MONTANA DEPARTMENT OF FISH AND GAME
FISHERIES DIVISION

JOB PROGRESS REPORT
RESEARCH PROJECT SEGMENT

State Montana Title Reservoir Investigations

Project No. F-34-R-6 Title Life History Studies of Westslope Cutthroat

Job No. III-a trout

Period Covered July 1, 1971 through June 30, 1972

ABSTRACT

A fish trap was operated on Hungry Horse Creek from May 25 through July 27, 1971. An estimated 703 adult westslope cutthroat trout (Salmo clarki subsp.) entered the creek for spawning. The 1971 spawning run included 131 repeat spawners that had spawned in Hungry Horse Creek in 1968, 1969 or 1970. Downstream escapement of spent fish was 256 including 52 repeat spawners. The downstream trap also caught 1,951 juvenile cutthroat trout as they moved toward Hungry Horse Reservoir.

Sex ratio of the adult fish was 1.0 males to 6.2 females. Several females caught in the downstream trap were examined internally and found to contain eggs starting to be reabsorbed. Concern is expressed that insufficient adult males may be present. Sex ratio of cutthroat trout gill netted in the reservoir in 1970 was determined to be 1.0:1.8 males to females while sex ratio of 103 outmigrant juveniles caught in 1971 was determined to be 1.0:1.9.

The wooden inlet structure regulating flows into the bypass channel was replaced with a concrete structure.

BACKGROUND

An upstream-downstream fish trap has been operated in Hungry Horse Creek annually since 1968. Numbers of westslope cutthroat trout spawning in Hungry Horse Creek and numbers of outmigrant juvenile fish leaving the creek during the period of peak outmigration have been determined yearly. The long term objectives of this project have been to delineate some of the spawning and rearing characteristics of the westslope cutthroat, their movement patterns in the reservoir environment and the reservoir population of cutthroat trout.

OBJECTIVES

The objectives of this job were to: (1) determine numbers of adult cutthroat spawning in Hungry Horse Creek, (2) determine downstream escapement of spent adult fish, (3) determine downstream escapement of juvenile cutthroat trout during period of greatest movement, (4) correlate upstream and downstream cutthroat movement with stream volumes and temperatures and (5) replace the wooden bypass channel headgate with a concrete structure and perform other needed maintenance.

PROCEDURES

The upstream fish trap was operated continuously from May 25 through June 26, 1971. Adult fish captured were measured in total length, sexed, had scale samples taken (some fish), were examined for identifying marks and released upstream. Spent fish released from the trap in 1968, 1969 and 1970 were each given a fin-clip or tag singular to that year. Captured repeat spawners bearing a tag would, in addition, be given a fin-clip signifying the year. As an example a fish re-entering the trap to spawn in 1971 could have a fin-clip from 1968, plus a jaw-tag and fin-clip from 1969 plus another fin-clip from 1970.

Juvenile fish released from the downstream trap in 1969 and 1970 were marked by fin removal or jaw-tags. The jaw tags were color coded or numbered so that they were different from tags used in spent adult fish. Fin-clips were selected so that chance of mixing between the juveniles and spent adults would be minimized. Noting of marks and tags on fish in 1971 enabled project personnel to determine fish that were first-time spawners in Hungry Horse Creek, spawners marked as smolts returning to the natal stream to spawn or repeat spawners.

In 1971, adult fish entering the upstream trap were marked by removal of the right posterior tip of the pre-maxillary bone.

The downstream trap was placed into operation and fished continuously from June 18 through July 27, 1971. Spent adult fish caught were measured, sexed and examined for identifying marks. If a fish carried a combination of marks which included the pre-maxillary clip, it was released downstream. Fish with only the pre-maxillary clip were tagged with a numbered jaw-tag and released. All adult trout were given a pre-maxillary clip either passing upstream or downstream and a numbered jaw tag passing downstream.

Juvenile trout caught in the downstream trap were enumerated and released downstream. A large sample were measured for total length. A total of 104 were killed and sex determinations made.

Stream temperatures through the period of trapping were collected using a 31-day continuous recording thermograph. Stream volumes during the same period were obtained from a U.S. Geological Survey continuous flow recorder. These data will not be included in this report but are on file at Regional Headquarters, Montana Department of Fish and Game, Kalispell, Montana.

FINDINGS

The upstream trap was fished from May 25 through June 26, 1971 and the first ripe adult cutthroat trout was captured May 26th. A total of 81 males and 562 females (determined by external characteristics) were captured by the upstream trap and the estimated total run was calculated to have been 97 males and 606 females. The estimated total spawning population was calculated from the ratio of unmarked to marked (pre-maxillary clip) fish caught in the downstream trap. Spent fish caught in the downstream trap totaled 256. There were 30 males of which two were unmarked and 226 females of which 16 were unmarked.

Male fish averaged 13.8 inches total length and ranged from 9.0 to 16.2 inches. Females averaged 14.1 inches and ranged from 12.4 to 16.1 inches total length. Average size of the females and range of size of females and males conformed closely to data collected in 1970. Average size of the males measured in 1971 was 0.3 inches smaller than that found in 1970.1/ It was noted that in 1971 most of the males were either less than 13.0 inches or larger than 15.0 inches. Most of the female fish were closely arrayed around the average size.

Sex ratio of the 1971 spawning run was calculated to be 1.0 males to 6.2 females. Several female fish were caught in the downstream trap in mid- and late July that had not spawned or that appeared to be only partially spent. Internal examination confirmed that they had not completed spawning and that eggs were being reabsorbed.

The percent of females in the cutthroat sex ratio of Hungry Horse Creek has been increased yearly. The sex ratio in 1963 was 1.0 : 1.8 males to females, compared to the 1971 ratio of 1.0 : 6.2. No logical explanation can be given for this change. Gill netting in the reservoir in 1970 yielded a ratio of 1.0 : 1.8 for both immature and mature fish. Sexing of 104 outmigrant juveniles caught by the Hungry Horse Creek downstream trap in 1971 resulted in a sex ratio of 1.0 : 1.9 males to females. Size of juveniles examined ranged from 3 to 7 inches total length.

Data collected in 1970 indicate that cutthroat trout spawning in Hungry Horse Creek exibited some alternate year spawning. This was further substantiated in 1971. The 1970 spawning run included 57 fish that spawned in 1968 and 1970 in Hungry Horse Creek while the 1971 spawning run included 57 fish that spawned in 1969 and 1971 in Hungry Horse Creek.2/

Little evidence has been collected to indicate that fish marked in Hungry Horse Creek spawn in other reservoir tributary streams except Emery Creek. Creel census data collected during the opening two or three week-ends of angling included some fish caught at Emery Creek which has been marked at Hungry Horse Creek. Both creeks drain into the same reservoir bay and Emery Creek was a tributary of Hungry Horse Creek prior to impoundment of Hungry Horse Reservoir in 1952.

1/ Huston, Joe E. 1971. Life cycle studies of westslope cutthroat trout and mountain whitefish. Job Prog. Report, Federal Aid to Fish Restoration Project F-34-R-5, Montana Department of Fish and Game, Job II-a, 7pp. mimeo.

2/ Ibid.

The total spawning run was estimated at 1,003 fish in 1970 and 703 fish in 1971. Data on spawning populations prior to 1970 indicate a gradual decline in numbers of spawners but no year so dramatic as from 1970 to 1971. The 1971 spawning data indicate that poor survival of cutthroat while in the reservoir may be a major cause of their decline.

An analysis of repeat spawning the following year by "new" fish spawning the first time in either 1969 or 1970 showed marked changes. A "new" fish is one that is spawning in Hungry Horse Creek for the first time. The estimated downstream escapement of "new" fish from the 1969 spawning run totaled 298 fish of which 182 returned to spawn in 1970. The return was 61 percent. A total of 308 "new" fish escaped following spawning in 1970 but only 38 of these fish returned to spawn in 1971. Return of these fish was only 12 percent; a decided reduction.

The potential for alternate year spawning was considered as a possible reason for the low return of the 1970 "new" fish in 1971. Preliminary analysis of the 1972 spawning run data indicated that only about 56 "new" fish from the 1970 downstream escapement spawned in Hungry Horse Creek in 1972 as alternate year spawners.

The 1970 spawning run included 239 fish (24 percent) which were repeat spawners and 764 (76 percent) which were "new" fish. The 1971 spawning run included 131 (19 percent) repeat spawners and 572 (81 percent) "new" fish. These data suggest no great change in make-up of the spawning run between "new" and repeat spawners. They do suggest a general decline affecting both groups of fish.

The most numerous age-groups as determined by scale reading in the spawning runs has been four year-old fish which migrated out of the natal stream at two years of age. The most numerous age-group of juvenile fish moving downstream out of Hungry Horse Creek into Hungry Horse Reservoir has been two year-old fish. The majority of fish entering Hungry Horse Creek for first-time spawning in 1970 should have been from the juvenile outmigration of 1968 while "new" fish entering for spawning in 1971 should have been from the juvenile outmigration in 1969.

Capture of juvenile cutthroat during the peak of outmigration in 1968 was about 2,200 fish. The number caught during the same period in 1969 was about 2,300 fish. These data would indicate similar downstream escapement between the years which with similar reservoir survival should have resulted in similar numbers of "new" fish entering the spawning run. However, as discussed above, the 1971 spawning run was markedly less than the 1970 run.

Operation of Hungry Horse Reservoir for flood control and production of electrical power has changed. Prior to 1965 average annual drawdown was about 60 feet. For the years of 1965 through 1971, average annual drawdown has increased to about 100 feet. Drawdown in these later years has also occurred at different times of the year than before 1965. Early years' drawdown usually did not start until November or December and filling was accomplished by late June. Time of drawdown since 1965 has varied from August to October and filling has not been completed until early or mid-July.

The downstream trap was placed into operation June 18 and fished through July 27, 1971. A total of 256 spent, partially spent and unspawned fish were captured and released downstream. Of these fish 226 were females and 30 were males.

Spawning survival (For period from passing through trap going upstream until return to trap) for males was 31 percent compared to 37 percent for females. The downstream trap also captured 1,951 juvenile cutthroat trout as they moved downstream toward the reservoir.

In September 1971, the wooden headgate structure controlling flows into the bypass channel was replaced with a concrete headgate. The new structure is ten feet wide divided into two equal bays. The old structure was eight feet wide divided into two equal bays. The new structure is aligned with the stream so that additional bays can be added if needed. The new structure was also designed to draw water away from the main velocity barrier (which includes the fish trap) and insure fish passage after the velocity barrier is removed in fall 1972. Soundness of the design will be determined in spring 1973.

RECOMMENDATIONS

The Hungry Horse Creek fish trap should be operated to enumerate the upstream movement of adults into the creek for spawning and the downstream escapement of juveniles into Hungry Horse Reservoir in 1972. It is planned that this structure will be removed in early fall 1972 and the downstream trap will be operated up to the time of removal.

Work should be started on a final job report covering all activities on this project since 1963. It is expected that write-up of this report will entail work in fiscal years 1973 and 1974.

Hungry Horse Creek has considerable volume and velocity in the area of the trap site. Trap removal will be done in the best manner possible leading to the least environmental disturbance. It was noted in an Environmental Impact Statement that some creek bottom disturbances were unavoidable. Work in the area may by needed in future years to stabilize channel characteristics.

Prepared by Joe E. Huston

Date April 30, 1973

Waters referred to:

1-08358001
1-08886005