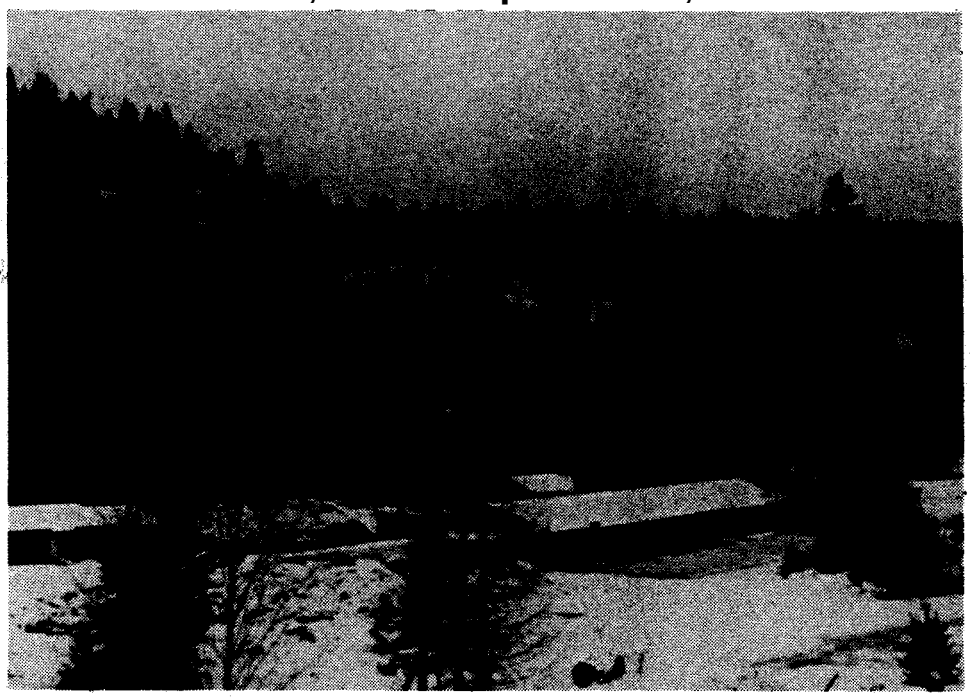
CABINET GORGE HATCHERY ANNUAL REPORT

October 1, 1985 to September 30, 1986



By

Edward B. Schriever
Fish Hatchery superintendent II

October 1987

TABLE OF CONTENTS

Page

INTRODUCTION 1

WATER QUALITY 2

FISH TRAPPING AND HOLDING 2

SPAWN-TAKING AND EGGS RECEIVED 4

EGG INCUBATION AND EMBRYO DEVELOPMENT 5

FEEDING AND GROWTH 7

FISH HEALTH 7

FISH RELEASES AND PLANTING 7

LIST OF TABLES

Table 1. Summary of late-run kokanee salmon spawntaking at Cabinet Gorge Hatchery, 1985-86 4

Table 2. Shipments of late-spawning kokanee salmon eggs from Sullivan Springs to Cabinet Gorge Hatchery, 1985-86. . 4

Table 3. Fish liberations from Cabinet Gorge Hatchery, 1986 . . 8

LIST OF FIGURES

Figure 1. Water temperature profile for Cabinet Gorge Hatchery 1985-86 3

Figure 2. Length frequency of adult kokanee at Cabinet Gorge Hatchery 1985-86 3

FIGURE 3. Cummulative survival of kokanee embryo at Cabinet Gorge Hatchery 1985-86 6

INTRODUCTION

This report covers the first year of operation at Cabinet Gorge Hatchery. Cabinet Gorge Hatchery is the first hatchery to be built as a result of the Northwest Power Planning Council's Columbia River Basin Fish and Wildlife Plan. The construction of Cabinet Gorge Hatchery was co-funded by Washington Water Power, Bonneville Power Administration and Idaho Department of Fish and Game (IDFG).

Hatchery operation is controlled by Idaho Department of Fish and Game with funding provided 25Z by IDFG and 75Z by the U.S. Fish and Wildlife Service through federal aid in fish restoration.

The objective of Cabinet Gorge Hatchery is to produce late-spawning kokanee salmon fry (Onchorhyncus nerka) for release into Idaho's Lake Pend Oreille.

Cabinet Gorge. Hatchery is located eight miles east of Clark Fork, Idaho, on the Clark Fork River one mile west of Montana, and 75 miles south of Canada in Bonner County.

Cabinet Gorge Hatchery is staffed by a manager (Hatchery Superintendent II), an assistant manager (Hatchery Superintendent I), and up to four temporary laborers during times of peak work loads. There are two residences and quarters for temporary employees at the hatchery. Other structures include the nursery building, the office-garage-shop complex, and a spawning shed. The hatchery complex includes an effluent treatment pond, a fish ladder and trap that accesses the Clark Fork River, and three adult holding ponds. The hatchery is also equipped with a 150 kw emergency diesel generator, and a fully automated alarm system.

The water for hatchery operation is supplied from wells. Four wells, each with 50-horsepower electric pump, are capable of delivering up to 24 cfs of water. Water temperature is seasonally variable. Hatchery water is regulated by a head box collection-degassing system that avoids less than favorable gas concentrations and pressure surges through the hatchery. Incubation and production water are plumbed separately.

Incubation capacity is approximately 30 million green kokanee eggs, or 25 million eyed kokanee eggs. All incubation is done in 12-in diameter 24-in tall upwelling incubators. The hatchery has 64 raceways, each equipped with four incubators. Egg incubation, hatching and feed training of swim-up fry are done in the upper one-third of the 4 ft x 4 ft x 60 ft raceways, which are located inside the nursery building (the raceways run under the walls). Rearing space to complete the seasonal growing cycle is gained by removing the screen at the one-third mark, allowing fish to have free access to the remaining two-thirds of raceway outside the nursery building.

Carrying capacity of Cabinet Gorge Hatchery is estimated at 9,100 kg (20,000 lb) of fish at 2,200 per kilogram (1,000 per pound).

Fry releases into the Clark Fork River are made using a 10-in underground pipe that bypasses the sedimentation basin and holding ponds and empties directly into the fish ladder.

The yearly fish cycle at Cabinet Gorge Hatchery typically starts in late October with the onset of kokanee spawning runs and fish trapping. Spawntaking occurs through November, December and into January. Eggs eye at approximately 250 centigrade thermal units (CTU), hatch at 600 CTU, and swim-up at 900 CTU. Fish size at swim-up is approximately 12,300 per kg (5,600 per pound). Program objectives call for fry at 2,200 per kilogram (1,000 per pound) for a mid-July release.

WATER QUALITY

As expected from test well data, water temperature varied throughout the 1985-86 production year. However, temperature variation was greater, and occurred at a faster rate than was shown by test well data.

The hatchery pumps were turned on for incubation on December 4 and temperature was 12.7°C (55°F). Temperature dropped to a low of 1.9°C (34°F) on March 1 and was below 2.5°C (36.5°F) for 50 days (February 15 to April 10) during incubation and fry development (Fig. 1).

Associated with rapidly decreasing water temperatures were elevated levels of total dissolved gas. Both nitrogen and oxygen were above saturation. Oxygen was monitored with a Yellow Springs Instrument (YSI) meter at 12.8 mg/L (saturation 10.2 mg/L), and saturometer readings showed nitrogen (and argon) readings at 107% saturation. Degassing using two-inch Koch rings reduced total dissolved gas concentrations to 101% with oxygen at saturation.

FISH TRAPPING AND HOLDING

The Cabinet Gorge Hatchery fish ladder and trap were in operation from December 4, 1985 to January 7, 1986. Thirty-one days of trapping yielded 745 adult, late-run kokanee salmon. The sex ratio was 50.5% female. Prespawning mortality accounted for 59 fish, 7.9% of the total trapped. Fork length averaged 253.48 mm and ranged from 235 mm to 290 mm (Fig. 2).

The fish ladder, trap, and adult holding ponds were nonoperational following a severe washout of the sedimentation basin on January 8.

Figure 1. Water temperature profile for

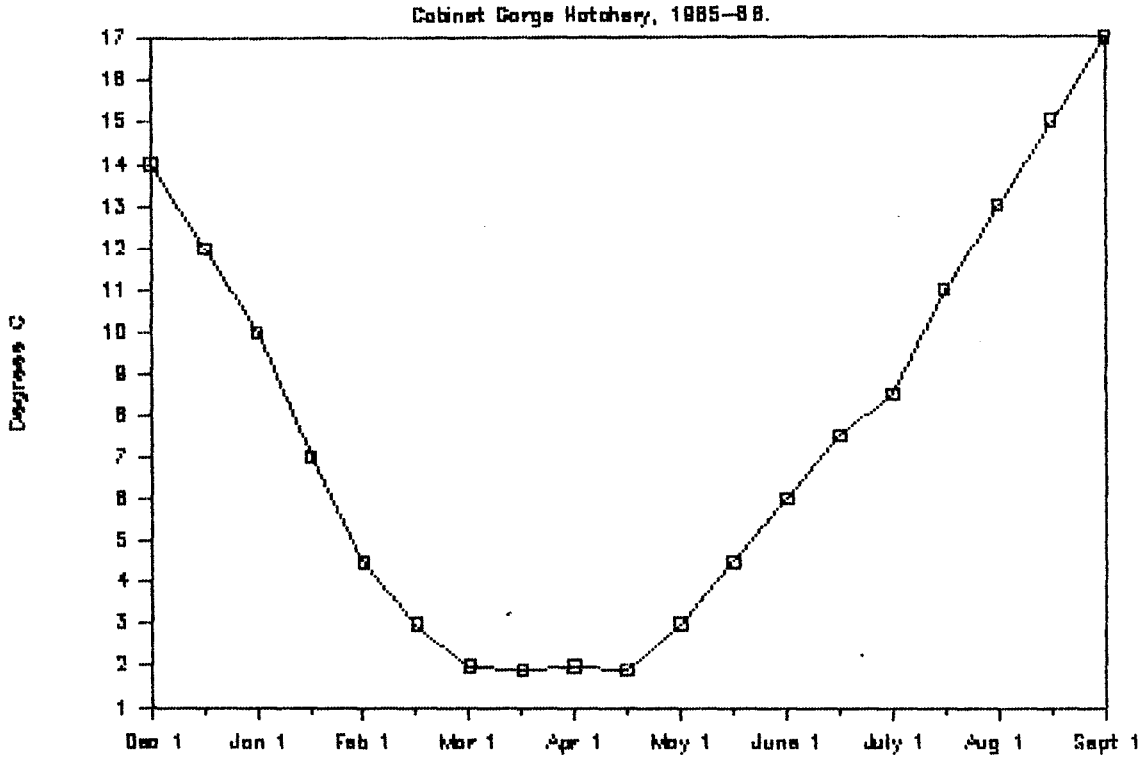
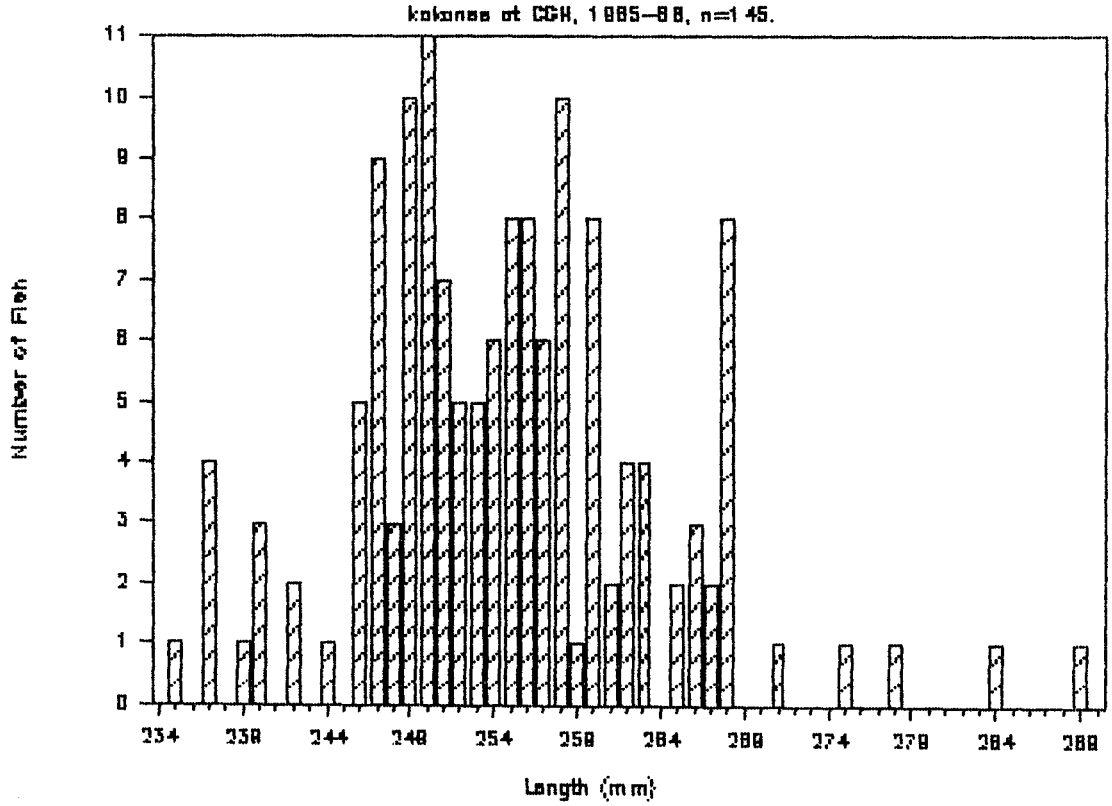


Figure 2. Length frequency of adult



SPAWNTAKING AND EGGS RECEIVED

During the 1985-86 spawning season, 117,865 green eggs were collected from 316 female late-spawning Kokanee salmon utilizing the fish ladder and trap at Cabinet Gorge Hatchery (Table 1).

Table 1. Summary of late-run kokanee salmon spawntaking at Cabinet Gorge Hatchery, 1985-86.

Take	Females spawned	Total eggs		Eggs per female
1	34	13,847		409
2	58	24,427		421
3	96	30,598		323
4	80	28,051		351
5	48	18,931		394
6	10	2,011		183
Totals	326	117,865	Average	347

A total of 6,540,177 green eggs were received from the spawn-taking operation at Sullivan Springs near the mouth of Granite Creek on Lake Pend Oreille (Table 2). These efforts resulted in a total of 6,658,042 green kokanee eggs at Cabinet Gorge Hatchery.

Table 2. Shipments of late-spawning kokanee salmon eggs from Sullivan Springs to Cabinet Gorge Hatchery, 1985-86.

Date	Total eggs
12/5	740,053
12/9	1,293,116
12/11	706,843
12/13	538,507
12/16	456,760
12/18	644,980
12/20	740,477
12/24	617,192
12/26	254,703
12/31	317,904
1/3	233,982
Total	6,540,177

EGG INCUBATION AND EMBRYO DEVELOPMENT

Upon receiving green eggs into the nursery building, they were first temperature-tempered, and then disinfected in a 1:150 buffered Argentyne solution for 15 minutes. Eggs were then measured using displacement method and placed in incubators. Water flow in the incubators was set at eight liters per minute. Following eye-up, flows were increased to 40 liters per minute.

Eye-up was estimated at 92¼ to 952. Survival rate from green egg to feeding fry ranged from 65Z to 862 with an average of 77.3% (Fig. 3).

Three factors plagued incubation during the 1985-86 production year. They were:

1. Colder than expected water temperature for longer than expected, resulting in much longer incubation time and increased exposure to dead eggs and fungus (Figs. 1 and 4).

2. Initial lack of a formalin treatment system for upwelling incubators, and the resultant fungal problems associated with dead eggs.

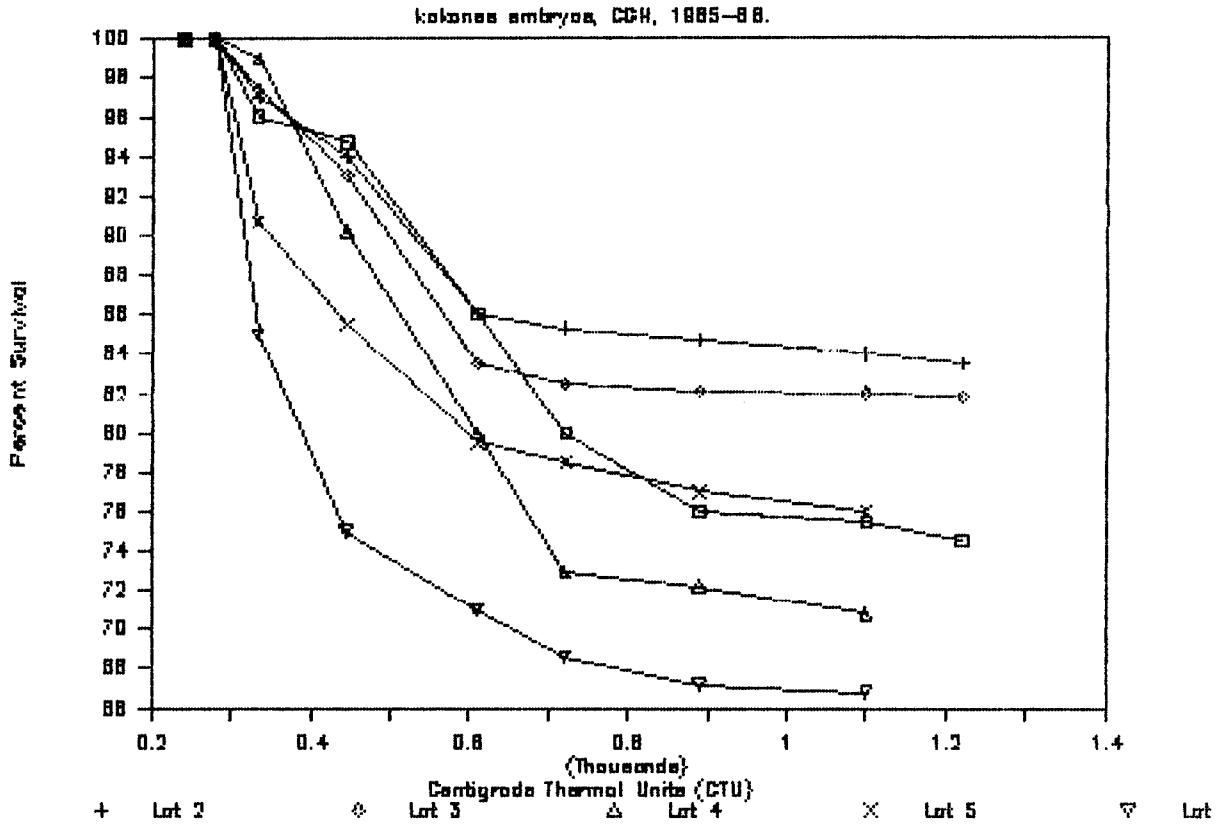
3. Gas supersaturation and water flow interruptions due to generator malfunctions during power outages both resulted in chronic conditions of coagulated yolk, and increased egg mortality.

A considerable amount of time was spent on research and design of an accurate and efficient method of delivering formalin into the incubator system. Once this system was perfected, treatments of 1,667 ppm formalin for 15 minutes every other day were successful in controlling fungal growth on dead eggs.

Supersaturated levels of total dissolved gas in the water supply was corrected by degassing with two-inch Koch rings. This significantly reduced the coagulated yolk condition that was occurring in this year's eggs.

Evaluation of egg-loading densities in the incubators did show a relationship to survival. Low egg volume (less than 4.6 liters) generally produced the lowest egg survival, less than 70Z. Loading volumes of 5.9 liters to 7.8 liters produced the best survival, greater than 752. Eyed egg size averaged 15.2 eggs per ml. Egg volume (loading density) is related to egg circulation within the upwelling incubator. Higher volumes of eggs circulated better than low volumes did, thus making the eggs less susceptible to dead flow spaces in the incubator.

Figure 3.Cummulative survival of



FEEDING AND GROWTH

Swim-up occurred between 780 and 830 centigrade thermal units (CTU). Fish were put on feed, 30 CTU, after the last fish in a raceway were "up." Initial fry densities in the upper one-third of the raceway ranged from 0.05 kilogram per cubic meter (0.8 lb per ft^3) to a low of 0.019 kilogram per cubic meter (0.3 lb per ft^3) for feed training. Fish were spread into the entire raceway after 10 to 14 days of feed training. Due to the colder than expected water temperatures, initial feeding dates on fish lots were much later than anticipated. Lots 6 and 7 did not go on feed until July 1.

Total kilograms of fish produced for the 1985-86 production year was 1,618.44 (3,560.57 lb) using 2,089.64 kilograms (4,597.2 lb) of feed, resulting in a conversion rate of 1.291 kilogram of food fed per kilogram of fish produced. Fish feed cost totaled $4,065.02 resulting in fish feed costs per kilogram of fish produced of $2.51 ($1.142 per lb produced).

Four diet combinations were evaluated during the 1985-86 production year. They were Moore Clark's OMP II mash starter and OMP IV 1/32 grower, Rangen's semi-moist starter and No. 1 grower, Bioproducts' bio-moist No. 1 starter and No. 2 grower, and Moore Clark's OMP II starter mash and New Age No. 1 grower. Results showed Rangen's and Bioproducts' semi-moist starters to be equal for the best growth and feed conversion during feed training. Cost per kilogram gained was slightly lower for the Rangen diet because of the cost difference. Moore Clark's OMP IV 1/32 grower gave the best overall results based on growth, conversion and cost per pound gained.

FISH HEALTH

The disease status of Cabinet Gorge Hatchery is the highest possible for a hatchery that is dependent on free-ranging broodstock. Pathological checks on adult spawners at Cabinet Gorge Hatchery and Sullivan Springs were negative again this year. Setting aside the environmental problems encountered during egg incubation, no fish health problems existed this year. Light loading densities, daily pond cleanings, and a short growing season helped make that possible.

FISH RELEASES AND PLANTING

A total of 5,010,248 fry were released into the Lake Pend Oreille system during July and August of 1986. Of these, 3,415,517 were released into the Clark Fork River at Cabinet Gorge Hatchery, and 1,594,731 were planted in Sullivan Springs. The average length of fry at release was 32 mm (1.3 in) (Table 3).

Table 3. Fish liberations from Cabinet Gorge Hatchery, 1986.

Date	Release site	Total fish	Total kilos
7/12	CFR	10,014	1.6
7/30	CFR	1,095,348	336.4
8/4	CFR	1,523,222	558.6
8/12	CFR	774,312	312.4
9/4	CFR	12,621	12.1
	CFR Subtotal	3,415,517	1,221.1
8/4	SS	846,347	224.3
8/6	SS	282,208	81.1
8/8	SS	369,080	92.1
8/8	SS	97,096[a]	24.2
	SS Subtotal	1,594,731	421.7
	Grand Total	5,010,248	1,642.8

[a]Reared at Clark Fork Hatchery.

CFR=Clark Fork River
SS=Sullivan Springs

Submitted by:

Edward B. Schriever
Fish Hatchery Superintendent II

Approved by:

IDAHO DEPARTMENT OF FISH AND GAME

Jerry M. Conley, Director

David L. Hanson, Chief
Bureau of Fisheries

Steven M. Huffaker
Fish Hatcheries Manager