Volume 046
Article 23

IDAHO
DEPARTMENT OF FISH & GAME

Jerry Conley, Director

Annual Performance Report

to

Idaho Power Company

IPC-17. Evaluation of Spring Chinook Salmon Emigration, Harvest and Returns to Rapid River Hatchery, 1979

IPC-13. Report of Operations at Rapid River Hatchery, 1979

Period Covered: 1 October 1978 to 30 September 1979

by

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May, 1980

TABLE OF CONTENTS

Page

ABSTRACT 1

OBJECTIVES 4

TECHNIQUES USED 4

Marking and Evaluation of Downstream Migrants 4
Evaluation of Upstream Migrants and Inventory of Fish Populations 4
Hatchery Operations, Disease Control Measures, Conversion Rates 5
Harvest Information 5
Brood Year and Age Class Composition 5
Summer Chinook 5

FINDINGS 5

Spring Chinook - 1977 Brood 5

Enumeration, Marking and Evaluation of Downstream Migrants 5
Conversion Rates 6

Spring Chinook - 1978 Brood 7

Enumeration 7
Rearing Problems--Diseases and Treatments Used 9

Spring Chinook -- Adult Returns 10

Arrival Dates 10
Enumeration 10
Nitrogen Bubble Damage and Other Injuries 15
Prespawning Mortality, Treatment of Adults 15
Spawntaking Operations and Enumeration of Eggs Obtained 19
Disposition of Carcasses 20
Marked Fish 20
Distribution of Eggs, Eye-Up Percentages 21
Harvest 21

Summer Chinook--Returns to Rapid River 21

Steel head 21

Inventory of Miscellaneous Species in Rapid River 22

Dolly Varden 22
Whitefish 22

TABLE OF CONTENTS (Continued)

Page

Other Species 22

Hatchery Improvements 22

Public Relations 22

RECOMMENDATIONS 22

Hatchery Maintenance 22
Research Projects 24

LITERATURE CITED 24

ACKNOWLEDGEMENTS 24

LIST OF TABLES

Table la. Egg shipments (1978 & 1979 brood) 1 Oct. 1978 - 30 Sept. 1979 8

Table lb. Fingerling shipments (1978 brood) 1 Oct. 1978 - 30 Sept. 1979 8

Table lc. Smolt shipments (1977 brood) 1 Oct. 1978 - 30 Sept. 1979 8

Table 2. Returns of spring chinook salmon to Rapid River Hatchery, survival to spawning, and enumeration of eggs, fry and smolts produced 11

Table 3. Length frequencies of spring chinook entering the Rapid River trap 1971 - 1979 13

Table 4. Summary of the returns to Rapid River Hatchery, by age class of spring chinook smolts released 1964 - 1979 16

ANNUAL PERFORMANCE REPORT

State of Idaho

Name: Evaluation of Spring Chinook. Salmon Emigration, Harvest and Returns to Rapid River Hatchery, 1979

Project No. IRC-13 AAl2C-17

Report of Operations at Rapid River Hatchery, 1979

Period Covered: 1 October 1978 to 30 September 1979

ABSTRACT

At the end of the 1978 fish year, we had 2,951,768 fish from the 1977 brood on hand at the hatchery. We lost 84,775 fish prior to emigration in the spring of 1979. An additional 281,563 fish were on hand in the concrete adult pond, being reared for the spring chinook reintroduction project. In late April, 200,735 of these fish were planted in the Clearwater River drainage.. We marked 250,200 of the fish that emigrated down Rapid River with an adipose in clip and coded-wire tag. No downstream survival estimates were available, but passage conditions appeared to be relatively good in 1979.

Net production from this hatchery for the fish year was 103,644 kg (228,534 lb). We fed a total of 117,324 kg (258,700 lb) of Oregon Moist Pellet fish food that cost $80,497.25. The conversion ratio was 1.13:1, and it cost 1.78 for fish food for each kg of fish flesh produced ($.352/lb). When all costs were included, each kg of production cost $1.54 ($.70/lb).

We had 4,469,815 eggs from the 1978 brood in the incubators at the end of the 1978 fish year. We shipped 249,969 eggs to the Sweetwater Eyeing Station to reduce the balance to 4,219,846 eggs to hatch and rear at this station, The resultant fry were placed in the raceways between 27 November 1973 and 22 March 1979. In May 1979, we ponded 3,109,685 fish in the earthen rearing ponds to be released to fulfill Idaho Power Company's mitigation obligation. At that time, we had 468,070 fish remaining in the raceways, a survival rate of 87% of the initial raceway stocking.

The fish remaining in the raceways were earmarked for other areas. We planted 10,000 in Meadow Creek and 232,500 in the Red River Pond. Some 184,438 remained on hand at Rapid River for planting in other drainages as smolts in early 1980. An additional 8.8% of the fish held for this program were lost between the May inventory and the end of the fish year.

The fish that were ponded to fulfill Idaho Power's needs survived well. We lost 207,594 fish (6.7%) to various causes, and 206,770 emigrated from the ponds in the fall. We have 2,664,224 fish on hand at the end of the fish year to release into Rapid River in the spring of 1980.

The upstream migrant trap was installed on 11 April 1979, and was operated until 26 July 1979. The first adult spring chinook arrived at the trap on 15 May 1979, and the fish continued to arrive until the trap was removed from operation on 26 July. The peak of the run occurred on 12 & 13 June, when 24[4] adults were removed from the trap each day. On 19 July we began releasing unmarked arrivals

back into Rapid River to spawn as summer chinook native to the stream.

We took 3,404 spring chinook salmon from the Rapid River trap in 1979. Fish in their third year-of-life (jacks) numbered 350 and made up 10.3% of the run. This is a good increase from 1978 when only 34 jacks were counted, but is still the third lowest count in the history of the hatchery. Fourth year-of-life fish normally are the most plentiful age class in a year's run. This was not the case in 1979. Only 598 fourth year-of-life fish were trapped, 17.9% of the run. Without the good return of fifth year-of-life fish, 2,413, (71.8% of the run) the hatchery would not have had enough eggs to continue full scale operation. Female salmon numbered 1,614 fish (52.8% of the run) while males numbered 1,409 (42.6% of the fish in their fourth year-of-life or older and used for brood purposes). Some 31 fish (1%) were not sexed. Fish taken from the Rapid River trap made up 6.6% of the total spring chinook counted over Bonneville Dam, and 45.2% of the Lower Granite Dam count. This is an increase from 5% of the Bonneville count and only 18% of the Lower Granite count in 1978.

Of the fish examined at the trap, 637 fish (18.7%) had symptoms of nitrogen bubble disease, a decrease from the 23.2% incidence seen in 1978. We saw 100 fish with gaff wounds, 28 fish with gillnet damage, and only 1 with a hooking injury; all much lower than the 1978 totals in number and percentage.

Of the 3,054 fish that arrived at the Rapid River trap, 51 died in the trap (1.7%). We ponded 3,003 at the hatchery, and lost 472 females and 468 males prior to spawning, a total of 940 fish (30.8%). The total loss percentage, including both trap and pond mortality, was 32.4%, the second highest loss in the history of the hatchery.

We continued to use drug injections administered to the adults as they arrived at the trap. A second injection was given to the earliest arriving fish some 30 days after ponding. We used two drug formulations to check for effectiveness in controlling Bacterial Kidney Disease, and noted very little difference in their performance. Results of treatment with malachite green to control fungus invasions were not as successful as in the past.

We spawned 1,141 female salmon and fertilized their eggs with the milt from 941 males. Only fish in their 4th year-of-life or older were used for brood purposes. The total number of eggs taken was 5,648,722, and each female produced an average of 4,950 eggs. The eggs averaged 3.11 per ml (88 per oz). All of the eggs were water hardened in drug at 1 ppm level for 1 hour prior to being placed in the incubators. We used two formulations of the same drug (Erytromycin, Abbott) for comparative purposes during water hardening. All of the eggs were eyed at Rapid River Hatchery, and 95.9% of the eggs survived to eye-up. Hayden Creek Hatchery received 806,400 and Kooskia National Hatchery 330,880 eyed eggs from the 1979 brood. We had 4,295,308 eyed eggs from the 1979 brood on hand at Rapid River at the end of the fish year.

There was no season for sportsmen to fish for salmon in 1979. The Indian fishery on Rapid River continued, but no attempt was made to monitor their harvest.

We passed 39 steelhead, 260 Dolly Varden, 7 whitefish, 4 rainbow and 1 cutthroat through the trap during the 1979 trapping season. No rough fish were captured.

Several maintenance and minor improvement projects were accomplished by the hatchery crew during the year. We estimated that nearly 30,000 people visited the hatchery during the year.

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OBJECTIVES

To evaluate the survival back to the hatchery of jack and adult spring chinook salmon by brood years.

To inventory all fish by species entering the upstream trap on Rapid River.

To report all functions and operations being carried out at Rapid River Hatchery, disease problems encountered, numbers and weights of fish released.

To report the numbers of eggs taken and their distribution, eye-up, and hatching success.

To report the distribution of fry, fingerlings, and smolts from the hatchery.

To estimate the harvest by sportsmen of hatchery reared spring chinook salmon in the Salmon and Little Salmon Rivers.

To report any improvements to the hatchery, the number of visitors annually, and public presentations made.

TECHNIQUES USED

Marking and Evaluation of Downstream Migrants

The fish tagging trailer was at Rapid River Hatchery from 6 to 17 November 1978. During this period, the tagging crew tagged (coded-wire tag) and adipose fin clipped 250,200 pre-smolt spring chinook salmon. During the first week of marking the crew tagged 127,800 fish with code 4-15, and 122,400 fish the second week with code 4-24. A check made in early April, 1979, showed that 98% of the tagged fish had retained the tags, This marking represents 8.5% of the total number of pre-smolts on hand for release in 1979.

The National Marine Fisheries Service did not attempt to estimate the survival of Rapid River origin smolts in 1979.

Evaluation of Upstream Migrants and Inventory of Fish Populations

We installed the upstream migrant trap on 11 April 1979, and operated it until 26 July 1979. The trap was activated 4 days later than in 1978, and operated 1 day later than in 1978. All upstream migrant fish were examined at the trap, and numbers, size, and species were recorded. This inventory included all fish in excess of 203 mm (8 in) in length.

During the entire trapping period, hatchery personnel examined all fish in the trap for wounds, tags, and other marks. Length measurements were taken on all chinook, and were used to determine age class by length frequency distribution. All fish that died in the holding ponds were examined for adipose fin clips, and the snouts removed from the marked fish. At spawning time, all fish that had an adipose fin clip were examined by a National Marine Fisheries Service technician for tags, and had the snout removed and individually bagged for return to our coded wire tag personnel. All jacks were examined for marks as they were killed and cleaned. All clipped jacks had their entire heads removed and bagged, and the heads sent to the coded wire personnel for examination.

Hatchery Operations, Disease Control Measures, Conversion Rates

Records were kept on normal hatchery operations by hatchery personnel. All diseases were noted, and recorded in a permanent hatchery log. The log also contains records of control measures and treatments used and their success in combating the disease problem.

Conversion rates were obtained from hatchery planting slips and fish food records.

All ponded adult mortalities were autopsied and examined by hatchery personnel. Individual records listing the cause of death and other conditions were made, and the information compiled at the end of the year.

Harvest Information

No sport fishing for chinook was permitted in 1979 because of extremely low numbers of fish entering the Snake River.

Brood Year and Age Class Composition

We measured all spring chinook entering the upstream trap. Brood year and age class was determined by using length frequency distribution curves.

Summer Chinook

Unmarked fish that appeared to be fairly bright colored that arrived after 18 July 1979 were released from the trap and allowed up Rapid River to spawn naturally. The initial release as summer chinook was one day later than in 1978. The trap was taken out, of operation on 26 July 1919 and all fish were allowed to pass the trap without being counted, Bocaus2 of work load pressures, no accurate count of summer chinook passing the trap was kept.

FINDINGS

Spring Chinook - 1977 Brood

Enumeration, Marking and Evaluation of Downstream Migrants,

At the beginning of the fish year (1 October 1978) we had 2,951,768 pre-smolts on hand in the earthen rearing ponds. We had an additional 281,563 pre-smolts being reared in the concrete adult pond for the spring chinook reintroduction program.

When the fish emigrated from the rearing ponds into Rapid River, we estimated that 2,866,993 smolts had been liberated from the ponds. This represents a 97% survival rate from the beginning of the fish year to liberation. The fish averaged 138 mm (5.4 in) in length and 33.1 fish per kg (15/lb) in weight; nearly the same size as smolts released in 1977 and 1978. Total weight of the fish released into Rapid River was 86,596 kg (190,945 lb).

The fish reared for the spring Chinook reintroduction program were planted in late April 1979. Department trucks planted 44,373 fish in the South Fork of

the Clearwater River at Newsome Creek. The fish weighed 952 kg (2,100 lb) and averaged 46.3 fish per kg (21/lb). The Lochsa River was planted at White Sands Creek with 156,362 fish. These fish weighed 3,356 kg (7,400 lb) and were identical in size to the South Fork Clearwater plant. The survival rate for the fish reared in the concrete pond was 72% to planting. A ruptured screen probably inflated the loss percentage for this pond, as little actual mortality was seen by the hatchery crew.

No major losses to disease were noted during the time period from 1 October 1978 until the March-April 1979 release. A large number of fish did show classic symptoms of sunburn during the early spring of 1979. Some fungal invasion was present on the sunburned areas of the affected fish, and was treated with malachite green flushes at a rate of .5 ppm dripped for a 1 hour time period.

The 1977 brood spring chinook smolts were the progeny of adult parents that had all been injected with Erythromycin Phosphate at the trap. All eggs had been water hardened in the drug as they were taken from the parent stock, and had shown no indications of an outbreak of Kidney Disease. Or. George Klontz (University of Idaho) had felt that these treatments should successfully break the chain of infection without a prophylactic treatment of Gallomycin 50 mixed in the diet. At the time of liberation, none of the fish were observed with any symptoms of Bacterial Kidney Disease. With the exception of the sunburn noted earlier, they appeared to be in excellent health.

It would appear from this year's experience that as long as all adults are injected at the trap, and all eggs are water hardened in the drug, the expensive (nearly $10,000) prophylaxsis Gallomycin feeding will not be necessary. It was interesting to note that because of a lack of drug, Kooskia National Hatchery received some of the eggs from the same brood that had not been water hardened in drug, and did experience some problems with Bacterial Kidney Disease (Wayne Olson, personal contact).

During November 1978, the tagging crew marked 250,200 pre-smolt spring chinook with an adipose fin clip, and placed a coded-wire tag in their snouts. Handling losses were again minimal, and no adverse effects from the marking procedure were noted. This marking represents 8.5% of the smolts released in 1979 from this station.

Since no other external marks were applied to Rapid River smolts, there was no way for National Marine Fisheries personnel to monitor the downstream survival rates or timing of these fish. Downstream passage conditions were similar to 1978 and fish passage was rated fairly good (Donn Park, personal contact).

Emigration from the hatchery began on 12 March 1979, and the last fish were forced from the pond on 24 April 1979. This time frame has remained fairly constant over the past several years. All mercury vapor lights surrounding the ponds were extinguished in early January in order to insure a normal daylight-dark photo period for at least 6 weeks prior to normal emigration time. It was noted that a larger percentage of the fish remained in the river as precocial males than was the case in 1978. The cause of the increase is unknown at this time.

Conversion Rates

Net production for the fish year (1 October 1978 to 30 September 1979) was

calculated by adding the weight of the fish planted, 93,646 kg (206,490 lb) and the weight of the fish on hand on 1 October 1978, 61,317 kg (135,204 lb). We then deducted the weight of the fish on hand on 30 September 1979, 51,319 kg (113,160 lb) to arrive at a figure of 103,644 kg (228,534 lb) as the net production from this station for the fish year.

We fed a total of 117,324 kg {258,700 lb) of Oregon Moist Pellet, Formula II, fish food at a cost of $80,497,2.5 to obtain this production. We fed slightly over .5/kg (1.13 1b) of fish food to produce each kg (2.2 lb) of fish flesh. Average cost to produce 1 kg of fish was $.78 (.352/lb) for fish food alone. When all other operational costs were included, the cost of producing 1 kg of fish was $1.54 ($.70/lb), a decrease of $.22 per kg ($.10/lb) from 1978. Part of the decreased costs can be attributed to less part-time labor being expended because of a reduced number of adult fish to handle.

Spring Chinook - 1978 Brood

Enumeration

On 1 October 1978 we had 4,469,815 eggs on hand in the Rapid River incubators from the adults that spawned in August and September of 1978. We shipped 249,969 eyed eggs to the Sweetwater Eyeing Station in October 1978, leaving a balance on hand of 4,219,846 eggs to hatch and rear at this hatchery. As the eggs hatched, and the resultant fry buttoned, they were moved to the raceways to be started on feed. The first lot of fry was moved to the raceways on 27 November 1978 and the final lot was moved to the raceways on 22 March 1979. All fish were moved to the raceways as they accumulated between 1,650 and 1,675 temperature units. The fry are not completely buttoned at this stage, but seem to accept feed more readily than at any other point of development. Losses from hatching amounted to 107,257 fish from the beginning of the fish year until being placed in the raceways (2.4% of the original number).

During the period of 10 to 15 May 1979 we moved 3,109,685 fish from the raceways to the 2 large earthen rearing ponds. These fish were to be used to fulfill the releases down Rapid River under the Idaho Power Company mitigation agreement. After the ponding was completed, 468,070 fish remained in the raceways. Losses from the time the fish were placed in the raceways in the fall and winter of 1978 and early spring of 1979 until this inventory was completed totaled 534,834 fish, 13% of the original population.

At this point, the fish remaining in the raceways were assigned to the spring chinook reintroduction program and food costs for starting the fish were pro-rated between Idaho Power Company and that project using a number percentage of each to arrive at an equitable cost assignment.

Of the fish remaining in the raceways, 10,000 were planted in Meadow Creek On the Clearwater River drainage, 232,500 were placed in the Red River Rearing Pond on the South Fork of the Clearwater, and 184,438 remained on hand in the concrete adult holding here at Rapid River Hatchery. They will be planted as smolts in the spring of 1980. We lost 41,132 fish in the raceways and pond between May 1979 and the end of the fish year, 8.8% of the May inventory.

The 3,109,685 fish that were ponded in the various earthen ponds had a slightly better survival rate. We lost 207,594 fish to various causes, 6.7% of the initial stocking. An additional 206,770 fish emigrated from the ponds in late summer. This is

Table 1 a.. Egg shipments (1978 & 1979 brood) 1 Oct. 1978 - 30 Sept. 1979

Destination	1978 Brood		1979 Brood		
	Green	Eyed	Green	Eyed	
Sweetwater Eye: ing :;t.		249,969			
Hayden Cr. Hatchery				806,400	
Kooskia Nat'l. Hatchery				330,880	
Totals		249,969		1,137,280	

Table 1 b. Fingerling shipments (1978 brood) 1 Oct 1978 - 30 Sept. 1979

Destination	Number	kg.	lbs.
Red River Pond	232,500	680	1,500
Ten Mile Creek	10,000	23	50
Totals	242,500	703	1,550

Table 1 c. Smolt shipments (1977 brood) 1 Oct. 1978 - 30 Sept. 1979

Destination	Number	kg.	lbs.
South Fork of Clearwater Riv.	44,373	952	2,100
White Sands Cr. (Lochsa River)	156,362	3,356	7,400
Totals	200,735	4,308	9,500

All shipments are of eggs, fingerlings, and smolts are in addition to hatchery needs to meet Idaho Power Company's mitigation requirements.

considered normal behavioral pattern for a portion of the hatchery run. We have on hand in the ponds 2,664,224 fish that will emigrate in the spring of 1980.

We started with 4,219,846 eyed eggs, lost a total of 890,817 eggs and/or fish, for an overall survival to 30 September 1979 of 79% of the 1978 brood spring chinook.

Rearing Problems--Diseases and Treatments Used

The young fish were moved from the incubators to the raceways when they accumulated 1,650 to 1,675 temperature units. The fish did well until late March, when some of the fish appeared to stop feeding, become emaciated and died. As in 1978, examination of emaciated fish revealed that a great deal of gill tissue damage had occurred. No bacterial or viral agent was isolated from any of the fish examined by either the University of Idaho staff or Harold Ramsey, disease pathologist for the Idaho Fish & Game Department. Some of the fish were treated with a 3% salt bath for 1 hour, but no positive results were observed and the treatments were discontinued.

James W. Woods describes the early spring problem that we experience at Rapid River in the publication of the State of Washington, Department of Fisheries, Hatchery Division, entitled "Diseases of Pacific Salmon, Their Prevention and Treatment" as "Clubbed Gills-Drop-out Disease." We have tried most or the preventive measures that he describes, without a great deal of success. Although losses are within acceptable levels, we intend to study the problem and attempt to reduce mortalities to the lowest possible level. We will reduce the initial raceway loading to approximately 350,000 fish per raceway, and will pond the fish in the earthen rearing ponds at the earliest possible date.

After the fish were placed in the large earthen ponds, mortality rates dropped to an almost negligible level. The fish that remained in the raceways were spread into the raceways that had been emptied during ponding *in* order to reduce density and responded with a good decrease in mortality. This suggests that pond loading density may be at least a part of the problem. It should be noted that the mortality rate remained slightly higher in the raceways than in the earthen ponds, throughout the rearing period.

During the first week in August 1979, a small outbreak of Bacterial Gill Disease occurred in rearing pond 2. As in 1978, the Disease Log indicated the problem would occur in this time period, and treatment with Cutrine Plus at a 2 oz per cubic foot of inflow for a 1 hour period was initiated. Losses were minimal and treatment was continued for 3 consecutive days each of the next 3 weeks. We estimated that 8% of the fish in pond 2 died during the outbreak. Pond 1 did not show any symptoms of the disease, but was treated with Cutrine Plus in the same manner as pond 2 as a prophalaxis.

Samplings for heavy metals were continued throughout the year, on a weekly basis. The testing was done by the Bureau of Mines and Geology at Moscow, Idaho, by Charles R. Knowles and his staff. The weekly sampling indicates some fluctuation in metals in our water source, but are within known tolerance levels for spring chinook. Results of this testing are part of the permanent hatchery records but are not included in this report.

No major flooding problems were encountered during the fish year, but siltation continued to be bothersome. We have not had a large runoff in the Rapid River drainage since the flash flooding that occurred in 1975. The heavy damage to the Rapid

River watershed at that time continued to move large amounts of sediments in the stream, that collect in ponds and raceways here at the hatchery. No adverse effects to the fish could be attributed to the siltation, although much hatchery labor was expended in cleaning and disposal of silt.

Spring Chinook --Adult Returns

Arrival Dates

The first adult spring chinook arrived at the Rapid River trap 15 May 1979, 3 days later than the earliest arrival in 1978. On 19 July 1979, we began releasing most unmarked fish (presumed to be summer chinook) up Rapid River to spawn naturally. We continued to place marked arrivals in the hatchery holding ponds until 26 July, when the trap was removed from operation and all fish were allowed upriver through the fish trap and ladder without being counted or detained. The 26 July cut-off for spring chinook was 1 day later than in 1978.

Spring chinook arrived at the Rapid River trap over a 76 day period. The trap was operational over the entire period, with silt removal taking place until evening on six occasions. We averaged 45 fish per day during the 76 day trapping period, and the peak of the run was recorded on 12 & 13 June 1979, when 244 adult salmon were removed from the trap each day. In 1978 the run peaked on 29 June, 16 to 17 days later than 1979. The daily take from the trap had been on an upward trend for several days preceding 28 June, when Nez Perce tribal fishing reopened. On 28 June, 233 adult and 14 jack spring chinook were taken from the trap. The following day, after Indian fishing resumed, only 28 adults and 9 jacks were counted. From 29 June until 26 July, when trapping was terminated, the daily take from the trap never exceeded 40 fish per day. The first jack salmon arrived on 11 May 1979, and jacks continued to arrive almost daily until the trap was removed from operation. The jacks peaked on 13 June, when the count was 3/ fish.

During May 1979 we trapped 71 adults and 16 jack spring chinook. In June, the count was 2,645 adults and 312 jacks, and July counts were 338 adult fish and 22 jacks taken from the trap.

Enumeration

During May, June, and July 1979, we trapped 3,404 spring chinook salmon at the Rapid River trap. This included 350 third year-of-life males (jacks), 10.3% of the run; 598 fish in their fourth year-of-life, 17.8% of the run; and 2,413 fish in their fifth or older year-of-life, 71,8% of the run (Table 3). Age classes were determined by using length frequency distribution curves. The 1979 return of spring chinook to the hatchery was the first time that all age classes would be represented in the coded-wire tagging program. Recovered tags proved that age class data we have presented in past reports from length frequencies were surprisingly accurate. They indicated that 9.3% of the run were in their third year-of-life, 17.3% in their fourth year and 73.4% in their fifth year of life. Some intermingling of year classes were noted near the length cut-offs, but was not significant in aging the run (Rodney Duke, personal communication). Size ranges for each *year* of life did not vary greatly from 1978, with the exception of fifth year-of-life fish being larger on the average than past years.

Rapid River Hatchery again made very significant contributions to both the Columbia and Snake River runs. The final count of spring chinook at Bonneville Dam was 51,462,

Table 2. Returns of spring chinook salmon to Rapid River Hatchery, survival to spawning, and enumeration of eggs, fry, and smolts produced.

Brood Year	Snake R. return (adults)	Rapid R. return (adults)	Rapid R. return (jacks)	Mortality prior to spawning	Number of females spawned	Number of eggs per female	Number of eggs taken
1964	349			16%	182	4,874	887,000
1965	408			21%	133	4,541	604,000
1966	1,511			18%	621	3,697	2,296,000
1967	974		1,039	11%	581	3,537	2,055,000
1968	351	3,416 1/	740	2%	1,809	3,671	6,540,000
1969	672	2,817 1/	1,043	8%	1,415	3,655	5,151,697
1970		6,470	887	10% 2/	3,520	4,136	14,560,280
1971		3,357	1,754	19% 2/	1,722	3,507	6,038,785
1972		12,310 3/	943	15% 2/	3,825	3,941	15,072,604
1973		17,054 3/	286	37% 2/	3,454	3,912	13,510,465
1974		3,457	538	27% 2/	1,756	3,924	6,890,186
1975		4,428	573	7% 2/	2,184	3,894	8,503,606
1976		6,342	1,765	15% 2/	3,055	3,762	11,492,878
1977		7,767 3/	437	11% 2/	3,781	3,745	14,160,330
1978		5,735	34	21% 2/	2,350	4,266	10,026,888
1979		3,054	350	31% 2/	1,141	4,950	5,648,722
Total:	4,265	76,207	10,342		31,529		123,639,441
Average:	711	4,763	646	19% 2/	1,971	3,921	7,727,465

1/ Adults over the 2,700 holding capacity at Rapid River Hatchery were hauled to Stolle Meadows and to McCall Hatchery.

2/ Until 1969, mortality rates were figured on losses prior to the beginning of spawning. After 1969, any fish that had not successfully completed spawning was included as pre-spawning mortality.

3/ Adults over the 8,000 holding capacity at Rapid River Hatchery (7,000 in 1977) were planted in the Little Salmon River, Salmon River, and the South Fork of the Clearwater River.

Table 2 (cont'd).

Brood Year	Number of smolts released	Year of release	Average length mm	(in)	Number per kg	(lb)	Total weight kg	(lb)
1964	580,000	1966	121	(4.8)	49.8	(22.6)	11,639	(25,644)
1965	480,000	1967	117	(4.6)	51.1	(23.2)	9,383	(20,690)
1966	1,460,000	1968	116	(4.6)	55.1	(25.0)	26,484	(58,400)
1967	900,000	1969	118	(4.6)	52.9	(24.0)	17,006	(37,500)
1968	3,172,000	1970	127	(5.0)	44.1	(20.0)	71,925	(158,600)
1969	2,718,720	1971	123	(4.8)	46.3	(21.0)	58,711	(129,463)
1970	2,809,200	1972	128	(5.0)	42.8	(19.4)	56,747	(125,132)
1971	2,908,425	1973	129	(5.1)	37.5	(17.0)	79,358	(174,989)
1972	2,707,917	1974	128	(5.0)	38.6	(17.5)	69,005	(152,162)
1973	3,373,700	1975	137	(5.4)	32.6	(14.8)	105,987	(233,708)
1974	3,564,640	1976	125	(4.9)	40.6	(18.4)	87,638	(193,206)
1975	3,170,922	1977	134	(5.3)	35.1	(15.9)	90,986	(200,640)
1976	2,413,678	1978	136	(5.4)	33.6	(15.7)	69,679	(153,643)
1977	3,219,183	1979	138	(5.5)	33.0	(15.0)	97,330	(214,612)
1978	3,055,432 4/	1980						
Totals:	36,533,817						851,878	(1,878,393)
Average:	2,435,588		127	(5.0)	42.4	(19.2)	60,848	(134,170

4/ Includes all fish from the 1978 brood year still on hand at the Hatchery on 1 October 1979, both for Idaho Power Company release and Spring Chinook Reintroduction plantings, and 206,770 fish that emigrated from the ponds in late summer, 1979.

Table 3. Length frequencies of spring chinook entering the Rapid River trap 1971 - 1979.

Length cm	in	1971	1972	1973	1974	1975	1976	1977	1978	1979
Third year-of-life (jacks)										
33.0	13	0	0	0	0	0	0	0	1	0
35.6	14	0	0	0	0	0	0	0	0	1
38.1	15	36	53	9	11	5	4	1	2	4
40.6	16	118	89	20	27	21	50	12	7	11
43.2	17	182	136	35	80	93	114	28	1	30
45.7	18	398	196	64	91	114	311	77	4	61
48.3	19	360	160	59	75	139	463	115	4	93
50.8	20	292	125	41	53	114	445	110	2	88
53.3	21	201	113	33	32	41	233	58	9	39
55.9	22	87	41	13	59	15	75	19	4	18
58.4	23	42	12	7	37	31	30	7	16 1/	6 2/
60.9	24	38	18	5	117	69	40	10	67 1/	7 2/
Subtotal		1,754	943	286	582	642	1,765	437	117 1/	358 2/
% of run		(34.3%)	(7.1%)	(1.6%)	(14.6%)	(12.8%)	(21.8%)	(5.3%)	(2.0%)	(10.4%)
Fourth year-of-life										
63.5	25	108	123	85	70	126	143	84	240	57
66.0	26	149	382	341	250	377	361	292	655	69
68.6	27	381	1,009	1,006	379	736	869	879	1,025	75
71.1	28	718	2,154	2,473	423	1,106	1,324	1,848	895	47
73.7	29	783	2,938	3,367	273	920	1,224	2,138	512	40
76.2	30	588	2,745	3,104	159	521	858	1,221	242	88
78.7	31	265	1,415	1,978	100	187	443	648	238	214
Subtotal		2,992	10,766	12,654	1,654	3,973	5,222	7,110	3,807	598
% of run		(58.6%)	(81.2%)	(73.0%)	(41.4%)	(79.4%)	(64.4%)	(86.9%)	(66.0%)	(17.8%)

1/ Includes 63 small adult fish that were spawned - true jack count is 34 fish, 0.59% of the run.

2/ Includes 8 small adult fish that were spawned- true jack count is 350 fish, 10.3% of the run.

Table 3. (Cont'd)

Length cm	in	1971	1972	1973	1974	1975	1976	1977	1978	1979
Fifth year-of-life										
81.3	32	98	726	921	146	110	232	245	362	414
83.8	33	60	271	717	260	96	217	122	483	525
86.4	34	59	160	905	376	77	215	92	458	485
88.9	35	47	98	631	358	51	176	74	303	455
91.4	36	39	105	716	298	27	151	38	136	291
94.0	37	25	86	256	190	13	78	26	63	131
96.5	38									
or larger		36	98	257	131	12	51	37	40	112
Subtotal		364	1,544	4,403	1,759	386	1,120	634	1,845	2,413
% of run		(7.1%)	(11.7%)	(25.4%)	(44.0%)	(7.7%)	(13.8%)	(7.8%)	(32.0%)	(71.8%)
Total run		5,110	13,253	17,343	3,995	5,001	8,170	8,181	5,769	3,361 3/

3/ We did not measure the 43 fish that died in the trap, total run was 3,404 fish.

and the Lower Granite Dane count was 7,539. We counted 3,404 spring chinook through the trap on Rapid River, 6.6% of the Bonneville total and 45.2% of the Lower Granite total. Had we been able to more closely monitor the Indian harvest and arrive at an estimation of numbers of fish that they harvested from Rapid River, the percentages of Columbia and Snake River Dam counts would have been even higher. With this percentage of the Idaho run returning to Rapid River, other stocks within the state were at extremely low levels.

As recorded in the 1978 Rapid River annual report, the low number of jacks in 1978 (34) did indicate a very minimal run of fish in their fourth year-of-life (598). It would follow that we can expect very few fifth year-of-life fish in the 1980 run. The jack count in 1979 was about 10 times that of 1978 (350) and should indicate a better 1980 return of fish in their fourth year-of-life. The 350 jack return is still extremely low when compared to jack runs in the recent past, and causes us some concern about the 1980 run. A relatively small return of fourth year fish coupled with the expected absence of fifth year fish in next year's run could leave the hatchery relatively short of spawners again in 1980 (Table 4).

Nitrogen Bubble Damage and Other Injuries

River flows throughout the Snake and Columbia River drainages was slightly below normal in 1979 and quite comparable to 1978. Nitrogen bubble damage declined slightly from 23.2% of the fish with visible nitrogen bubble damage in 1978 to 18.7% of the run in 1979 (637 fish). Both figures are considerably greater than the 2% incidence in the low water flow year of 1977. Both the bubble size and severity of the injuries were reduced in 1979 from 1978. All fish were checked for injuries as they were removed from the trap.

Fishery related injuries declined significantly because of the reduced fishing effort on the record low run of spring chinook in 1979. We counted 100 fish (2.9%) that had been injured by gaff hooks used in the Indian fishery on Rapid River. In 1978, we counted 280 that had gaff injuries. Gillnet damaged fish numbered 230 in 1978 (4% of the run), and only 28 fish examined (.8% of the run) in 1979. The sport fishery on the Little Salmon river was closed in 1979, and only one fish was observed with a hooking injury. With the fishery open in 1978, we observed 167 fish with hooking wounds, (2.9% of the run). Some fish were observed with what appeared to be bruising and skin abrasion in the area of the head, but we were unable to determine the cause of the damage.

Prespawning Mortality, Treatment of Adults

All of the returning adult spring chinook salmon were measured at the trap, and examined for wounds, tags, brands and other marks. The fish were then injected with Abbott's Gal1omycin at a rate of 11 mg of active drug per kg of body weight (5 mg/lb). We used two formulations of Abbott's Gallomycin (Erthromycin, Abbott) for comparative purposes. We injected 2,038 fish with Abbott's commercially available large animal injectable, a vegetable oil based formulation, and 975 fish with pure erythromycin in a distilled water base. The drugs were used on alternate days so that a cross section of the run would be represented in the experiment. Fish given the water based formulation were marked with a right ventral fin-clip to enable us to differentiate them from the Abbott's Gallomycin injected fish. All open wounds were then treated with a strong solution of

Table 4. Summary of the returns to Rapid River Hatchery, by age class of spring chinook smolts released 1964 - 1979.

Brood Year	Year of Release (Smolts)	Number Released	Type Mark	Returns (number & percent) by age class: 3rd.yr of life No.	3rd.yr of life Per-cent	4th.yr of life No.	4th.yr of life Per-cent	5th yr of life No.	5th yr of life Per-cent	Total No.	Total Per-cent	Survival One Adult / No.Smolts
1964	1966 (sp)	51,181	LP*	76	.15	?	?	?	?	?	?	
	1966 (sp)	536,820	None	963	.18	?	?	?	?	?	?	
Total	1966	588,000		1,039 (22%)	.18	3,422 (73%)	.58	197 (5%)	.03	4,658	.79	126
1965	1966(fall)	14,590	RP*	?	?	13	.09	3	.02	?	?	
	1966(fall)	14,670	Y(rt)**	?	?	0	.00	8	.05	?	?	
	1967(sp)	20,000	LP*	?	?	19	.09	3	.01	?	?	
	1967(sp)	20,000	Y(lt)**	?	?	0	.00	2	.01	?	?	
	1967(sp)	410,730	None	?	?	2,588	.63	856	.21	?	?	
Total	1966-67	480,000		740 (18%)	.15	2,620 (63%)	.55	874 (19%)	.18	4,234	.88	115
1966	1968(sp)	50,000	LV*	54	.09	348	.70	14	.03	416	.83	
	1968(sp)	50,000	Y(rt)**	0	.00	97	.19	7	.01	104	.20	
	1968(sp)	1,360,000	None	989	.07	5,115	.38	343	.03	6,447	.48	
Total	1968	1,460,000		1,043 (15%)	.07	5,596 (80%)	.38	364 (5%)	.02	7,003	.48	208
1967	1969(sp)	25,000	LV*	48	.19	205	.82	29	.10	272	1.08	
	1969(sp)	25,000	R(rt)**	1	.01	88	.35	8	.03	98	.40	
	1969(sp)	25,000	R** LV*	27	.11	85	.34	5	.02	117	.47	
	1969(sp)	825,000	None	811	.10	2,614	.32	1,502	.18	4,927	.60	
Total	1969(sp)	900,000		887 (16%)	.10	2,992 (55%)	.33	1,544 (29%)	.17	5,416	.60	166
1968	1970(sp)	25,000	LV*	5	.02	43	.17	4	.01	52	.21	
	1970(sp)	25,000	R(lt)**	3	.01	21	.08	4	.01	28	.10	
	1970(sp)	25,000	R**LV*	0	.00	6	.02	0	.00	6	.02	
	1970(sp)	3,097,000	None	1,746	.06	10,686	.35	4,395	.14	16,827	.54	
Total	1970(sp)	3,172,000		1,754 (10%)	.06	10,766 (64%)	.34	4,403 (26%)	.14	16,923	.53	187
1969	1971(sp)	48,500	N(lt)**	12	.02	177	.36	6	.01	195	.40	
	1971(sp)	102,000	R(rt)**	27	.03	119	.12	15	.01	161	.16	
	1971(sp)	99,000	R(lt)**	19	.02	212	.21	11	.01	242	.24	
	1971(sp)	2,469,200	None	885	.03	12,146	.49	1,727	.07	14,758	.60	
Total	1971(sp)	2,718,700		943 (6%)	.03	12,654 (82%)	.47	1,759 (12%)	.06	15,356	.56	177
1970	1972(sp)	200,092	Ad-½An*	7	.01	54	.02	21	.01	82	.04	
	1972(sp)	2,609,108	None	279	.01	1,644	.06	365	.01	2,288	.08	
Total	1972	2,809,200		285 (12%)	.01	1,698 (72%)	.06	386 (16%)	.01	2,370	.08	1,185

Table 4 (continued)

1971	1973(sp)	201,547	Ad-an*	18	.01	233	.12	41	.02	292	.14	
	1973(sp)	2,706,876	None	520	.02	3,973	.15	1,079	.04	5,572	.21	
Total	1973(sp)	2,908,425		538	.02	4,206	.14	1,120	.04	5,864	.20	496
				(9%)		(72%)		(19%)				
1972	1974(sp)	100,374	R(lt)**	0	.00	89	.09	14	.01	103	.10	
	1974(sp)	170,775	R(rt)**	26	.01	121	.07	22	.01	169	.09	
	1974(sp)	2,436,768	None	547	.02	5,012	.21	598	.02	6,157	.25	
Total	1974(sp)	2,707,917		573	.02	5,222	.19	634	.02	6,429	.23	421
				(9%)		(81%)		(10%)				
1973	1975(sp)	343,278	R(rt)**	49	.01	272	.07	82	.02	403	.12	
	1975(sp)	3,030,422	None	1,716	.06	6,838	.22	1,763	.06	10,317	.34	
Total	1975(sp	3,373,700		1,765	.05	7,110	.21	1,845	.05	10,720	.32	315
				(17%)		(66%)		(17%)				
1974	1976(sp)	136,606	Ad-CWT*	9	.007	95	.07	93	.07	197	.14	
	1976(sp)	3,222,334	None	428	.01	3,795	.12	2,320	.07	6,543	.20	
Total	1976(sp)	3,358,940		437	.01	3,890	.11	2,413	.07	6,740	.20	498
				(6%)		(58%)		(36%)				
1975	1977(sp)	50,475	R(rt)**	1***	.002	1	.002	inc.(1980)--		inc.	--	
	1977(sp)	254,945	Ad-CWT*	2	.001	22	.001	inc.(1980)--		inc.	--	
	1977(sp)	2,865,502	None	32	.001	575	.02	inc.(1980)--		inc.	--	
Total	1977(sp)	3,170,922		34	.001	598	.02	inc.(1980)--		inc.	--	
1976	1978(sp)	131,250	Ad-CWT*	12	.009	inc.(1980)		inc.(1981)--		inc.	--	
	1978(sp)	2,282,428	None	338	.01	inc.(1980)		inc.(1981)--		inc.	--	
Total	1978(sp)	2,413,678		350	.01	inc.(1980)		inc.(1981)--		inc.	--	
1977	1979(sp)	250,200	Ad-CWT*	inc.(1980)		inc.(1981)		inc.(1982)--		inc.	--	
	1979(sp)	2,616,793	None	inc.(1980)		inc.(1981)		inc.(1982)--		inc.	--	
Total	1979(sp)	2,866,993		inc.(1980)		inc.(1981)		inc.(1982)--		inc.	--	

* LP, RP, LV, RV, Ad-½An, signify left or right pectoral fins clipped, left or right Ventral fins clipped, adipose an ½ of the anal fin clipped, adipose and anal fins clipped. Ad-CWT signifies that the adipose fin was clipped and a coded wire tag was inplanted in the snout of the fish.

** "Y", "R", "N" signify the letter brand placed on either the left or right of the fish.

*** One jack returned with an adipose clip-coded wire tag, and an "R" brand on the right side.

malachite green applied directly to the wounds. The drug injections were a continuation of cooperative Kidney Disease study with the University of Idaho. Dr. George Klontz provided the drugs used in the experiment and some manpower at both reinjection and spawning times. All operations at the trap were carried out by hatchery personnel.

All fish were taken to the hatchery and placed in the earthen adult holding ponds. We treated with malachite green flushes at a rate of 1 ppm for a 1 hour period, twice weekly, for fungus control. Success of the treatments were reasonably good. The exception was a rather severe outbreak of fungus invasion on the adults in the smaller adult pond after handling for reinjection. The malachite flushes were not successful because of a couple of factors at that point. Even though we reduced the concentration of malachite to .5 ppm, treating stress caused nearly as much mortality as the fungus. Warmer water temperatures at this time of year are conducive to fungal growth, and nearly daily treatments would be needed to halt the spread of the invasion.

Reinjections of the fish that arrived in the early part of the run and were placed in the smaller earthen adult pond were accomplished on 17 and 18 July. We were careful to use the same drug formulation and dosage as we used when the fish were originally injected at the trap. We did not reinject the fish in the larger earthen adult pond because their later arrival did not allow enough time lapse between injections and the onset of spawning. All fish that died prior to spawning were autopsied, and if the cause of death could be determined by gross examination, the results were recorded on individual sheets. Pre-spawning mortality increased again in 1979.

Of the 3,054 adult fish that arrived at the trap on Rapid River, 51 died in the trap (1.7%). We ponded 3,003 adults at the hatchery, and lost 472 females and 468 males prior to spawning, a total of 940 fish (30.8%). Total prespawning mortality was calculated by combining both trap and pond losses, 991 fish, to arrive at a total mortality percentage of 32.4%. This is the second highest loss of prespawning fish in the history of the hatchery, exceeded only by the 37% loss recorded in 1973, and considerably above the 20.8% mortality in 1978. Female salmon numbered 1,614 fish, 52.8% of the run, and males numbered 1,409 fish, 46.1% of the total run. Some 31 fish were not sexed because of deterioration of the carcass prior to autopsy (1%). Female mortality prior to spawning was 29.2% while male mortality was 33.2%. It would appear that several factors may be involved in the increase in the overall mortality.

As noted earlier, fungal invasions on wounds and abrasions were very heavy. Since over 71% of the fish exceeded 81 cm (32 in) in length, they were extremely difficult to handle. More fish were dropped and handled roughly than in any year that I have been at the hatchery. The roughness was a result of the fish's size and strength, not a lack of concern on the part of the hatchery personnel. The reinjection handling triggered a massive fungal outbreak, and probably indirectly killed more fish than would have been lost to Kidney Disease. Dr. Klontz and I agree that in the future, the fish will be drug injected only at the trap, and will not be touched after ponding. The only exception to be made in this procedure would be in the case of extremely early arriving runs such as in 1973 and 1977 when holding periods could exceed 2 1/2 months. A new system of fungus control is being researched atthis time and we hope to use it on adult fish in 1980.

In years when the majority of the fish to be held in the ponds arrive at the Rapid River trap in June & July, (1 to 2 month holding period), the double injected fish have not shown an advantage in the lessening of Kidney Disease lesions great enough to justify the second handling among fish that survive to spawn. In 1978, 7.6% of the single injected fish and 6.8% of the double injected fish were found to have Kidney Disease lesions when examined after spawning. In 1979, 2.6% of the single injected fish and 1.0% of the double injected fish had lesions. In 1977, we had a long holding period (2 to 3 months), all fish were double injected, and only .8% had Kidney Disease lesions.

The fish that were injected with Abbott's Gallomycyin, Large Animal Injectable (Erthromycin Abbott) numbered 2,028. We lost 669 of these fish prior to spawning (33%). Of the 669 that died, autopsies revealed that 34 had Kidney Disease lesions on internal organs (5.1% of the mortality). We injected 975 fish with pure Erythromycin dissolved in distilled water. We lost 271 of these fish in the holding ponds (27.8%), and 16 had Kidney Disease lesions (5.9% of the mortality). Shortly after spawn-taking was completed, all fish were examined for Kidney Disease lesions. We found that 704 fish that had been injected with Erythromycin and water had survived to spawn, and 15 of those fish had Kidney Disease lesions internally (2.1%). The 1,359 fish that survived to spawn after being injected with Abbott's Gallomycin also had 15 fish with Kidney Disease lesions (1.1%). We would conclude that there is not a great deal of difference in the effectiveness of the two formulations, and since the Large Animal Injectable is more readily available, we should continue to use it in the future for Kidney Disease control.

Spawntaking Operations and Enumeration of Eggs Obtained

The initial sort for ripeness of the adult spring chinook was made on 7 August 1979, and the final egg take was made on 10 September. These dates are identical to 1978. During the first sort, seven ripe females were spawned and 38,320 eggs were taken, .7% of the total number of eggs. During the second week of spawning, 11 to 17 August, we spawned 224 females and obtained 1,125,824 eggs, 21.2% of the total number taken. The week of 18 to 24 August was the peak of spawning activity. We found 550 ripe females and took 2,709,128 eggs, 48% of the total egg take. The week of 25 to 31 August we spawned 301 ripe females and took 1,432,632 eggs, 25.4% of the year's take. During the period of 1 to 10 September we spawned 59 ripe females and took 272,818 eggs, 4.8% of the season's total.

The total number of eggs taken for the year was 5,648,722 from 1,141 females. We used the milt from 941 males to fertilize the eggs. Only fish in their fourth year-of-life or older were used for brood purposes. The average number of eggs per female increased from 3,745 in 1977 to 4,266 in 1978, and to 4,950 in 1979. The increase in production per female was due to the very high percentage of fish in their fifth year-of-life being more productive than younger fish that normally make up the highest percentage of the run. The size of the eggs varied from 2.54 to 3.67 per ml (72 to 104/oz) and averaged 3.11 per ml (88/oz). The eggs were considerably larger than in most past years.

As soon as the eggs were taken from the female and fertilized, they were washed in clean water to remove excess milt and ovarian fluid from the bucket, and placed in a 1 ppm solution of one of two drug formulations. This was another of the studies that were done cooperatively with the University of Idaho to control Kidney Disease. The first several takes of eggs were water hardened in pure erythromycin (Abbott) dissolved in distilled water. Slightly over 1,000,000 eggs

were treated. The remainder of the eggs were water hardened in water soluable Gallomycin (Erythromycin Abbott) Poultry Formula Improved, a readily available commercial formulation. The eggs remained in both drug solutions an equal amount of time, 1 hour. We noticed no difference in either the eye-up or losses between the two groups of eggs. We have separated the fry resulting from eggs treated with the two formulations and will continue to rear them separately until emigration takes place in 1981, to determine if there is an advantage in either formulation in the prevention of Kidney Disease transmittal.

Disposition of Carcasses

After spawning, all carcasses were examined for Kidney Disease lesions, and the noses of all adipose clipped fish were removed for recovery of coded wire tags. The noses were taken to Lewiston for examination and tag recovery. We disposed of the carcasses by placing slightly over 2,000 in a freezer trailer unit to be utilized by the Wildlife Bureau of the Department for bait in black bear trapping studies. The remainder were buried on hatchery property, with the exception of a small number given to local trappers to be rendered into trapping scent. The carcasses could not be used for human consumption because of the experimental drug injections (Food & Drug Administration Regulations).

Marked Fish

All spring chinook entering the trap on Rapid River were examined for marks and tags. The fish that left the hatchery in the spring of 1978 returned as third year-of-life (jacks) fish in 1979. Prior to releasing these fish, 131,250 were implanted with a coded wire tag, and the adipose fin was clipped to provide an external mark. We recovered 12 coded wire tagged-adipose clipped fish from that group, .009% of the total number marked (Table 4). We released 2,282,428 fish simultaneously with the marked group that had no marks. We recovered 338 unmarked fish, .01% of the total released. Of the total fish released as smolts in 1978, 350 returned as jacks in 1979, .01% of the total number released, 2,413,678. This is the third lowest count of jacks in the history of the hatchery.

Fish in their fourth year-of-life normally make up the largest percentage of the run. This was not true in 1979 (Tables 3 & 4). These fish were from the 1975 brood, and went to sea in 1977, the worst drought year in recent history. Survival estimates that spring were that less than 3% of the smolts from the Snake River drainage survived the out migration through the Snake and Columbia River dams. (Donn Park, National Marine Fisheries, personal contact). The 34 jacks that returned in 1978 also gave us an indication that fourth year fish would be in short supply. In the spring of 1977, we released 50,475 fish that had been branded with the letter "R" on the right side of the fish. We only recovered one branded fish at the Rapid River trap, .002% of the marked total, in 1979. An additional 254,945 fish were marked with coded-wire tags and adipose fin clips prior to outmigration. Only 22 of the tagged and clipped fish were recovered at the Rapid River trap, .001% of the total released. We also released 2,865,502 smolts that had not been marked and recovered 575 of those fish, .02% of the release. We do not expect over 200 of the fish that emigrated in 1977 to return as fifth year-of-life fish in 1980.

Fish in their fifth year-of-life made up the largest portion of the 1979 adult return (Tables 3 & 4). They were from the 1974 brood, and emigrated in 1976. Prior to releasing the smolts in 1976, we marked 136,606 fish with an adipose fin clip and a coded-wire tag. We recovered 93 clipped and tagged fish at Rapid River in

1979, .07% of the total number released. We also released 3,222,334 fish that had been marked in 1976, and we captured 2,320 unmarked fish in 1979, .07% of the release. This is the first time that an identical percentage of marked and unmarked fish has been captured in a given year class. Overall the fish marked in 1976 returned at a percentage, .14% slightly lower than the unmarked fish, .20% over the 3-year period of their returning to the hatchery.

Marked/unmarked percentages indicate that there will be very few fish in their fifth year-of-life return in 1980. This is borne out by the record low number of both jacks in the 1978 return and fourth year-of-life fish in the 1979 return. We will be nearly totally dependent on fish in their fourth year-of-life in 1980. The run of jacks from this year class that arrived back at Rapid River in 1979, numbered only 350 fish. Although this is a tenfold increase over 1978 (34 jacks), it is still the third lowest jack count ever recorded. To compound the problem, fourth year-of-life fish produce nearly 1,000 less eggs per female than older fish. We feel that it will be imperative that the harvest of fish by any user group be minimized again in 1980, to insure that enough fish escape to the hatchery for spawning purposes.

Distribution of Eggs, Eye-Up Percentages

As the eggs were taken from the female fish and fertilized, they were placed in the incubators at Rapid River for eyeing. The eggs eyed well and after picking we had 5,417,124 eyed eggs from the original 5,648,722 placed in the incubators (an eye-up of 95.9%). We shipped 806,400 eyed eggs to Hayden Creek Hatchery and 330,880 eyed eggs to Dworshak National Hatchery to be reared at Kooskia National Hatchery after repairs at that station had been completed (Table 1). We kept 4,295,308 eggs at Rapid River to fulfill our needs. This population is believed to be about optimum for our raceway carrying capacity.

Harvest

Because of the extremely low run of spring chinook into Idaho in 1979, no sports fishing for salmon was allowed.

Summer Chinook--Returns to Rapid River

Between 18 and 26 July 1979 we released 22 adult salmon and 1 jack salmon from the trap to migrate up Rapid River and spawn as natural summer run chinook. After 26 July, the trap was removed from operation and all fish allowed to pass through without being counted. No accurate estimate of total summer run chinook was attempted this year. The trap was taken out of operation 1 day earlier in in 1979 than in 1978.

Steelhead

Between 20 April and 5 June 1979, we passed 39 steelhead above the Rapid River trap. We counted 23 female fish and 16 males in the run. This was the smallest run of steelhead ever counted into Rapid River, well below the 94 steelhead passed in 1978. No steelhead were held at the hatchery in 1979.

Inventory of Miscellaneous Species in Rapid River

Dolly Varden

During the time that the trap was in operation in 1979, we passed a total of 260 Dolly Varden through the trap that were in excess of 203 mm (8 in) in length. Some of the fish exceeded 2.75 kg (6 lb) in weight. This is a good increase over the past years' counts. Only 128 Dollies were counted in 1978, and 212 in 1977. The population may be rebounding to normal levels after declining following the 1975 flash flooding in Rapid River.

Whitefish

Whitefish numbers continued to be very low in 1979. Only 7 were counted during the entire trapping period. The maximum count for a year occurred in 1974 when we passed 274 whitefish. No explanation for the decline is readily visible.

Other Species

In addition to the species listed above, we passed 1 cutthroat trout and 4 rainbow trout through the trap in 1979. No rough fish were observed in 1979.

Hatchery Improvements - 1979

No major improvements were made to the hatchery during 1979. The hatchery crew accomplished routine maintenance procedures on all equipment and buildings during the year. The hatchery buildings will require a complete painting in the coming year, and some drastic remodeling will be needed (see recommendations).

Public Relations

We estimated that 25,000 to 30,000 people visited the hatchery during 1979. This is 5,000 to 7,000 less than 1978, and the reduction was due to several factors including the shortage of gasoline, the lack of a salmon season, reduced visiting hours and tighter hatchery security. The visiting hours were limited to a 9 hour per day period, 0800 to 1700 hr instead of the 12-hour period in force for the past several years. A gate on the hatchery entrance road was closed and locked at 1700 hr. All trap visiting was limited to the same hours unless the Conservation Officers at the trap chose to allow visitors at later hours. The shorter hours were enacted to help prevent vandalism and theft.

Presentations were made to numerous groups that toured the hatchery during the year. School groups from McCall, New Meadows, Riggins and Council toured the hatchery.

RECOMMENDATIONS

Hatchery Maintenance

Idaho Power Company should consider several projects to improve and maintain this hatchery. Frozen feed storage is very inadequate, and needs to be increased in capacity. The north end of the present hatchery building now houses both the food storage freezer and an incubator room. Over the past 15 years, the freezer has drawn moisture from the water **in** the incubator room and formed a layer of ice several inches in depth over the entire top of the freezer (in the attic). In

warm weather, the ice melts and moisture saturates the ceilings and walls of the hatchery rest room, freezer and incubator room. The moisture has caused severe deterioration of the studs, insulation, and wall boards. It is now impossible to set the incubators along the freezer wall because of buckling and distortion of the wallboard. Repairing the structural damage to the present building may not be feasible and an entire new structure of material of a more water resistant nature may be in order.

Housing for summer aides is very inadequate. The present 15-ft trailers are not equipped with running water or sewers and are in need of replacement. It is unfair to expect a person to exist under these conditions for the nearly 4 months of employment that continues yearly. Facilities for a minimum of two aides are badly needed.

At the present time, the hatchery office is located next to the hatchery work shop, and no partitions separate the two. The results are that the desks and office machines are subjected to a great deal of dust and dirt from the shop area. There isn't a private location to counsel employees in any of the present hatchery facilities (performance ratings, etc.). The general public has constant access to the hatchery office and records, and on more than one occasion, non-department people have been found rummaging through the desks and file cabinets in the office. A separate room for an office is badly needed. The writing of this report has had numerous interruptions due to this "open" office.

The larger of the two earthen rearing ponds should be divided in the middle by an earthen dike, and another set of screens installed at the dike. This would prevent the entire pond population from moving into the upper half of the pond and overcrowding during periods of warmer water temperatures and probably minimize the Bacterial Gill Disease problem we experience nearly every summer in that pond. The net result of the modification would be three rearing ponds of nearly equal size, with a capacity of 1 million smolts each. If the plan to haul one million smolts to Hells Canyon is approved, some modification of at least one rearing pond will be needed to enable us to capture and load out the fish.

The yearly cleaning of silt and fish wastes from the earthen ponds have deepened them to the point that some material will have to be replaced in the bottoms to enable us to drain them. The footings for the catwalks are almost totally exposed.

All buildings at the hatchery are in need of painting. Nine years have passed since this was last done.

All of the picnic tables in the public park are rotted and in need of replacement.

A high pressure car wash should be installed in the incubator room to facilitate incubator tray cleaning. The present hand washing method is time consuming and very tedious.

Some of the incubator trays will have to be replaced over the next few years. The feeders on the two rearing ponds will soon need to be rebuilt or replaced.

The absence of adequate storage needs to be remedied. The lawn maintenance equipment and all other vehicles should be stored inside to extend their useful period. Chemical storage needs to be improved.

Research Projects

We should continue to use the Kidney Disease control methods developed in cooperation with the Fisheries Unit of the University of Idaho over the past few years. The program should be modified to include only an initial injection of Gallomycin (Erthromycin Abbott) as the fish arrive at the trap. Only in years of extremely early adult arrival would a repeat injection and the extra handling of the adult fish be advisable. We should also continue to water harden all eggs in a 1 ppm solution of Erythromycin as a means of reducing transmission of the disease from eggs to fry. In 10 years we have reduced Kidney Disease incidence to the point that not one fingerling with the disease has been observed for the past 2 years.

We should investigate the possibility of vaccinating a limited number of smolts for Vibrio Disease. Vibrio is thought to be one of the major causes of salt water disease mortality, and it may be possible to provide some protection to our hatchery reared populations and increase ocean survival. Some form of differential marking would be needed to monitor the success of the experiment.

Mel Reingold has done numerous studies on size-smolt relationships using steelhead from Niagara Springs Hatchery. His work indicates that size of smolts at release is important in both smoltification and survival. Past records at this station indicate that better returns were obtained during the first years of operation when fish were being released at 44 to 66 fish per kg (20 to 30/lb). In recent years, we have increased the average size of the smolts to approximately 33 per kg (15/lb) by more intensive feeding and management on the assumption that bigger is better. We propose that we test this assumption by programming two lots of fish held in the raceways to arrive at a smaller average size at emigration. We would hold one group to an average length of 90 to 100 mm and average weight of 55 to 66 per kg (25 to 30/lb). A second group that would average 100 to 115 mm long and 44 to 55 per kg (20 to 25/lb) at release. By differential marking with coded wire tags, the smaller average sized fish could be compared for survival with fish from the general hatchery population that will be 125 to 140 mm long and 33 per kg (15/lb). The experiment should be repeated over a period of 4 years to accurately measure survival of each of the size related groups. This experiment could be carried out with only minimal extra expense for the differential tagging of the three groups of various sized smolts. We propose to make the initial marking and release in 1981.

We should encourage cooperation with the Nez Perce Tribal Government in initiating some method of enumerating the fish of hatchery origin taken in their fishery on the Little Salmon and Rapid Rivers. Such information would be of value to the Department and the Tribal Executive Committee.

LITERATURE CITED

Wood, James W. Diseases of Pacific Salmon, Their Prevention and Treatment, Second Edition. State of Washington, Department of Fisheries, Hatchery Division, 82 pp.

ACKNOWLEDGEMENTS

The hatchery crew appreciates the help provided by the following people this

past year: John Siple for both the trapping and spawning season; Boyd Thietten and Joe Bross for help whenever needed; all the Conservation Officers that assisted the hatchery crew while stationed at the trap for security purposes; Walt Browne, Walt Berry and Dwight Kilgore of Region 2; Idaho State Police Officers Irv Stucker and Tom Beall; and the Idaho County Sheriff, Bud Walkup and his deputies.

The following persons have contributed information for inclusion in this report: Emil Slatickand Donn Park of the National Marine Fisheries Service, Rodney Duke and Mel Reingold of the Idaho Department of Fish and Game, Dr. George Klontz and students from the University of Idaho, and Wayne Olson, Dworshak National Fish Hatchery.

Dr. Klontz and his staff contributed many hours of labor in assisting with injections of adults, drug water hardening of the eggs and helping with spawning of the adults.

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