MONTANA DEPARTMENT OF FISH AND GAME
FISHERIES DIVISION

JOB PROGRESS REPORT
Research Project Segment

State Montana Title Reservoir Investigations

Project No. F-34-R-7 Title Life Cycle Studies of Westslope Cutthroat

Job No. III-a Trout.

Period Covered July 1, 1972 through June 30, 1973

ABSTRACT

A fish trap was operated on Hungry Horse Creek continuously from May 26 through July 29, 1972, and intermittently from September 15 through September 27, 1972. An estimated 590 adult westslope cutthroat trout (Salmo clarki, subsp.) entered the creek for spawning. This spawning run was comprised of 454 maiden and 136 repeating spawners. Repeat spawners included fish that were maiden fish in either 1968, 1969, 1970 or 1971. Downstream escapement of spent fish was 223 of which 54 were repeat spawners. The downstream trap also caught 1,422 juvenile cutthroat moving downstream toward the reservoir in 44 days of operation.

Spawning males were 14.6 inches while females averaged 14.1 inches in total length. Females showed no change in average length for 1972 compared to 1971 but males averaged 0.8 inches longer in 1972 than in 1971. Sex ratios measured in 1963 as 1.0 males to 1.8 females changed to 1.0:6.2 in 1971 and dropped to 1.0:4.0 in 1972.

BACKGROUND

The long-term objectives of this job has been to delineate some of the spawning and rearing characteristics of a reservoir-dwelling population of westslope cutthroat trout. Another important aspect of the program has been as a measure of the general status of westslope cutthroat in Hungry Horse Reservoir. An upstream-downstream fish trap has been operated in Hungry Horse Creek each year since 1968. Numbers of cutthroat spawning in the creek and numbers of juvenile fish emigrating during periods of peak outmigration have been determined yearly.

PROCEDURES

The upstream fish trap was operated continuously from May 24 through June 26, 1972. Adult fish captured were measured to total length, sexed, had scale samples taken (some fish), were examined for identifying marks, marked by removal of the left pelvic fin and released upstream. Spent fish released from the trap

in prior years were marked differently each year so that adults having no marks were considered first-year (maiden) spawners and those marked were identified as repeat spawners from previous years. Juvenile fish released from the downstream trap in 1969 and 1970 were also marked separate from spent spawners. The upstream trap has never been 100 percent efficient. Spent spawners captured moving downstream without the left pelvic fin clip had not been caught previously by the upstream trap.

The downstream trap was placed into operation June 22, fished continuously through July 29, 1972, and eight days between September 15 and September 27, 1972. Spent adult spawners captured were examined for identifying marks, sexed and released downstream. Juvenile trout caught in the downstream trap were enumerated and released. A large number were measured for total length and scale samples were taken for age and growth determinations.

Stream temperatures and volumes were recorded using a 31-day thermograph and a U.S. Geological Survey continuous flow recorder during the period of trap operation. These data will not be included in this segment report but will be reported in the final report.

The trap structure was removed from Hungry Horse Creek in late September, 1972. Concrete abutments, headgate structures and aprons were left intact. An Environmental Impact Statement on the method of trap removal was filed with the State of Montana's Environmental Control Council.

FINDINGS

The upstream trap was fished from May 24 through June 26, 1972. The first ripe cutthroat was captured May 26 and the last one June 24. A total of 449 females and 99 males were captured by the upstream trap. The estimated total run was calculated to have been 473 females and 118 males and was calculated from the ratio of unmarked to marked (left pelvic clip) fish caught in the downstream trap. Spent fish caught in the downstream trap included 180 females of which 9 were unmarked and 43 males of which 7 were unmarked.

Female fish average 14.1 inches total length and ranged from 12.1 to 15.7 inches. The average size and range of females has varied little since 1970. Male fish average 14.6 inches total length and ranged from 10.4 to 16.3 inches in 1972. Size range of males has not varied much since 1970 but average size has shown change. In 1970, average size of males was 14.1 inches; in 1971, 13.8 inches; and in 1972, average size was 14.6 inches total length.

Sex ratio of the 1972 spawning run was calculated to be 1.0 males to 4.0 females. Sex ratios have shown variability since trapping in hungry Horse Creek started in 1963. The sex ratio in 1963 was 1.0 males to 1.8 females, changed to 1.0 males to 6.2 females in 1971 and dropped to 1.0 males to 4.0 females in 1972. No explanation can be given for this fluctuating sex ratio.

The total spawning run in Hungry Horse Creek has declined from 1,003 fish in 1970 to 590 fish in 1972. Gill net sampling in Hungry Horse Reservoir in 1970 caught an average of 1.2 cutthroat per net night. The average catch per net night in 1972 decreased to 0.7 fish per night. The declining catch rates both in gill nets and stream trap appear to be of the same magnitude.

Reasons for this decline in the spawning population appears to be related to in-reservoir survival. Capture of juvenile cutthroat trout during the peak of outmigration was about 2,200 fish in 1968, 2,300 fish in 1969, 2,000 in 1970 and 1,900 in 1971. Maiden fish spawning in 1972 would most likely be from the juvenile outmigration of 1970 while maiden fish spawning in 1970 would have been from the 1968 juvenile outmigration. About equal escapement of juvenile fish should have resulted in similar numbers of maiden spawners with equal reservoir survival rates. The 1972 spawning run included 454 maiden fish while the 1970 spawning run contained 764 maiden fish.

Data shown in Table 1 gives the number and percent of maiden and repeat spawners for 1970, 1971 and 1972. These data suggest no noticeable change in each years spawning run in the proportion of maiden and repeating fish.

Table 1. Numbers and percentage of maiden and repeat spawning cutthroat trout in Hungry Horse Creek, 1970, 1971 and 1972

Type fish	1970		1971		1972	
	Number	Percent	Number	Percent	Number	Percent
Maiden	764	76	572	81	454	77
Repeat	239	24	131	19	136	23
Total Run	1,003		703		590	

The downstream trap was placed into operation June 22 and operated continuously through July 29, 1972. Downstream trapping was resumed September 15 and the trap was fished a total of eight days between that date and September 27. The downstream trap captured 223 spent spawners including 54 repeat spawners (1 male and 53 females) and 169 maiden spawners (42 males and 127 females).

Spawning survival during the period of time from passing upstream to being recaptured downstream was 37 percent for males and 38 percent for females.

The downstream trap captured 1,422 juvenile cutthroat trout as they moved downstream toward the reservoir. Scales from 563 fish were analyzed for age and growth patterns. Age structure and growth rates of the outmigrant juveniles collected in 1972 are compared to juveniles collected in 1970 in Table 2.

Table 2. Age and growth and age class distribution of juvenile cutthroat trout collected during out-migration, Hungry Horse Creek, 1970 and 1972

Year	Length in Inches at Annulus					
	Percent in Age-class	I	Percent in Age-class	II	Percent in Age-class	III
1970	43	2.8 (212)*	52	4.6 (120)	5	6.5 (9)
1972	37	2.8 (326)	53	4.6 (205)	10	6.1 (32)

*Number in parenthesis is size of sample

These age and growth data indicate little change in growth rates of juvenile fish sampled in 1970 and 1972. Strength of age-classes show some change most marked in age-class III fish. The apparent increase in percent of age-class III fish found in the age and growth data may not be a true image of the total numbers of outmigrant fish. Age structure shown by sampled fish compared to total numbers of outmigrant fish will be reported in the final job report and likely will be more conclusive.

The trap structure was removed from Hungry Horse Creek in September, 1972. Concrete structures, abutments, bypass channel headgate, and aprons were left intact. Bedload material deposited upstream from the velocity barrier was not removed but left in place to be distributed downstream with the 1973 high water. Examination of the trap site in late June, 1973, showed that the creek had eroded through the bedload deposits to its original bottom.

The 1973 spring peak flows were about 50 percent of normal and no erosion problems below the concrete aprons were noted. Channel width to accomodate normal peak flows was not created by 1973 high water. Stabilization of channel characteristics will be observed following a high spring flow.

DISCUSSION

Measuring the spawning run of cutthroat trout of Hungry Horse Creek for several years has yielded much information on the life history of this species and on the inter-relationship between the animal and its environment. Spawning runs measured in the late 1960's ranged in size from 1,000 to 1,200 fish and declined to 590 fish in 1972. Reasons for this change in spawning run sizes are known to be complex.

Work will be continued on a write-up of a final report covering all activities in Hungry Horse Creek since 1963. Some data from investigations conducted in the reservoir since 1958 may also have to be incorporated. At the present time, it is considered that two final reports dealing with different aspects of the Hungry Horse Creek investigations would be best. One of these would deal with life history aspects of the study and the other with the population statistics of the declining numbers of spawning fish using the drainage. It is anticipated that these reports will require considerable time for evaluation and analysis of all pertinent data. Further information related to both the reservoir and stream environments from agencies such as Bureau of Reclamation and U.S. Forest Service will be needed.

It would also appear at this time to be advantageous if the Hungry Horse Creek trap were reinstalled and fished to capture spawning adults and juveniles for a one-year period in about 1977 or 1978. These new data could be useful in determining if spawning run declines were related to habitat changes or to other factors including the effect of the trap and handling both spawning and juvenile fish for five consecutive years.

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Waters referred to: 08-3580 Hungry Horse Creek
08-8860 Hungry Horse Reservoir