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PROJECT 3. WILD TROUT INVESTIGATIONS

SUBPROJECT 1. WHIRLING DISEASE STUDIES
SUBPROJECT 2. EVALUATIONS OF SALMONID RESTRICTED HARVEST REGULATIONS PERMITTING THE USE OF BAIT

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ABSTRACT

Past sampling in Idaho (1995) indicated widespread distribution of *Myxobolus cerebralis,* the parasite responsible for whirling disease, but preliminary data indicated most rainbow trout *Oncorhynchus mykiss* populations in Idaho were not impacted. However, the Big Lost River was one drainage which tested positive for *Myxobolus cerebralis* where population declines in rainbow trout have been anecdotally reported by anglers.

In this study I used sentinel fry exposures of hatchery rainbow trout and cutthroat trout *O. clarki,* monitoring of rainbow trout fry in the wild, and population estimates to determine potential infection levels from *Myxobolus cerebra/is* in the Big Lost River drainage. I compared Big Lost River data with data from other drainages which also tested positive for *Myxobolus cerebralis,* but where population declines have not been detected. Results from sentinel tests indicated high levels of infection of rainbow trout and cutthroat trout exposed in two locations in the East Fork Big Lost River. Exposures in a headwater section during June, July, and August resulted in high infection levels for rainbow trout as measured by spore counts and histological ranking. Exposures in a mid-drainage location resulted in a decreased incidence of infection, as the summer progressed, in cutthroat trout and rainbow trout. Although cutthroat trout did get heavily infected in the headwater location, they did exhibit lower infection levels compared to rainbow trout in all trials, possibly indicating a lower susceptibility to infection.

Results from fry monitoring during September to December in the South Fork Boise River and the Big Wood River did indicate infection of young-of-the-year rainbow trout, but at low levels, with only three fish observed with clinical signs. Abundance of young-of-the-year rainbow trout remained high until declining flows and icing conditions precluded further sampling in December. These results did not indicate severe negative impacts to young-of-the-year rainbow trout in the areas monitored. Population estimates in the East Fork Big Lost River indicated a decline of rainbow trout compared to prior years. The declines were greatest in the headwater section of the East Fork, adjacent to the section of highest spore loading observed in sentinel tests. Sample sites progressively farther downstream from the headwater area did not have as great of declines in rainbow trout populations.

Brook trout *Salvelinus fontinalis* populations in all sections increased compared to prior years. Data collected indicates *Myxobolus cerebralis is* a likely limiting factor to rainbow trout in the Big Lost River. However, I would also expect to see *Myxobolus cerebralis* impacts to brook trout populations - this was not the case. Data from the South Fork Boise River and the Big Wood River supports the conclusion *Myxobolus cerebra/is is* not currently limiting rainbow

trout populations in these drainages. Additional sampling is recommended in Idaho streams to define the conditions which allow the parasite to negatively impact trout populations in some cases and have no apparent effect in others.

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INTRODUCTION

Statewide sampling during 1995 indicated *Myxobolus cerebralis (MC)*, the causative agent of whirling disease in salmonids (Markiw 1992), was widespread in Idaho (Elie, in press). Population monitoring in Colorado and Montana indicate this parasite can result in large losses of wild trout, with greatest losses reported in rainbow trout *Oncorhynchus mykiss* populations (Walker and Nehring 1995, Vincent 1996). Studies in Colorado and Montana indicated high levels of infection in age 0 trout exposed during spring or summer with subsequent mortality of these trout during late fall and winter (Nehring and Thompson 1996, Vincent 1996).

In Colorado and Montana, few rainbow trout survive to age 1 in streams impacted by the parasite. Preliminary trout population monitoring in Idaho indicates highly variable year classes within trout populations with no clear trend in age 1 year classes in drainages which tested positive for the parasite. Although these data appear to contradict the findings from Colorado and Montana, the Idaho Department of Fish and Game (IDFG) is concerned about potential populations declines in several drainages where the parasite is present. The Big Lost River drainage is one example where anecdotal information indicates a decline in trout numbers concurrent with the period when the parasite was likely introduced to the drainage.

This study was designed to collect data comparable to research in Colorado and Montana to determine if the parasite results in a level of mortality detectable at the population level for wild trout in Idaho. I conducted tests in drainages that tested positive for MC during 1995. I also conducted exposure tests at the IDFG Hayspur Fish Hatchery, a facility which tested positive for the parasite in the past but is no longer used for production rearing.

OBJECTIVES

Research Goal: Evaluate the effects of whirling disease on naturally-producing salmonid populations in Idaho.

1. Determine the incidence and level of infection by species, drainage, and season of exposure for sentinel fish exposed to MC-positive water.

2. Monitor wild age 0 rainbow trout populations in selected MC-positive watersheds for clinical signs of disease and changes in abundance.

3. Evaluate long-term population trends in selected Idaho streams which are positive for the parasite.

METHODS

Sentinel Fry Tests

Young-of-the-year (YOY) trout fry were held for 10 days in surface water in two drainages which have tested positive for MC and are believed to contain the infective stage of the parasite. The fish were then reared offsite for four to six months to allow spore development and maturation. Fish were sampled for length, weight, and clinical signs of whirling disease every two weeks.

At termination of each experiment, a 5-fish sample was collected for histological examination and a 20-fish sample was collected for spore quantification through pepsin-trypsin-digest (Markiw and Wolf 1974). Histological evaluations were made by Tom Baldwin at the Washington Animal Diagnostic Disease Laboratory in Pullman, Washington using the following rating system:

Grade 0: No skeletal abnormalities noted.
Grade 1: Discrete, rare (usually single), small islands of spore/trophozoites with minimal associated inflammation are seen.
Grade 2: A single, locally extensive focus, or several small foci (usually two) of cartilage necrosis with associated trophozoites or mature spores and mild inflammation are seen.
Grade 3: Multiple foci of cartilage necrosis (usually three or four) with accompanying moderate inflammation are present. Moderate numbers of trophozoites/spores are within lesions.
Grade 4: Widespread, extensive cartilaginous necrosis with severe inflammation. Trophozoites and/or spores are within cartilaginous lesions.

Spore quantification was completed using digest methods and counting the numbers of spores in 12 grids using a micro-cytometer on the 40 power setting. Based on subsampling, an expansion factor of 3,300 was multiplied by the number of spores counted. If no spores were seen in 12 grids, up to 120 grids were rapidly searched to check for positive versus negative ranking of the individual fish. If no spores were found, the fish was designated free of infection.

Big Lost River

Two study sites were used. The first site was located in the headwaters of the East Fork Big Lost River (Copper Basin) in a 2nd-order stream with a gradient of 0% to 1%. The second site was 20 km downstream from the first, in a 4th-order section of the East Fork Big Lost River (Castlerock) with an average gradient of 2% to 3%.

For sentinel fish, I used Trout Lodge domesticated Kamloops strain rainbow trout and cutthroat trout O. *clarki* from a feral stock of Yellowstone cutthroat trout *O. clarki bouvieri* from Henrys Lake, Idaho. Rainbow trout were 30 mm to 40 mm and cutthroat trout 34 mm to 40 mm during initial exposure. To examine seasonality of infection rates, three separate groups

of fry were exposed for 10 days beginning on June 3, July 8, and August 5. Rainbow trout were used in all tests. Cutthroat trout were available for July and August tests. Following 10-day exposures, fry were moved to the IDFG Mackay Fish Hatchery for the duration of the experiment. This rearing was done on parasite-free well water. Fish were reared in 0.5 m diameter circular vats. Cutthroat trout were marked with an adipose fin clip and reared in the same vat with rainbow trout from corresponding test sites and dates. Fish were reared long enough for spores to form following in-river exposures (Pete Walker, Colorado Division of Wildlife, personal communication). The June test was terminated October 16. The July and August tests were terminated December 10.

Hayspur Fish Hatchery

One group of Colorado River rainbow trout was exposed to surface water from Loving Creek, a surface water source for Hayspur Fish Hatchery that tested positive for MC in 1987 and 1995. The fish were 25 mm to 30 mm at initial exposure. The test began on May 29 and was completed on October 3. Fish were reared for the entire period on Loving Creek water.

In-Stream Fry Monitoring

A two-person crew, using a Smith Root Type VII backpack shocker, conducted monthly relative abundance sampling of wild rainbow trout fry populations to monitor potential impacts of whirling disease on YOY trout rearing under natural conditions. Sample streams included the South Fork Boise River, Big Wood River, and Cabin Creek (Big Lost River tributary). Four sites were sampled on the South Fork Boise River, five sites on the Big Wood River, and one site on Cabin Creek. Each site on the South Fork Boise and Big Wood rivers was a 33 m long section along one shoreline. The area from the shoreline out to approximately 4 m was sampled. A single, upstream electrofishing pass was completed at each site (Vincent 1996). The entire width of the Cabin Creek site (2 m to 4 m) was sampled. Sampling occurred monthly from September to early December. All fish were measured, weighed, and examined for clinical signs of whirling disease. A sample of fry was collected for histological examination from the South Fork Boise and Big Wood rivers during the October and December sample periods. A single sample was collected from Cabin Creek in December.

Population Monitoring

Population estimates were completed during August at three sites in the Big Lost River to compare current populations with estimates from 1986 and 1990. Corsi (1989) established these sites in 1986. One site was located on the Big Lost River at Bartlett Point Road (3,000 m) and two sites were located on the East Fork Big Lost River at Whitworth Ranch (924 m) and at Fox Creek (1,273 m).

Peterson mark-recapture methods were used as the population estimator. Methods of fish collection, marking, and data collection are similar to those used in prior sampling (Corsi 1989; Elie, in press). Fish data were entered and analyzed using the computer program

MARKRECAPTURE 4.0 (MDFWP 1994). The program generated population estimates based on log likelihood and modified Peterson methods.

I assessed population changes since 1986 using population estimates and length-frequency data.

RESULTS

Sentinel Fry Tests

Exposures of rainbow trout and cutthroat trout fry in the East Fork Big Lost River resulted in substantial infection rates by MC in all cases. Rainbow trout consistently had higher infection levels compared with cutthroat trout exposed at similar dates and locations (Tables 1 and 2). For both rainbow trout and cutthroat trout, histologic examinations revealed greater tissue damage in fish exposed at the Copper Basin versus the Castlerock site (Table 1). With the exception of the June test, fish from the Copper Basin site had a greater number of spores compared to the Castlerock site for both species (Table 2).

During the rearing period, cutthroat trout had poor growth and developed a pinhead condition which we did not attribute to whirling disease. However, the lower histologic rankings and spore counts, compared to rainbow trout, suggest the high percentage of pinhead condition (up to 100%) and lower survival observed for cutthroat trout are not in agreement with the results from histological and digest analyses.

Test results for rainbow trout exposed to surface water from Loving Creek at Hayspur Fish Hatchery indicated very low incidence of infection. No fish developed external clinical signs of disease. Histological examination indicated 5 of 5 fish with a rank of "0." Digest results indicated only 1 of 20 fish with detectable spores. The estimated number of spores in the 1 positive fish was only 3,000 spores. These results indicate the Loving Creek water source is infected with the parasite, but conditions result in very low infection rates. Nonetheless, the rearing of production rainbow trout has been discontinued at the hatchery and remaining brood stock production is all done an well water.

In-Stream Fry Monitoring

Fry sampling in the South Fork Boise River and Big Wood River indicated declining numbers of YOY rainbow trout fry during the period from September through December (Table 3). However, crew members observed only a total of 3 fish (out of 2,364 sampled) on both rivers with clinical signs of whirling disease during the three sample periods. In Cabin Creek (East Fork Big Lost River), I observed an increase in the number of fry during sampling and no clinical signs of disease. I did not observe increasing proportions of external signs of whirling disease as sampling progressed through the fall.

Histological samples collected during October in the South Fork Boise River indicated 2 of 10 fish sampled tested positive for whirling disease (1 of grade 2 and 1 of grade 4 ratings).

Table 1. Summary of survival, external clinical signs, and histological analysis for rainbow trout (Rb) and cutthroat trout (CO fry exposed as sentinel fish in the Big Lost River, Idaho during 1996.

Location	Species	Date Exposed	Date Sampled	Survival (%)	Clinical Signs (%)	Histological Results[a] Number Sampled	Ranking 0	1	2	3	4	Mean
Copper Basin	Rb	6/3	10/16	85	85	10	-	-	-	1	9	3.9
Castlerock	Rb	6/3	10/16	87	62	5	1		-	2	2	2.8
Copper Basin	Rb	7/8	12/10	75	89	5	-				5	4.0
	Ct	7/8	12/10	72	31	5	-		-	1	4	3.8
Castlerock	Rb	7/8	12/10	100	47	5			-	2	3	3.6
	Ct	7/8	12/10	60	32	5	1		2	2	-	2.0
Copper Basin	Rb	8/5	12/10	86	87	4			-		4	4.0
	Ct	8/5	12/10	40	67	5				2	3	3.6
Castlerock	Rb	8/5	12/10	77	52	5	1	2	1	1		1.4
	Ct	8/5	12/10	46	37	5	-	-	-	-		0.0

[a] Based on rating system of 0-4 for histo-pathological involvement.

Table 2. Summary of survival, external clinical signs, and pepsin-trypsin-digest analysis for rainbow trout (Rb) and cutthroat trout (Ct) fry exposed as sentinel fish in the Big Lost River, Idaho during 1996.

Location	Species	Date Exposed	Date Sampled	Number Sampled	Number Positive [a]	Digest Results (10^3)[b] Mean	Range
Copper Basin	Rb	6/3	10/16	20	20	93.3	0-400
Castlerock	Rb	6/3	10/16	20	20	149.1	7-353
Copper Basin	Rb	7/8	12/10	20	18	176.9	0-740
	Ct	7/8	12/10	20	19	94.8	0-290
Castlerock	Rb	7/8	12/10	20	17	78.8	0-247
	Ct	7/8	12/10	20	16	20.5	0-63
Copper Basin	Rb	8/5	12/10	20	20	192.2	23-623
	Ct	8/5	12/10	19	19	51.8	10-1 10
Castlerock	Rb	8/5	12/10	20	14	14.6	0-43
	Ct	8/5	12/10	19	12	5.3	0-33

[a] Number positive based on pepsin-trypsin-digest results.
[b] Based on spore counts from digest methods.

Table 3. Relative numbers of young-of-the-year rainbow trout per 100 ft (33 m) at sample sites in the South Fork Boise River, Big Wood River, and Cabin Creek (Big Lost River) sampled from September to December 1996.

Drainage	Sample Site	Rainbow Trout per 100 ft		
		Sept 5	Oct 18	Dec 2
South Fork Boise River	1	108	42	27
	2	204	75	33
	3	63	84	54
	4	99	84	63
		Sept 6	Oct 17	Dec 3
Big Wood River	1	87	78	18 [a]
	2	72	162	78
	3	270	159	--[b]
	4	114	105	33[a]
	5	192	60	-- [b]
		Sept 13	Oct 16	Nov 26
Cabin Creek	1	30	45	87

[a] Habitat and sampling affected by shoreline ice.
[b] Dewatering and shoreline ice precluded sample.

Sampling during December in the same area indicated one of six fish sampled tested positive (one of grade 2 rating). In the Big Wood River, four of five fish sampled during October were histologically positive (two of grade 2 and two of grade 3 ratings), and zero of five fish tested positive during December. Histological samples from Cabin Creek indicated zero of five fish tested positive during December.

During sampling in December, reduced flows and icing conditions resulted in major changes to available habitat for YOY rainbow trout within the sample sections. Partitioning of the observed reductions in fry numbers between whirling disease, natural mortality, or movement due to changing habitat was not possible.

Initial sampling in the East Fork Big Lost River during sampling in August indicated almost a total absence of YOY rainbow trout in 2 km of river sampled. Therefore, this stream was deleted from our sampling. A five-fish sample of YOY rainbow trout in the Big Lost River was collected near Bartlett Point Road on October 17. Histological analysis indicated zero of five fish positive.

Population Monitoring

Population estimates indicated low numbers of rainbow trout present in the two sections sampled in the East Fork Lost River (Table 4). The estimates were similar or reduced compared to earlier estimates (Table 5). Few rainbow trout from 100 mm to 199 mm (age 1 +) and virtually no age 0 rainbow (< 80 mm) were collected in these sections in 1996. The observed numbers of these size classes is well below those observed in previous years (Figure 1). Brook trout *Salvelinus fontinalis* numbers were six to eight times higher compared to 1990 (Table 5, Figure 2). I did not capture enough mountain whitefish *Prosopium williamsoni* in the East Fork sections to estimate population size, but numbers appeared to be well below those in 1986.

Table 4. Population estimates with 95% confidence limits for three sections of the Big Lost River sampled during August 1996.

		Big Lost River	East Fork Big Lost River	
Species	Size (mm)	Bartlett Point Road	Whitworth Section	Fox Creek Section
Wild Rainbow	100-199	178 (±46)	10 (±9)	20 (±3)
	200-299	314 (±42)	91 (±12)	35 (±7)[a]
	≥300	60 (±9)	17 (±2)	
	All ≥ 100	552 (±64)	118 (±15)	55 (±10)
Brook Trout	≥100	19[b]	62 (±11)	296 (± 22)
Whitefish	≥150	1,322 (± 708)	84[b]	17[b]

[a] 200 mm.
[b] No estimate, actual numbers captured.

Table 5. Comparisons of fish population estimates for trout 100 mm in three sections of the Big Lost River from 1986 to 1996.

Sample Location	Year	Rainbow Trout	Brook Trout	Mountain Whitefish
Bartlett Point Road[a]	1988	452	29 [c]	423
	1990	469	2 [c]	219
	1996	552	19 [c]	1,322
Whitworth [b]	1986	281	2 [c]	825
	1990	102	8 [C]	65
	1996	118	62	84[c]
Fox Creek [b]	1986	30 °	22 [c]	717
	1990	126	45	51
	1996	55	296	17[C]

[a]Mainstem Big Lost River. [b]
East Fork Big Lost River.
° No estimate possible due to low recapture numbers, actual numbers captured.

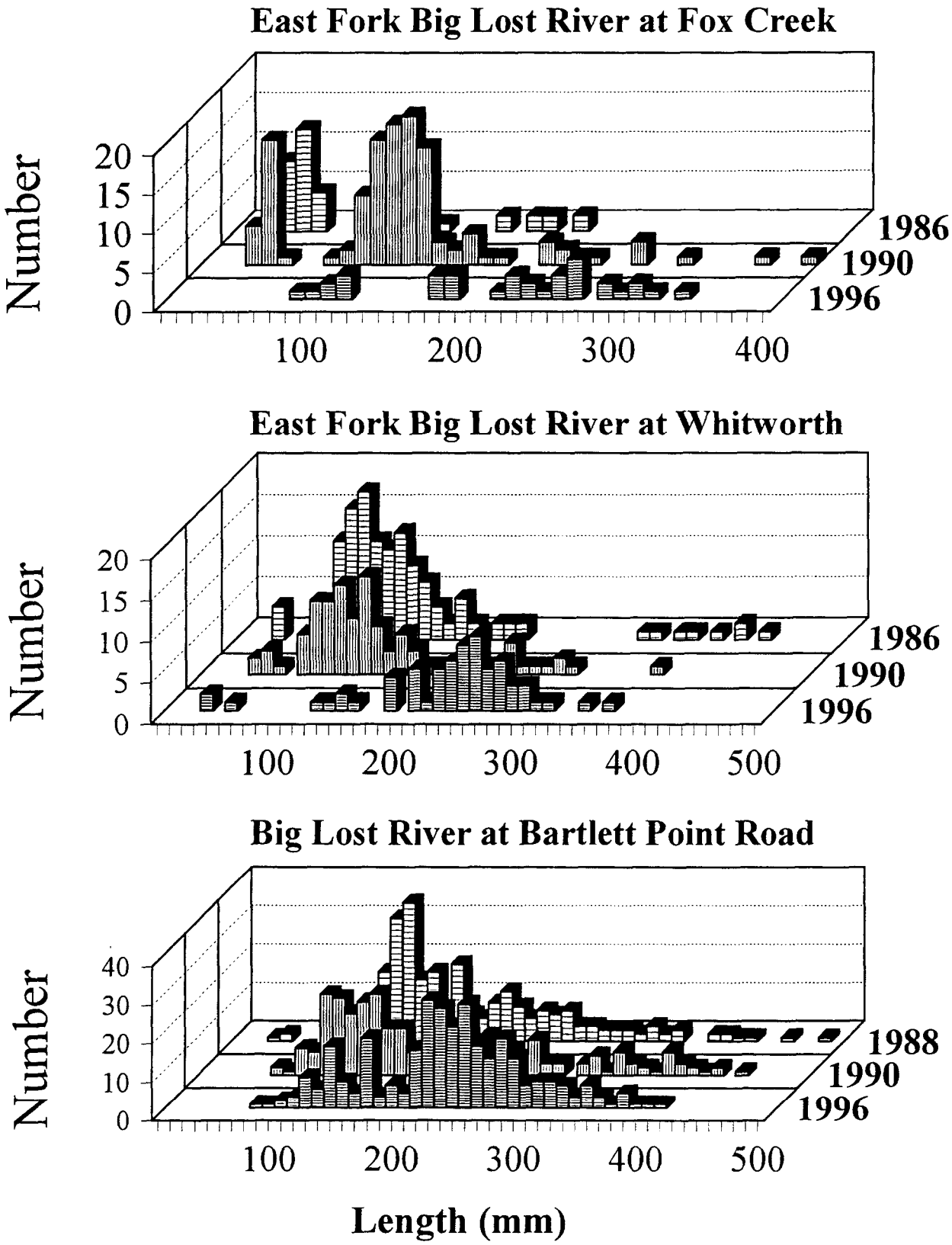

Figure 1. Wild rainbow trout length-frequencies from the Big Lost River drainage.

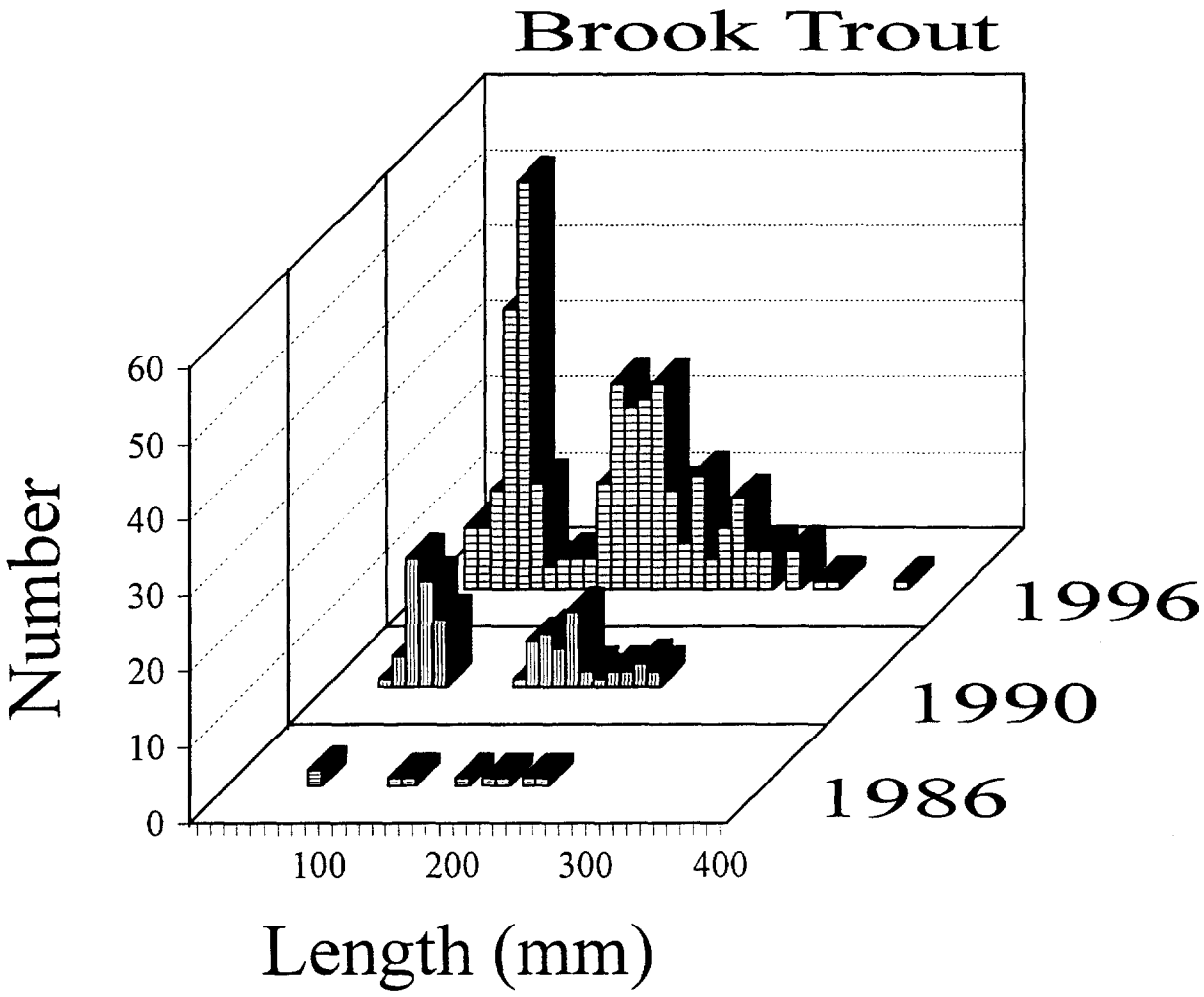

Figure 2. Brook trout length-frequencies from the East Fork Big Lost River at Fox Creek.

In the mainstem Big Lost River at Bartlett Point Road, the number of rainbow trout estimated was similar to the estimates during 1988 and 1990 (Table 5). The 1996 sample contained fewer large rainbow trout (>300 mm) compared to earlier years (Figure 1). I collected no age 0 rainbow trout in this section, which was similar to results from the two sections in the East Fork, but few were collected in this section during 1988 and 1990. Brook trout numbers remained low, which was similar to prior years. Mountain whitefish numbers were more common during 1996, compared to prior sample years, but the confidence limits were wide (Table 4).

Our samples indicated increasing numbers of rainbow trout sampled the farther downstream from the headwaters of the upper East Fork (Fox Creek site). A similar trend was observed for mountain whitefish. The reverse was true of brook trout, with the highest estimates in the headwater section.

I observed clinical signs (deformed head and jaw with some scoliosis) of whirling disease in 0%, 12%, and 4% of the rainbow trout and 1%, 6%, and 5% of the brook trout collected in the Fox Creek, Whitworth, and Bartlett Point Road sections, respectively. No whirling behavior was noted.

DISCUSSION

Based on sentinel test results, MC represents a limiting factor to wild trout populations in the Big Lost River. Rates of clinical signs, histological examinations, and spore counts indicate the incidence of infection and cranial tissue losses are comparable to studies in Montana and Colorado where rainbow trout populations have been heavily impacted by the parasite. Markiw (1992) found clinical signs of whirling disease in fish with more than 30,000 spores per fish. The average spore density was in excess of 30,000 for all tests in rainbow trout and cutthroat trout in Copper Basin and for rainbow trout from the June and July tests at Castlerock. These test groups also had high levels of clinical signs of whirling disease. Walker and Nehring (1995) found average counts of 50,000 to 400,000 spores for wild rainbow trout sampled in sites from the Colorado River and the Williams Fork, a Colorado River tributary. These fish were sampled from areas which had multiple year class failure for wild rainbow trout.

Sentinel test results indicate infection is variable by location and species within the two sites tested in the Big Lost River. The Copper Basin site produced consistently higher infection spore loads and histological ratings compared to the Castlerock site. Both rainbow trout and cutthroat trout in this study became infected at levels which could result in mortality as reported in other studies. Cutthroat trout may have a limited resistance to infection by MC. Cutthroat trout consistently had lower total and mean spore counts at both sites compared to rainbow trout.

Heavy infections of rainbow trout throughout the summer indicated the infective stage of MC was present throughout the testing period in the Copper Basin site of the Big lost River. This study was designed to span the potential period of emergence of wild rainbow trout fry in the Big Lost River. Assuming the hatchery trout used in sentinel tests are good surrogates for wild trout in terms of infection susceptibility, all wild rainbow trout fry in the Copper Basin reach would receive high infections during all summer months, regardless of emergence timing.

Infection did appear to decline during August at the Castlerock site, which may indicate some seasonality of infection or decline in infective stages of the parasite as distance from headwater areas increases.

Nehring and Thompson (1996) observed lower spore loading and lower percentages of YOY rainbow trout with clinical signs in sample sites in the Colorado River, located downstream of Windy Gap Reservoir. They hypothesized Windy Gap Reservoir may be a zone of high infection and that rate of infection decreased with increased flows and distance from the reservoir. It is possible the Copper Basin headwater area of the Big Lost River is a zone of high levels of MC. This could result from lower gradient and increased benthic material which might favor *Tubifex tubifex,* the alternate host. Copper Basin also has a large number of beaver dams which could favor tubifex worms.

Results from Hayspur Fish Hatchery do indicate the parasite is present in the Loving Creek water source, albeit at very low levels. Histological examination did not indicate any infection and digest results indicated only 2 of 20 fish infected with very low spore levels. However, the presence of the parasite makes this water source questionable for rainbow trout rearing. As noted above, the hatchery is currently using only well water for rearing fish to avoid this problem.

Conclusions based on sentinel tests are subject to some limitations. I was only able to hold the fish exposed in the Big Lost River drainage during June and August tests for four months. Markiw (1992) indicated formation of mature spores continued between four and five months post-exposure. The Colorado Division Wildlife recommends holding fish for at least 1,800 Celsius degree units following exposure to insure complete spore formation (Barry Nehring, Colorado Division of Wildlife, personal communication). Following this criteria, we should have held the fish from five to six months at Mackay Fish Hatchery. By not holding fish long enough following exposure, digest results from the June and August test periods may have yielded lower spore counts relative to the fish exposed in July. I only exposed sentinel fish to MC-positive water sources for 10 days. A continuous exposure for the full trial period may have resulted in a higher incidence of infection and spore load. Dick Vincent (Montana Department of Fish Wildlife and Parks, personal communication) has found relatively constant results between short-term and long-term exposure.

A second study limitation developed in the survival and growth of cutthroat trout during the post-exposure rearing period. Cutthroat trout and rainbow trout from the same date and location of exposure were held in the same vat due to limited rearing facilities. The fish were fed a maintenance diet. The cutthroat trout were from a feral stock compared to the rainbow trout which were from a domestic, commercial stock. Rainbow trout from a domesticated brood stock may have out-competed cutthroat trout for limited food. It is possible the parasite did contribute to the pinheaded condition of the cutthroat trout, but I did not include the fish with this condition in the assessments of external clinical signs. If we included the pinheaded condition, nearly 100% of the cutthroat trout would have been rated as having external clinical signs of whirling disease. Few of the rainbow trout had the pinheaded condition.

During fall monitoring of age 0 rainbow trout on portions of three rivers, I observed few fish with clinical signs of whirling disease. I classified only three YOY as having external clinical signs of whirling disease. Sampling did indicate reductions in shoreline YOY rainbow trout numbers, but some reduction was anticipated because of high mortality in this age group and due to habitat change associated with declining river flows and temperatures. Histological

analysis did indicate a decline in the number and percentage of YOY sampled from October to December which tested positive for MC. It is possible mortality was removing these infected fish from the populations which accounted for at least a portion of the population decline. Researchers in Colorado and Montana have observed high percentages of rainbow trout YOY with clinical signs of whirling disease during September and October (Walker and Nehring 1995; Mark Lere, Montana Department of Fish, Wildlife, and Parks, personnel communication). These observations have preceded sharp declines in numbers of YOY rainbow trout sampled in the same areas.

In the drainages I sampled, whirling disease does not appear to be a limiting factor in the survival of wild rainbow trout YOY. This conclusion is supported by stable or increasing rainbow trout populations in the South Fork Boise and Big Wood rivers (Elle, in press). Although sentinel tests produced high infections of rainbow trout and cutthroat trout at the Copper Basin site, wild fish collected in Cabin Creek did not show external signs of disease and histological examination indicated these fish had no infection. The Cabin Creek site was located only 100 m to 200 m upstream from the confluence with the upper East Fork Big Lost River. The Cabin Creek site did have a higher gradient with less benthic deposition compared to the Copper Basin sentinel site.

Population monitoring in the Big Lost River indicates variable population numbers compared to prior sampling. Rainbow trout numbers declined but brook trout increased in the East Fork Big Lost. Based on sentinel test results, Nehring and Thompson (1996) concluded brook trout are susceptible to infections by MC. The declines in rainbow trout numbers support data from sentinel tests which indicate a potential impact from MC. However, based on the results from Colorado, the brook trout numbers would also be expected to decline. Sampling of brook trout in the Big Lost River indicates a lower incidence of MC infection and spore loading compared to rainbow trout. Also, I observed few brook trout with clinical signs of infection. Earlier emergence due to fall spawning may allow brook trout enough growth to reduce susceptibility to infection during the summer months in the Big Lost River drainage.

Southern Idaho experienced drought conditions from 1987 to 1994, the period corresponding to rainbow trout declines and the likely introduction of MC to the drainage. It is possible drought conditions directly resulted in reduced trout populations in the Big Lost River or were additive to the impacts of MC infection. Current snow pack conditions indicate 1997 will again be above normal for runoff and base stream flows. Sampling of population sites in the Big Lost River should be repeated in 1997 to determine if rainbow trout recruitment begins to increase in relation to the presence of more mature adults and improvements in long-term flow conditions.

RECOMMENDATIONS

1. Conduct additional sentinel tests in other drainages testing positive for MC. Compare sentinel test results with population data in streams with stable populations to streams with depressed populations. Sentinel exposures should retain fish for a minimum of 1,800 Celsius degree units following exposure to insure maximum spore formation for comparison purposes.

2. Quantify spore loading and percent of infection of salmonids in drainages testing positive for MC.

3. Surface water from Loving Creek at Hayspur Fish Hatchery is positive for MC and should not be used for rearing any trout for release in MC-negative waters in Idaho.

4. Continue population estimates to monitor year class and population trends in selected positive waters.

ACKNOWLEDGMENTS

Geoff Fitzgerald, Bryan Ledgerwood, and Rod Scarpella assisted in the field work associated with sentinel test exposures and subsequent sampling and with fall fry monitoring and population estimates. U.S. Forest Service personnel assisted with population estimates. Phil Coonts and his staff at Mackay Fish Hatchery maintained the sentinel test groups at Mackay Fish Hatchery following exposure. Mick Hoover and Mel Hughes from Mackay Fish Hatchery assisted with population estimates at a critical period of recapture when a fire preempted assistance by U.S. Forest Service personnel. Bob Esselman and Hayspur Fish Hatchery staff maintained the sentinel test at Hayspur Fish Hatchery. Geoff Fitzgerald and Kelly Gillogly completed the digest analysis with training assistance from Carla Hogge and Roberta Scott at the Eagle Fish Health Laboratory. Dan Schill, Doug Nemeth, and Mark Gamblin provided useful comments and suggestions on early drafts of this report. Rick Holm finalized the report and prepared it for publication.

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ANNUAL PERFORMANCE REPORT

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

Project No.: 3 Title: Wild Trout Investigations

Subproject No.: 2. Evaluations of salmonid restricted harvest regulations, permitting the use of bait

Period covered: April 1, 1996 to March 31, 1997

ABSTRACT

This study is in the second year of a three-year effort to evaluate the changes in the fish populations and sport fisheries since restricted harvest regulations permitting the use of bait were enacted on the Big Wood River during 1990 and on Silver Creek during 1992. During 1996, I completed population estimates for five sections on the Big Wood River and one section on Silver Creek. Data analysis from the 1996 field season was not completed at the time of this report. Data collected in 1996 will be reported along with 1997 data in the completion report due in 1998.

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IDAHO DEPARTMENT OF FISH AND GAME

Virgil K. Moore, Chief
Bureau of Fisheries

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