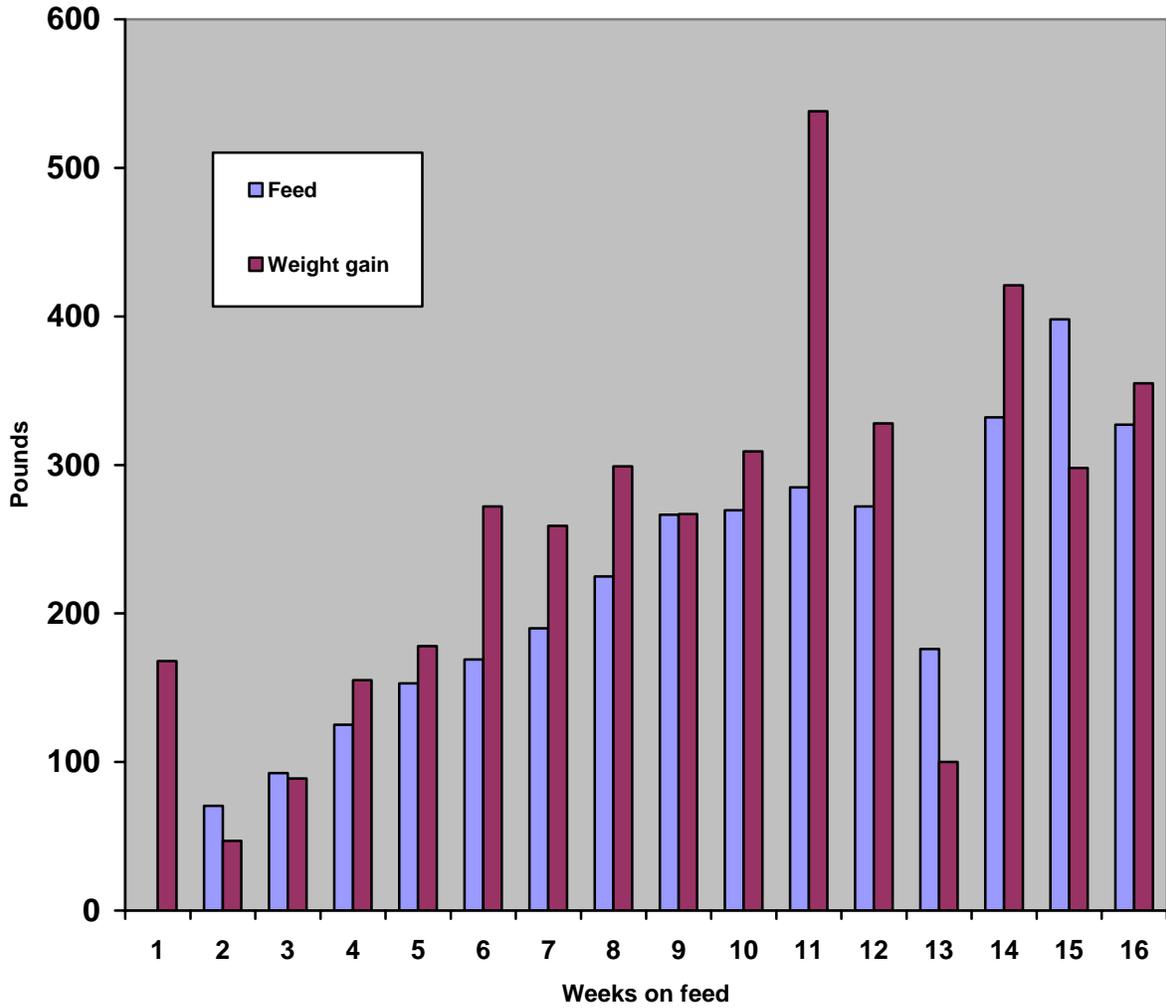
Month	# 0 starter	#1 starter	#2 starter	1.2 mm	1.2 mm med	1.5 mm
Feb	88 lb	264 lb				
Mar			682 lb	236.0 lb		
Apr				490.7 lb	602.8 lb	
May				372.8 lb		594 lb
Total	88 lb	264 lb	682 lb	1099.5 lb	602.8 lb	594 lb

Appendix 4. Temperatures for Well, River, and Mixed water during 2002.



Appendix 5. Fall chinook feed and weight gain during 23002.

Weekly feed and weight gained



Appendix 6. Oxbow Fish Hatchery production summary for 2002.

	Fish on hand at end of month				Mortality		Fish Feed		Weight Gain		Feed Conversion	
	Number	Weight	Length	Fish/Lb	Month	To Date	Month	To Date	Month	To Date	Month	To Date
Feb	172,692	536.3	2.09	322	2716	2,716	374	374	346.9	346.9	1.08	1.08
Mar	171,778	1,735	2.87	99	914	3,630	918.5	1,292.5	1,199	1,545	0.77	0.84
Apr	171,561	2,989	3.92	57.4	217	3,847	1093.5	2,386	1,254	2,799	0.87	0.85
May	171,463	4,082	4.24	42	98	3,945	966.8	3,352.8	1,093	3,892	0.88	0.86
June												

Eggs were received December

Appendix 7. Summary of fish autopsy, 2002.

ACCESSION NO:	02-161	LOCATION:	Oxbow Hatchery
SPECIES:	Chinook Fall	AUTOPSY DATE:	04/23/02
STRAIN:	Lyon's Ferry	AGE:	Fry
UNIT:	All ponds sampled	SAMPLE SIZE:	60
REASON FOR AUTOPSY:	Prelib		
INVESTIGATOR(S):	Munson		
REMARKS:			

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL*	0.00	0.00	0.00
HEMATOCRIT			
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN			

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER
 **CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO-BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	20	N	20	N	20	0	20	0	0	B	20	0	20	N	20	A	0	0	0
B1	0	F	0	S	0	1	0	1	12	R	0	1	0	S	0	B	40	1	0
B2	0	C	0	L	0	2	0	2	20	G	0	2	0	M	0	C	20	2	0
E1	0	M	0	S&L	0			3	22	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean=0.00		4	6	E	0	Mean=0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0	Mean=0.00	
H2	0			O	0			Mean=2.07						OT	0	OT	0		
M1	0																		
OT	0																		

SUMMARY OF NORMALS

SEX	20	20	20	20	20	20	20	20	20	20	20
		M: 0		F: 0		U: 0					

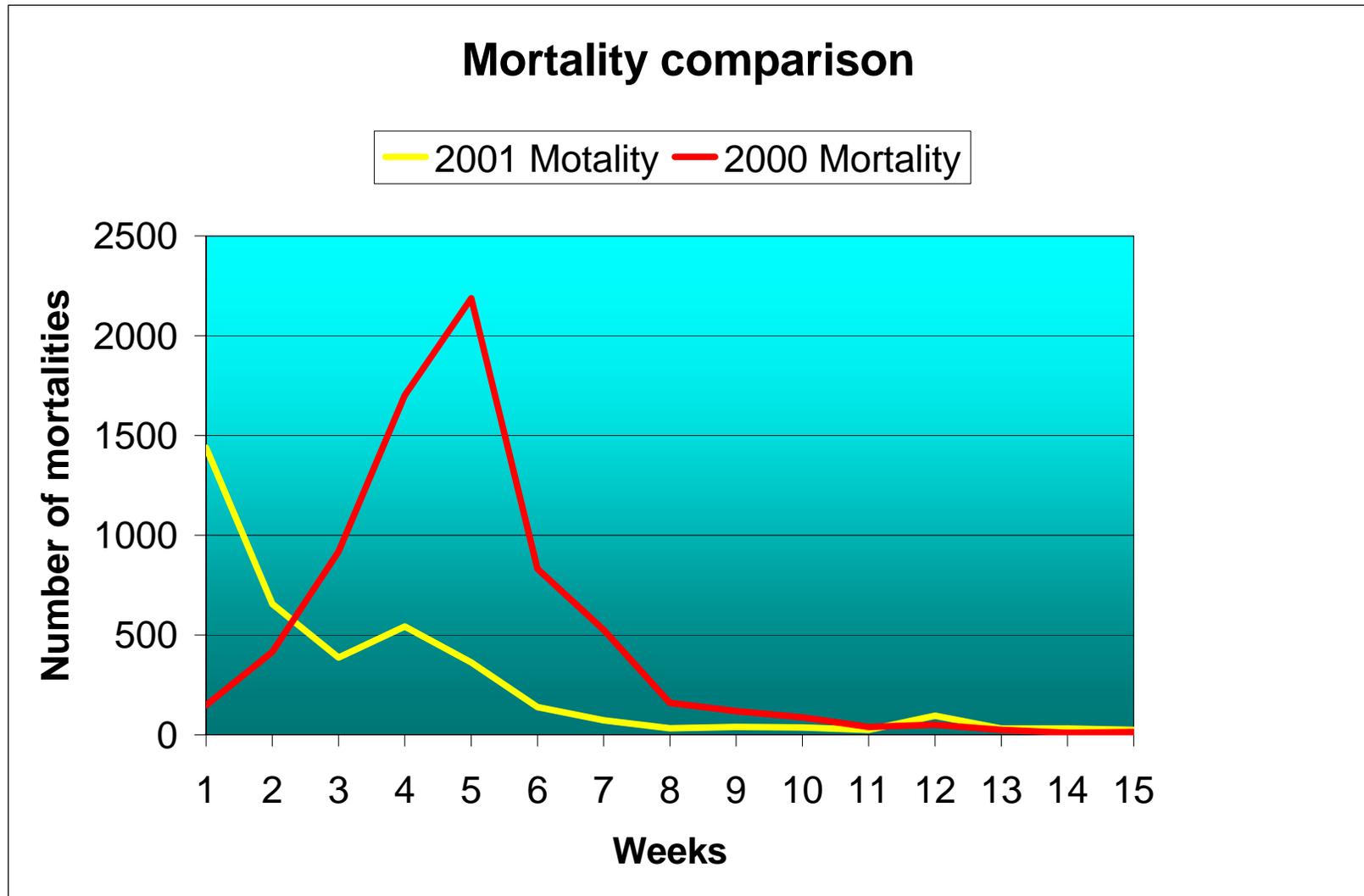
GENERAL REMARKS:

FINS: GOOD
 SKIN: LOSING SCALES
 GONADS:
 OTHER:

Appendix 8. Fall chinook weekly mortality for 2002.

Week	2/11	2/18	2/25	3/4	3/11	3/18	3/25	4/1
Mortality	1,439	655	387	542	363	139	72	33
Week	4/8	4/15	4/22	4/29	5/6	5/13	5/20	5/21
Mortality	39	37	25	96	31	32	25	20

Appendix 9. Comparison of weekly mortality for brood year 2000 and 2001 fall chinook.



Submitted by:

Approved by:

**Kent Hills
Hatchery Assistant Manager**

**Virgil K. Moore, Chief
Fisheries Bureau**

**Tom Rogers
Anadromous Fish Hatcheries Supervisor**