FISHERY RESEARCH

Job Performance Report
July 1, 1996 to June 30, 1997

Grant Number F-73-R-19

PROJECT 8. HATCHERY TROUT EVALUATIONS
SUBPROJECT 1. STERILE TROUT INVESTIGATIONS

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JOB PERFORMANCE REPORT

State of: Idaho | Grant No.: F-73-R-19, Fishery Research

Project No.: 8 | Title: Hatchery Trout Evaluations

Contract Period: July 1, 1996 to June 30, 1997

ABSTRACT

We continued put-and-grow stocking evaluations in 1996 with new evaluations of spring and fall fingerling and catchable stocking in Mormon and Roseworth reservoirs. Because 1996 was the first year of evaluation on these two waters, return-to-creel data for various stocked groups are incomplete. Monitoring will continue through at least 1997, at which time the data will be incorporated into a comprehensive analysis and report.

We conducted an experiment to determine if training catchable rainbow trout *Oncorhynchus mykiss* to recognize bait items would increase return-to-creel in stream put-and-take fisheries. Hatchery catchables were fed night crawlers for five to seven days, jaw-tagged, and stocked in 10 southern Idaho streams. An equal number of control (untrained) fish were also jaw-tagged and planted in each stream. Relative return-to-creel for trained and control fish was assessed by jaw tag returns.

Results suggest a short-term increase in catchability of trained fish, but benefits were not sufficient to justify the added costs of training. Numerically, 10% more trained fish returned to the creel than untrained fish overall. The difference in overall return was not significant. Most of the return advantage for trained fish occurred the first week after planting, with return rates relatively equal thereafter. Training regimens, which include a variety of bait items, may be more successful, particularly if the fish are stocked in fisheries where bait fishing comprises most of the angling effort.

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INTRODUCTION

Fingerling-Catchable Tradeoffs

Since 1992, the Idaho Department of Fish and Game (IDFG) has evaluated return-to-creel and cost-effectiveness of hatchery trout stocking programs in 18 lakes and reservoirs statewide (Dillon and Alexander 1995, 1996). Emphasis is on comparisons of spring fingerling, fall fingerling, and catchable-sized rainbow trout *Oncorhynchus mykiss* and assessments of lake productivity, fish species composition, and angling effort which might influence performance of stocked fish. Results from these evaluations will be used to develop statewide trout stocking guidelines based on lake and reservoir characteristics and angling effort.

We continued trout stocking evaluations in 1996 on Mormon and Roseworth reservoirs. Because 1996 was the first year of evaluation on these two waters, return-to-creel data for the various stocked groups are incomplete. These fisheries will be monitored through at least 1997, at which time the data will be incorporated into a comprehensive analysis and report.

Tests for Increasing Returns in Streams

In 1995, we conducted preliminary tests of "food training" to improve catchability and return-to-creel of put-and-take rainbow trout stocked in streams (Dillon and Alexander 1996). The results suggested conditioning hatchery fish to recognize common bait items (worms, corn, salmon eggs) as food had potential to improve catchability. Returns for trained fish were 23% higher than for untrained fish (Dillon and Alexander 1996). However, the 1995 experiment used only four paired stocking events (trained and control fish, same time, same stream). To better define the benefits and cost-effectiveness of food training in a range of stream types, we designed an additional paired stocking experiment in 1996, with 10 stocking events in 10 southern Idaho streams.

PROJECT GOAL

To maximize the effectiveness of hatchery trout stocking programs in Idaho.

OBJECTIVES

1. Describe growth, returns, and cost per fish in the creel for fingerling and catchable-sized rainbow trout in select put-grow-and-take waters statewide.

2. Describe relationships among lake and reservoir characteristics, angling effort, stocking rate, growth, and returns of stocked fingerling and catchable-sized rainbow trout.

3. Describe general characteristics of successful fingerling rainbow trout stocking programs.

4. Develop stocking guidelines for put-grow-and-take rainbow trout fisheries in Idaho lakes and reservoirs.

5. Develop hatchery fish evaluation protocols for lakes and reservoirs.

6. Develop and test methods to improve return-to-creel in put-and-take stream fisheries.

METHODS

Fingerling-Catchable Evaluations

Methods for stocking, conducting creel censuses and return estimates, assessing growth and condition of stocked fish, and defining lake and reservoir characteristics are described in Dillon and Alexander (1995). Although data were collected from Mormon and Roseworth reservoirs in 1996, no analyses were attempted. Results will be presented in the annual report covering the 1997 field season when return data are complete.

Tests for Increasing Returns in Streams

The 1996 food training experiments were conducted at IDFG's Grace and Hagerman fish hatcheries. At each facility, equal numbers of catchable-sized Hayspur strain rainbow trout were placed in adjacent raceways for the duration of training. One raceway was designated a treatment group and the other a control group. For five to seven days prior to planting (June 30-July 1), the treatment groups were hand-fed a half ration of standard pellet food and an equal weight of night crawlers (approximately 4 lbs. of each). We purchased night crawlers from a commercial distributor and cut them into small pieces for feeding. Control groups were fed a full ration of pellets. All fish were held off feed for one to three days prior to planting.

From July 1-3, we measured, jaw-tagged, and stocked 250 trained and 250 control fish each into 10 southern Idaho streams in IDFG's Magic Valley and Southeast regions (Table 1). Jaw tags were sequentially numbered, which allowed identification of individual stocked groups and streams. We posted signs along each stream and submitted a press release soliciting tag returns. We also attached tear-off data slips at each streamside sign post for anglers to record the date and location of catch. As an incentive to return tags, in each IDFG region we offered a drawing wherein each tag submitted provided one chance at a $100, $75, or $50 gift certificate at the vendor of their choice. We requested tags be submitted by September 30 and held the drawing in late October. We randomly selected the six drawing winners by matching numbers from a random number table (Zar 1984) to jaw tag numbers.

We used jaw tag return data to assess timing of returns and total returns for each stocked group. We entered tag data into a database, which included stream, tag number, date caught, and the angler's name, address, and phone number. If anglers provided incomplete

Table 1. Stocking data for the bait training experiment conducted in 10 Magic Valley and Southeast region streams, 1996.

Location		Number Stocked	Dates Trained [a]	Stocked	Mean Length (mm)
South Fork Boise River	Trained [b]	250	6/26-30	7/1	279 (n=55)
	Untrained °	250	6/26-30	7/1	264 (n = 55)
Cassia Creek	Trained	250	6/26-30	7/1	270 In = 50)
	Untrained	250	6/26-30	7/1	267 (n = 50)
Trapper Creek	Trained	250	6/26-30	7/1	257 In =50)
	Untrained	250	6/26-30	7/1	258 (n=50)
Rock Creek	Trained	250	6/26-30	7/2	257 (n=52)
	Untrained	250	6/26-30	7/2	264 (n = 52)
Little Wood River	Trained	250	6/26-30	7/2	251 (n=50)
	Untrained	250	6/26-30	7/2	267 (n = 50)
Bear River	Trained	250	6/26-30	7/1	241 (n=121)
	Untrained	250	6/26-30	7/1	239 (n=99)
Cub River	Trained	250	6/26-30	7/1	241 (n=121)
	Untrained	250	6/26-30	7/1	239 (n=99)
Lower Blackfoot River	Trained	250	6/26-7/1	7/2	241 (n=121)
	Untrained	250	6/26-7/1	7/2	239 (n=99)
8-Mile Creek	Trained	250	6126-7/1	7/2	241 (n=121)
	Untrained	250	6/26-7/1	7/2	239 (n=99)
Upper Portneuf River	Trained	250	6/26-7/2	7/3	241 (n=121)
	Untrained	250	6/26-7/2	7/3	239 In = 99)

[a] Separated into two groups of 4,000 to 6,000 fish for training.
[b] Half ration chopped worms and half ration pellets. ° Ration of pellets.

information, the data were not used in our analysis, but the names were still included in the gift certificate drawing list. We plotted cumulative returns against dates to describe the timing and total returns for trained and control fish in each stream. We used raw tag return data at various dates in paired-t analyses to test for differences in overall returns between trained and control fish. Because we sought only to describe relative returns between trained and control groups, we did not attempt to adjust the tag return data for non-response bias.

RESULTS

Tests for Increasing Returns in Streams

Total tag returns in individual streams were low, ranging from 33 (6.6%) in the lower Blackfoot River to 111 (22.2%) in the upper Portneuf River. Overall total tag returns were 785, with 411 trained fish (16.4% return) and 374 control fish (15.0% return) (Table 2). Numerically, 10% more trained fish returned to the creel than control fish overall. The difference in overall return was not significant at the 0.10 level.

Timing of returns for trained and control fish varied among streams (Appendix A). Plots of cumulative returns (all streams combined) indicate most of the return advantage by trained fish occurred the first week after stocking, with returns relatively equal for trained and control fish thereafter (Figure 1). Paired-t analyses of tags returns through July 7 indicate significantly better initial returns ($p = 0.06$) for trained fish, but total returns were not significantly different.

DISCUSSION

Our food training methods provided an increase in short-term catchability, but no significant increase in total return to the angler. The small (10%) increase in total return probably did not offset the cost of training in this experiment. If we assume production and stocking cost of control fish was the statewide average for catchables ($0.54/fish, IDFG unpublished data), the total cost to plant 2,500 fish was $1,350. We spent an additional $160 (total of 40 lb at $4/lb) to purchase night crawlers for the trained groups. Total cost was estimated at $1,510, or about $0.60/fish. Costs were about 12% higher for trained fish than for control fish (this does not include "fixed" costs such as increased labor for training).

Our observations of fish behavior during the food training period suggested short-term exposure of hatchery fish to new food items is sufficient. Although initially the fish were reluctant to consume night crawlers, within two to three days, the fish fed readily on them.

Alternative training strategies might be more effective at improving return-to-creel. Using a variety of bait items in the training process would increase the likelihood of fish recognizing different baits as food.

We did not attempt to record angling methods or gear types on our study streams. If bait fishing made up a small percentage of the angling effort on these streams, we would not expect substantial increases in return from food training. Alternatively, results might have differed if we selected only streams where bait anglers comprise most of the angling effort. Future work should include assessments of angler gear type in addition to relative return-to-creel of trained and untrained fish.

Table 2. Overall return of jaw tags from bait-trained and control rainbow trout in 10 Magic Valley and Southeast region streams, 1996.

Location		Number Stocked	Total Tag Returns
South Fork Boise River	Trained [a]	250	45
	Untrained [b]	250	25
Cassia Creek	Trained	250	34
	Untrained	250	42
Trapper Creek	Trained	250	36
	Untrained	250	36
Rock Creek	Trained	250	51
	Untrained	250	41
Little Wood River	Trained	250	51
	Untrained	250	53
Bear River	Trained	250	23
	Untrained	250	23
Cub River	Trained	250	47
	Untrained	250	43
Lower Blackfoot River	Trained	250	17
	Untrained	250	16
8-Mile Creek	Trained	250	52
	Untrained	250	40
Upper Portneuf River	Trained	250	55
	Untrained	250	56
Totals	Trained	2,500	411
	Untrained	2,500	375

[a] Half ration chopped worms and half ration pellets.
[b] Ration of pellets.

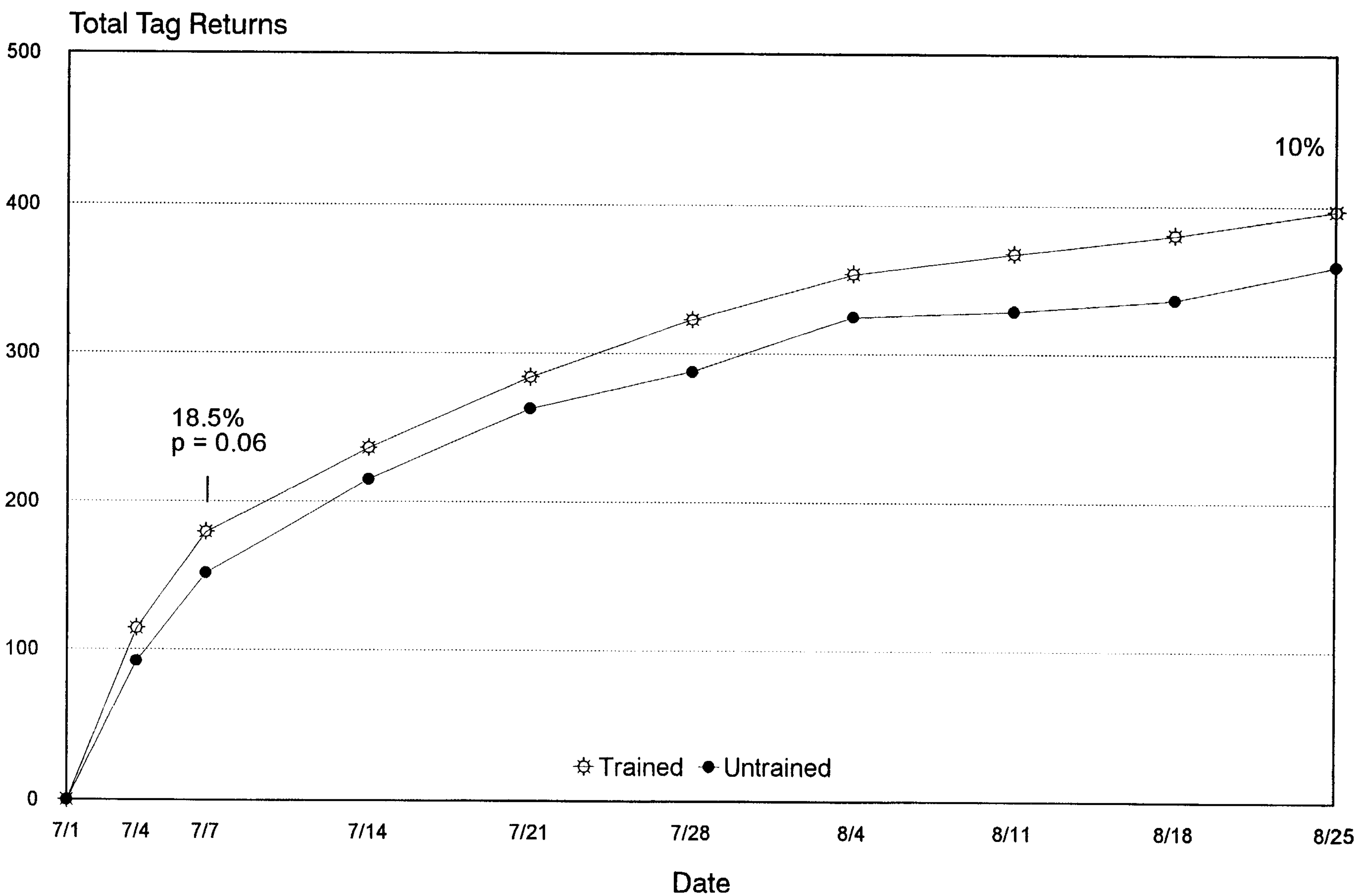

Figure 1. Jaw tag returns for 5,000 rainbow trout (2,500 each trained and untrained) stocked in 10 Magic Valley and Southeast region streams in July 1996.

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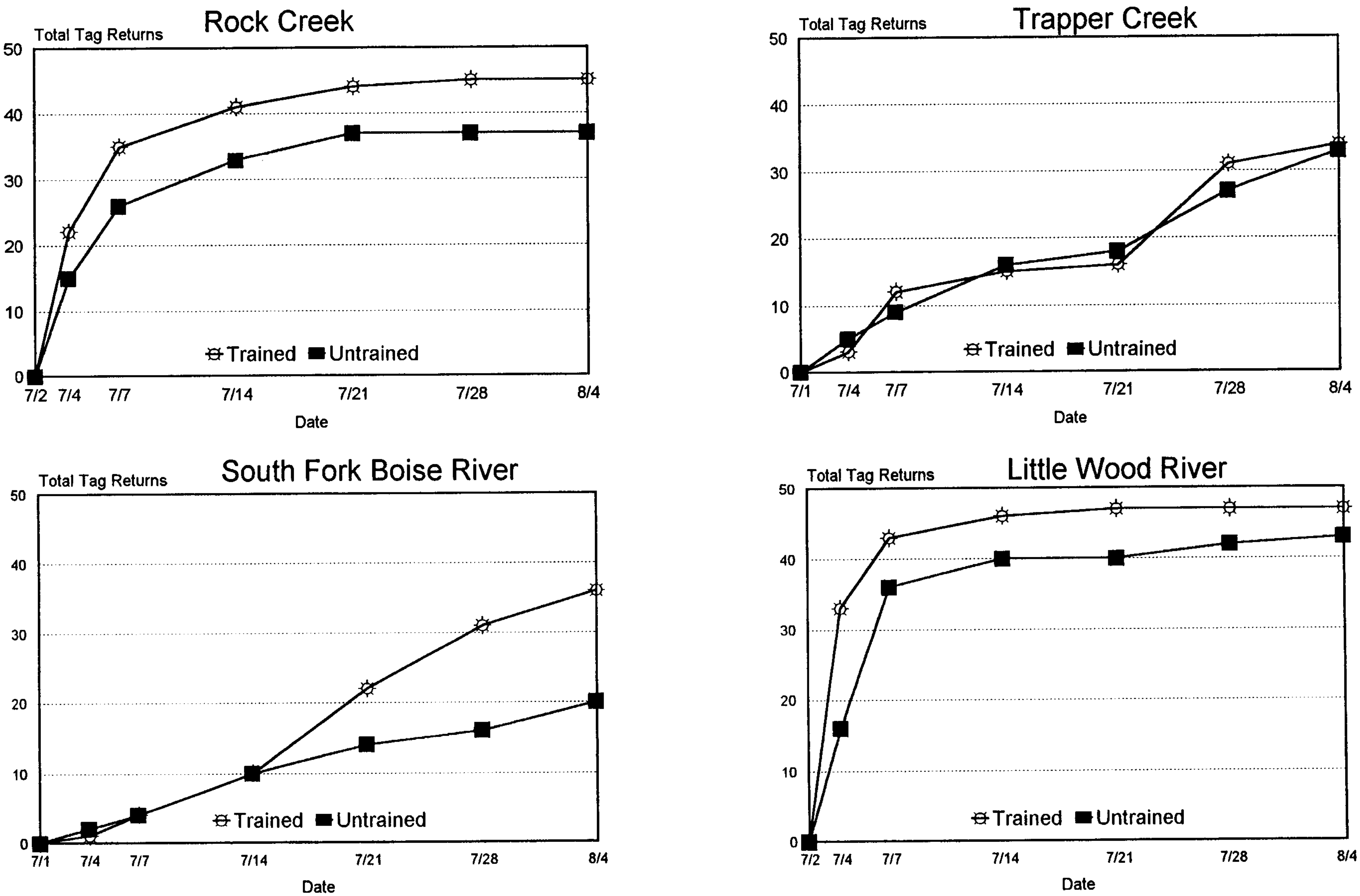
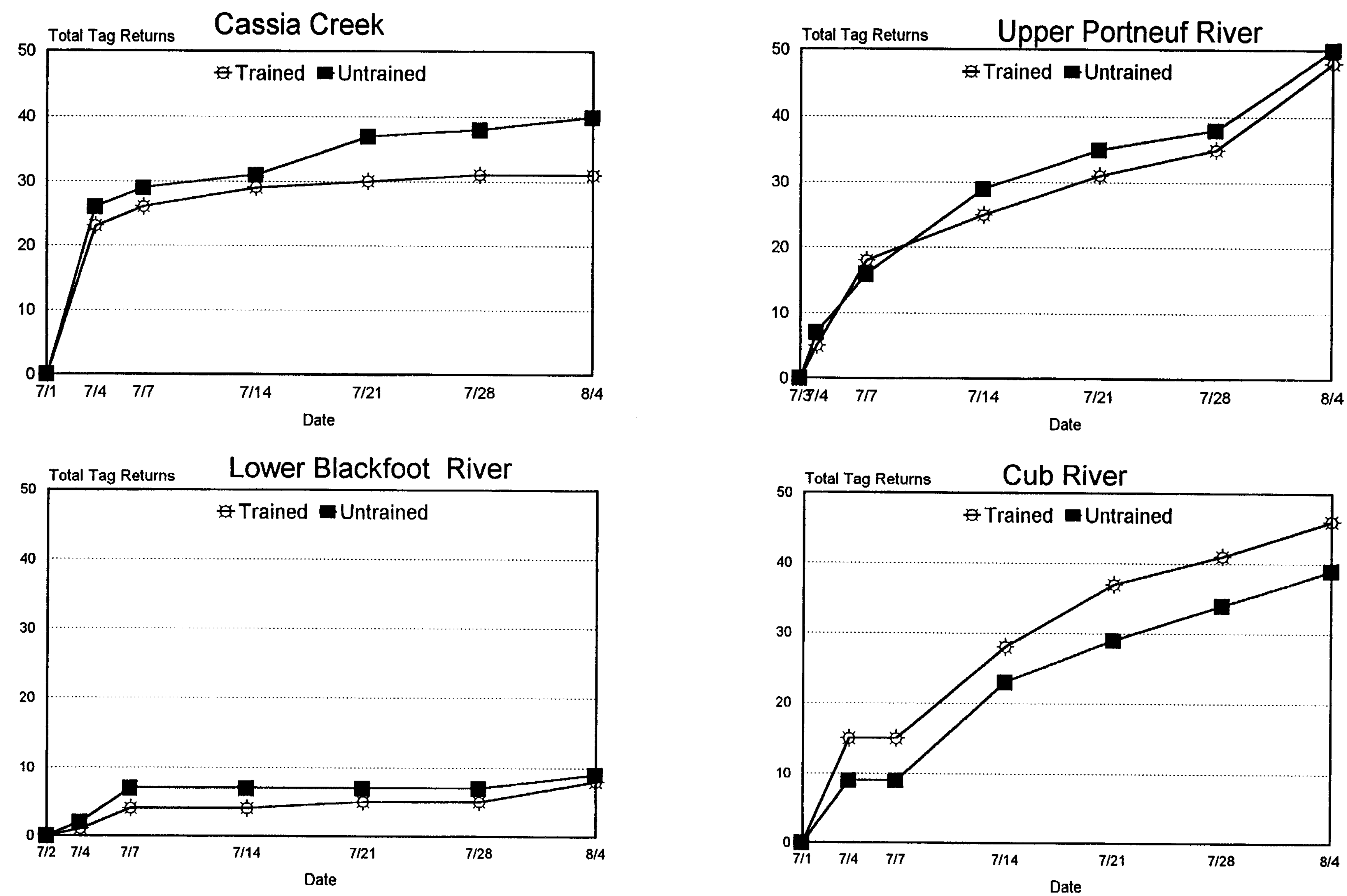
Zar, J.H. 1984. Biostatistical analysis. Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

A P P E N D I C E S



Appendix A. Returns of jaw-tagged rainbow trout (250 each trained and untrained per stream) stocked in July 1996.



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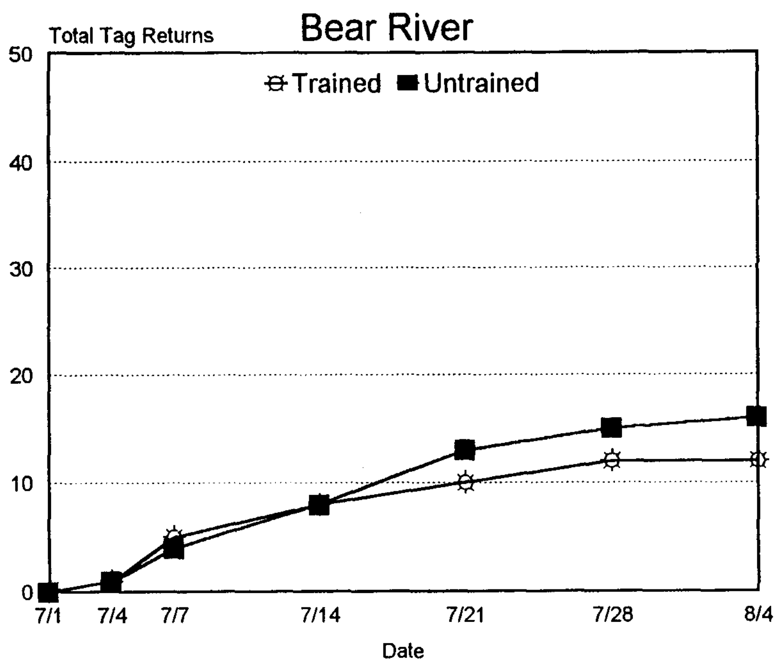

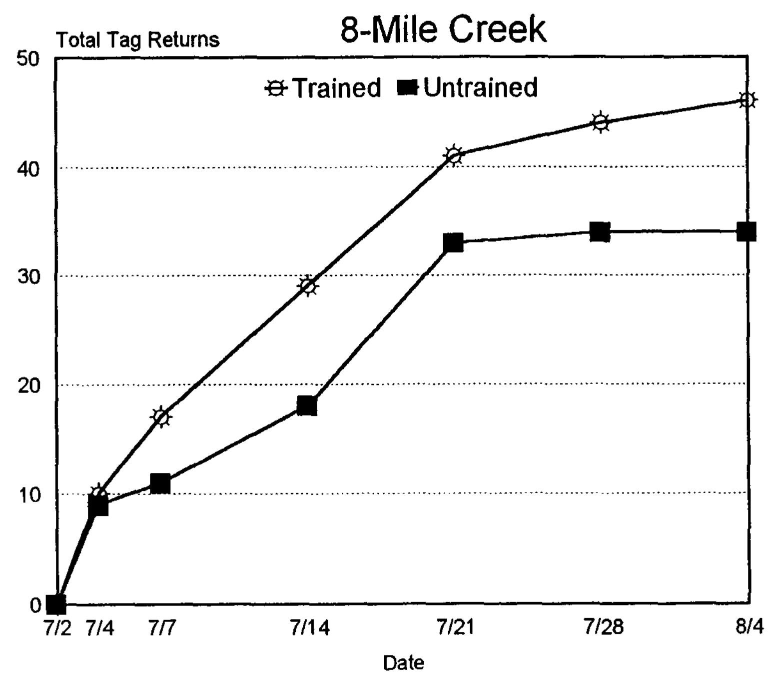

Appendix A. Continued.

JOB PERFORMANCE REPORT

State of: Idaho Grant No.: F-73-R-19, Fishery Research

Project No.: 8 Title: Hatchery Trout Evaluations

Subproject No.: 1, Sterile Trout Investigations

Contract Period: July 1, 1996 to June 30, 1997

ABSTRACT

Sterile triploid hatchery fish may have important applications in fishery management programs. Triploid salmonids are functionally sterile, and do not pose genetic risks to indigenous salmonids. Sterile fish may also grow faster and live longer than normal diploid fish. Techniques to produce sterile salmonids are well developed, but vary among species and even among strains of the same species. Triploid rainbow trout *Oncorhynchus mykiss* are available from commercial sources. Although some performance data for sterile triploid salmonids in culture programs is available, virtually no information is available on performance in recreational fisheries.

In 1995-1996, the Idaho Department of Fish and Game began four phases of research on the production and evaluation of sterile hatchery trout. We purchased 20,000 mixed-sex triploid and 20,000 control diploid rainbow trout eggs to be reared for evaluation as stream catchables in 1997.

We also purchased 60,000 all-female triploid and 60,000 all-female diploid rainbow trout for evaluation as fall fingerlings. These fish were reared to 150 mm, differentially marked with fluorescent grit dye, and stocked in October in eight Idaho lakes and reservoirs.

We used heat shock treatments of fertilized eggs to produce triploid Henrys Lake cutthroat trout O. *clarki x* rainbow trout hybrids. Treated groups averaged 46% triploid when pooled. Treated and control fish were differentially fin-clipped and stocked for evaluation in the East Harriman Fish Pond. We will further refine sterile hybrid production techniques in 1997.

Tetraploid salmonids are fertile and when spawned with diploids will theoretically produce all-triploid (sterile) offspring. We attempted to produce tetraploid rainbow trout broodstock using various pressure treatments (8,000 to 9,500 psi) on fertilized Hayspur strain rainbow trout eggs. None of the treatments produced tetraploid fish in significant numbers. Treatments will be modified and another attempt made in the fall of 1996.

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INTRODUCTION

Over the last decade, the production and use of sterile fish as a fishery management tool has received increasing attention. Rationale for using sterile fish in stocking programs is generally based on two distinct and separate needs: 1) the desire for a longer-lived, faster growing hatchery product, and 2) protecting the genetic integrity of indigenous stocks. Although early researchers focused on the predicted growth and longevity benefits and the trophy potential of sterile fish, such benefits have not been documented in recreational fisheries.

With or without growth benefits, sterile fish represent a fishery management tool with potentially broad applications. For example, the demand for consumptive trout fishing in Idaho streams is largely met by stocking hatchery rainbow trout *Oncorhynchus mykiss* catchables in selected streams or stream sections. Despite recent emphasis on wild trout management and reductions in rainbow trout stocking in Idaho streams, about 40% of stream plants occur in waters with viable wild trout populations (Idaho Department of Fish and Game [IDFG] unpublished data). Using sterile rainbow trout catchables to meet these demands would eliminate concerns for genetic impacts on indigenous rainbow trout and cutthroat trout O. *clarki bouvieri.* The Henrys Lake management program includes hatchery supplementation of native Yellowstone cutthroat trout, non-native brook trout *Salvelinus fontinalis,* and rainbow trout x cutthroat trout hybrids. The hybrids are fertile, and represent a potential genetic risk to cutthroat trout. Hybrids are also an extremely popular sport fish in Henrys Lake and provide much of the trophy component of the fishery. Production and use of sterile hybrids in stocking programs could potentially meet the public demand for trophy fish while minimizing genetic impacts on wild cutthroat trout.

Sterile fish may also be useful in mountain lake stocking programs as both a genetic conservation and a fishery enhancement tool. Hatchery-reared trout and Arctic char S. *alpinus,* which mature in mountain lakes, may emigrate at high rates if an outlet is accessible (Josephson and Gordon 1995; Warrillow et al. 1996). This represents a loss to the lake fishery as well as potential interaction with and genetic impacts on downstream indigenous stocks. Additionally, in some mountain lakes with spawning habitat, fertile hatchery fish may overpopulate and stunt. If sterile fish are less likely to emigrate and will not reproduce, lake populations, particularly in size structure, could improve.

Techniques to produce sterile salmonids are well developed, particularly within the aquaculture industry, and triploid rainbow trout eggs are available from many commercial egg suppliers. The most widely used approach is chromosome manipulation, specifically for induction of triploidy. Triploidy is induced by thermal, pressure, or chemical shock of eggs shortly after fertilization. This causes retention of the second polar body of the egg and results in an embryo with two sets of maternal and one set of paternal chromosomes. Triploid salmonids are functionally sterile, although males may still develop secondary sex characteristics and exhibit spawning behavior.

Another less-refined technique for producing triploid salmonids is by spawning tetraploid fish with normal diploid fish. Tetraploids are produced by shocking fertilized eggs just prior to the first cell division. Tetraploid salmonids appear to be less viable, but are fertile. Resultant sperm and eggs contain two complements of chromosomes rather than the normal one. Spawning with normal diploid fish will theoretically produce all-triploid offspring.

Although production techniques are fairly well developed, information on performance of triploid salmonids in recreational fisheries is lacking (Simon et al. 1993). Sterile fish must survive, grow, and return to anglers at rates comparable to normal fish if they are to be useful in stocking programs.

MANAGEMENT GOAL

To minimize genetic risks to indigenous rainbow trout and cutthroat trout from hatchery trout.

OBJECTIVES

1. Evaluate return-to-creel of commercially-supplied triploid rainbow trout and normal rainbow trout in put-and-take stream fisheries.

2. Evaluate relative survival and growth of commercially-supplied triploid and normal rainbow trout fingerlings in lakes and reservoirs.

3. Refine techniques to produce, and evaluate the performance of triploid Henrys Lake cutthroat trout **x** rainbow trout hybrids.

4. Develop techniques to produce tetraploid Hayspur strain rainbow trout broodstock for future production of triploid rainbow trout and hybrid trout.

METHODS

Sterile Stream Catchables

In June 1996, IDFG purchased 20,000 mixed-sex triploid (sterile) and 20,000 diploid (control) rainbow trout eyed eggs from the Mt. Lassen Trout Farm. Incubation and rearing took place at IDFG's Nampa Fish Hatchery. We monitored hatching rate, survival, and growth and conversion for the sterile and control groups. To confirm ploidy levels of each group, in October we took blood samples from 40 sterile fish and 5 control fish. Blood was taken by severing the caudal peduncle. Blood from each fish was preserved in Alsevers solution, put on ice, and transported to Washington State University. Individual blood samples were analyzed by flow cytometry.

The sterile and control fish will be reared through spring 1997, by which time they will be of catchable size (>250 mm). Performance evaluation in stream fisheries will be based on relative return-to-creel for sterile and control fish in at least 10 streams statewide. Equal numbers (approximately 300 each) of sterile and control fish will be jaw-tagged and released in each stream. Design and analysis will be a paired-t test using raw tag return data for each group and stream. A priori power analysis suggested such a design with 10 streams should provide an 88% chance of detecting a 25% difference in returns between sterile and control fish. If hatchery survival is high and more fish are available, they should be incorporated into additional paired stocking events. This would increase the statistical power of the experiment and reduce the probability of Type I error.

Sterile Fingerlings in Lakes and Reservoirs

In April 1996, IDFG received 60,000 all-female triploid (sterile) rainbow trout eggs from Trout Lodge and an equal number of all-female diploids (control). These eggs were programmed for use as fall 1996 fingerling plants in lakes and reservoirs statewide. They were hatched and reared at Nampa Fish Hatchery. Hatching rate, survival, and growth and conversion were monitored for steriles and controls.

In August 1996, we differentially marked the sterile and control groups with fluorescent grit. To confirm ploidy levels, in September we took blood samples from 40 sterile group and 5 control group fish. Samples were taken and analyzed as above for the stream catchables.

In October, sterile and control fish were stocked in roughly equal proportions into eight lakes and reservoirs statewide (Table 1). IDFG management personnel will use a combination of gillnetting, electrofishing, and creel surveys to assess relative abundance and growth of the sterile and control groups.

Sterile Henrys Lake Hybrids

On March 18, 1996, we attempted to induce triploidy in Henrys Lake cutthroat trout x rainbow trout hybrids. Cutthroat trout eggs were collected at the fish ladder at IDFG's Henrys Lake Fish Hatchery. Rainbow trout sperm was collected from Kamloops strain broodstock at Ennis Fish Hatchery in Montana and brought on ice to Henrys Lake Fish Hatchery. For each treatment replicate, eggs from five females were pooled and fertilized with pooled sperm from five males. Fertilized eggs were then poured into plastic mesh shipping cylinders, and held at ambient temperatures (7.8°C). Heat shock treatments were at 28.5°C and 29.5°C, starting 10 min post-fertilization, and lasting 10 min (Table 2). Egg cylinders were lifted from the ambient temperature bath and moved to a circulating water bath at treatment temperature. After shocking, the eggs were returned directly to the ambient temperature bath, then moved to Heath trays for incubation. A total of about 68,000 eggs were heat-shocked. Another 30,000 control eggs were handled identically, but at ambient temperatures.

Treated and control eggs were eyed up at Henrys Lake Fish Hatchery, then shipped to IDFG's Ashton Fish Hatchery for hatching and rearing. Eye-up and hatching data were recorded for each group. In July, we collected blood as above for ploidy determination (40 treated fish and 5 controls). Blood samples were taken to Washington State University for analysis.

In September, all treated fish were given a left pelvic fin clip and controls were given a right pelvic clip. Treatment and control fish were stocked in approximately equal proportions into the East Harriman Fish Pond on September 25 (Table 3). Due to lower hatching rates and lower rearing densities, the treated fish were slightly larger than the controls at the time of

Table 1. Idaho lakes and reservoirs stocked with sterile fall fingerling rainbow trout in October 1996.

Location		Number Stocked	Number of Fish/lb	Grit Dye Mark
Brundage Reservoir	Triploids [a]	1,003	11.8	Pink
	Controls [b]	1,016	12.7	Green
Little Payette Lake	Triploids	5,015	11.8	Pink
	Controls	5,080	12.7	Green
Warm Lake	Triploids	5,015	11.8	Pink
	Controls	5,080	12.7	Green
Tule Lake	Triploids	100	11.8	Pink
	Controls	100	12.7	Green
Lost Valley Reservoir	Triploids	12,980	11.8	Pink
	Controls	12,700	12.7	Green
Little Wood Reservoir	Triploids	1,180	11.8	Pink
	Controls	11,430	12.7	Green
Daniels Reservoir	Triploids	7,965	11.8	Pink
	Controls	7,938	12.7	Green
Treasureton Reservoir	Triploids	5,900	11.8	Pink
	Controls	6,030	12.7	Green

[a] Sterile (triploid) fingerlings from Trout Lodge.
[b] Fertile (diploid) fingerlings from Trout Lodge.

Table 2. Experimental heat shock treatments used to induce triploidy in Henrys Lake cutthroat trout x rainbow trout hybrids on March 18, 1996.

Group	Treatment Temperature (°C)	Time After Fertilization (min)	Treatment Duration (min)	Number of Females	Number of Males	Number of Bags
1	28.5	10	10	5	5	10,917
2	28.5	10	10	5	5	7,667
3	28.5	10	10	6	5	15,455
1	29.5	10	10	5	5	10,682
2	29.5	10	10	5	5	10,917
3	29.5	10	10	5	5	13,103
C 1	7.6-7.9[a]	10	10	5	5	15,484
C2	7.6-7.9 [a]	10	10	5	10	14,919

[a] Control groups and ambient temperatures.

Table 3. Henry's Lake hybrids, triploid and control groups, planted in East Harriman Fish Pond on September 25, 1996.

Group	Number of Fish	Mark	Size
Triploid	2,400	left pelvic clip	62.6
Control	2,129	right pelvic clip	53.8

stocking. The pond will be sampled periodically over the next two to three years to assess the relative survival and growth of treated and control hybrids.

Tetraploid Hayspur Rainbow Trout Broodstock

In February 1996, we attempted to use hydrostatic pressure shocking on fertilized eggs to produce tetraploid rainbow trout. Egg sources were two- to four-year-old Hayspur strain rainbow trout broodstock held at IDFG's Hayspur Fish Hatchery. Pressure treatments began approximately 286 min after fertilization (60% of the time to first cleavage). Treatments were at 8,000, 8,500, 9,000, and 9,500 psi for a duration of 6.0 to 6.5 minutes, with two or three replicate egg groups per treatment (Table 4).

Table 4. Experimental pressure shock treatments used to induce tetraploidy in Hayspur strain hatchery rainbow trout at Hayspur Hatchery, February 1996. Treatments began approximately 286 min post-fertilization and lasted 6.0 to 6.5 min. Control eggs were handled identically, but were not pressure-shocked.

		Number of fish (age)		
Date	Treatment Pressure (psi)	Females	Males	Number of Eggs
2/02/96	8,500	2 (2)	3 (2)	14,628
		2 (2)	1 (2)	14,000
		2 (2)	4 (2)	14,000
	9,000	2 (2&3)	4 (2&3)	19,000
		2 (3)	4 (3)	19,000
		2 (3&4)	4 (3&4)	19,000
	Controls	2 (2&3)	4 (2&3)	5,544
2/08/96	9,500	2 (2)	2 (2)	6,356
2/13/96	9,500	Unknown (3)	Unknown (3)	3,816
	8,000	Unknown (2)	Unknown (2)	8,775
		Unknown (3)	Unknown (3)	1,908

Incubation and rearing took place at Hayspur Fish Hatchery. In July 1996, we took blood samples (as described above) from 40 fish in each treatment group and sent them to Washington State University for ploidy analysis.

RESULTS

Sterile Stream Catchables

Hatching and rearing data for the triploid and control groups through December 1996 are provided in Table 5. All 40 of the blood samples from the triploid group were confirmed as triploid by the flow cytometric analysis. These fish will continue to be reared at Nampa Fish Hatchery through the spring of 1997, at which time they will be used in the stream put-and-take stocking evaluations.

Sterile Fingerlings in Lakes and Reservoirs

Hatching and rearing data for triploid and control groups through October 1996 are provided in Table 6. All of the 40 sampled triploid group fish were confirmed as triploid by flow cytometry. Comparative post-stocking performance will be monitored by research and management personnel for at least two years.

Table 5. Hatching and rearing data through December 1996 for Mt. Lassen triploid and diploid rainbow trout to be used in 1997 stream stocking evaluations.

Group	Number of Eyed Eggs	Percent Hatched	Number of Fish [a]	Mean size (mm) [a]
Triploids	22,222	65.4	14,320	198
Diploids (Control)	23,908	74.2	17,607	183

[a]As of January 1, 1997

Table 6. Hatching and rearing statistics through October 1, 1996 for Trout Lodge triploids and control diploids stocked as fall fingerlings in lakes and reservoirs.

Group	Number of Eggs	Percent Hatched	Number of Fish [a]	Mean size (mm) [a]
Triploids	65,000	78.7	41,412	148
Diploids (Control)	63,795	90.4	56,733	145

[a] As of October 1, 1996

Sterile Henrys Lake Hybrids

Hatching and rearing data for treatment and control groups are provided in Table 7. Initial blood analysis of the two treatment groups indicated 38 of 40 (28.5°C group) and 35 of 40 (29.5°C group) were triploid. The two groups were then pooled to provide one treatment group with approximately 91 % triploids. We later received a second report of blood work results indicating 7 of 10 and 9 of 26, respectively, were triploid. Because the two treatment groups were already pooled, the estimated rate of triploid induction was adjusted to 46%.

Performance evaluation in the East Harriman Fish Pond will take place in 1997 and 1998, using a combination of gillnetting and electrofishing to recapture marked hybrids.

Tetraploid Hayspur Rainbow Trout Broodstock

Only one tetraploid fish was confirmed among the samples of treated fish. This fish was in the 9,500 psi treatment group. Because tetraploidy induction rates were so low, we terminated the experiment. We plan to modify treatments and attempt tetraploid induction during the fall-winter 1996 egg taking season at Hayspur Fish Hatchery.

Table 7. Incubation statistics for Henrys Lake hybrid eggs that were heat-shocked to induce triploidy on March 18, 1996.

Treatment	Number of Eggs	Percent Eyed	Percent Hatched
28.5°C	34,435	15.5	12.6
29.5°C	35,827	7.6	6.4
Controls	30,413	62.7	61.5

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