MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
April 1, 1966

PROGRESS REPORT

EVALUATION OF CATCHABLE-SIZE AND SUBCATCHABLE-SIZE RAINBOW TROUT PLANTED IN CANYON FERRY RESERVOIR

Introduction

For several years the basic maintenance plant into Canyon Ferry Reservoir has been 100,000 catchable-size rainbow trout (7 inches total length and longer) each spring and 100,000 subcatchable rainbow each fall. Starting in fall 1961, approximately 50,000 trout of each fall plant and of each spring plant were marked by removal of fins or maxillary bones. A creel census was started in 1962 to compare the return to the creel of catchable-size trout to that of subcatchables on the basis of cost of each type stocking.

In 1963 the opportunity arose to experimentally stock an additional 200,000 hatchery rainbow trout - 100,000 in mid-summer when they averaged 5 inches long and 100,000 in the fall when they averaged 6.8 inches. One-half the fish in each of these two plants were marked with a distinctive fin clip. These experimental plants were repeated in 1964 and 1965 with some variation in numbers and average size of fish. Bureau of Sport Fisheries and Wildlife personnel conducted the creel census during the main fishing season in 1962, 1963 and 1964 and censused winter fishing from January 11 through March, 1964.

The 1963 and 1964 data indicated one-half or more of the yearly harvest was taken during May and June and that the species and marked fish composition for these two months were essentially the same as during the fishing season. Therefore, it was decided to limit the 1965 creel census to these two months. The Bureau of Sport Fisheries and Wildlife furnished a boat and outboard motor and is to reimburse the state for the state census taker's salary and personal benefits. The State Fish and Game Department furnished gas, oil and other travel expenses for the census taker, administered the study, and compiled the data.

Methods

The creel census during May and June 1965 was conducted about the same as in previous years. The census taker worked a five-day week on a prearranged systematic-random sampling schedule (Table 1). He used both a boat and a pickup truck in contacting as many fishermen as possible and at the same time endeavored to contact a representative cross-section of the fishermen. In addition a few counts of boat and shore fishermen were made as in former years. These data will not be presented in this report; however, they should be useful in future analyses for determining the ratio of boat to shore fishermen, the distribution of fishermen around the reservoir and possibly trends in fishing pressure.

The local Montana Fish and Game Department warden conducted a non-scheduled creel census and contacted 31 fishermen in January, February and March and 830 fishermen from April through July 1965. Some of the data he collected has been incorporated with that collected by the regular creel census taker.

The fish marking phase of the study was terminated following the April 1965 plant from Bozeman National Fish Hatchery and the September 1965 plant from Bluewater State Fish Hatchery.

During May and June 1965 Mr. Buel Reed was engaged as full-time creel census taker on Canyon Ferry Reservoir. Mr. Erwin Kent was the local game warden. The data were tabulated by the State of Montana's Data Processing Center. Mr. Thomas H. Leik, Montana Fish and Game Department Statistician, assisted with project design and analyses of data.

Table 1. Creel Census Clerk's Schedule 1965

April	16																	
May	1*	2	5*	6*	7*	8*	9	10	13	14	15*	16	17*	19*	20*	22*	23	25
	26	28	29*	30	31*													
June	1*	5*	6	7	8	9	12	13*	16*	17*	18*	19*	20	21	22	25	26	27*
	28*																	

* Indicates census from 1:00 p.m. - 10:00 p.m. Census on other days was from 9:00 a.m. to 6:00 p.m. except on April 16 when it was from 8:00 a.m. to 1:00 p.m.

Findings

The creel census taker contacted fishermen on the reservoir 1 day in April, 23 days in May and 19 days in June. The following is a summary of the information he collected:

Days sampled by creel census taker	43
Number of fishermen interviewed	4,831
Number of hours fished by fishermen contacted	22,990
Trout per hour	0.08

Fish caught by fishermen interviewed:

No.	Category	Average total length (inches)
679	Hatchery rainbow trout with fin or maxillary clip.	15.6
944	Hatchery rainbow trout without fin or maxillary clip - recognized as hatchery fish by the dorsal fin which was eroded at time of planting and then regenerated to a varying degree	15.3
48	Wild rainbow trout	13.4
85	Brown trout	16.9
34	Yellow perch	8.8

Table 2. Summary of Marked Rainbow Planted 1961 - 1965 and Checked in Creels in 1965

Planted 1961 - 1965 [1]						1965 Catch				
						No. checked by				
Plant No.	Mark[2]	Date Planted	Av. total length when planted (inches)	Pounds of marked fish planted[3]	% of pounds planted	Census taker[4]	Warden[4]	Combined	% of Marked fish	Av.[5] length (inches)
1	Ad-LV	Oct. 61	6.3	4,444	6.0	19	2	21	2.6	16.9(15)
2	Ad-RV	Apr. 62	8.5	11,355	15.4	47	10	57	7.1	17.2(41)
3	Ad-LP	Sept. 62	5.6	3,537	4.8	82	21	103	12.8	16.5(53)
4	Ad-RP	Apr. 63	8.1	11,020	15.0	100	26	126	15.6	16.3(70)
5	LV	July Aug. 63	5.0	2.656	3.6	139	14	153	19.0	15.6(153)
6	RV	Sept. Oct. 63	6.8	6,370	8.7	145	31	176	21.9	15.0(175)
7	Ad-LM	Sept. 63	5.3	3,000	4.1	48	4	52	6.5	15.9(37)
8	Ad-RM	Apr. 64	7.6	8,860	12.0	80	5	85	10.6	15.6(59)
9	An	July Aug. 64	5.2	2,503	3.4	3	4	7	0.9	14.0(7)
10	An-RV	Sept. 64	7.5	7,640	10.4	1	1	2	0.2	12.2(2)
11	Ad-LV	Sept. 64	5.0	2,364	3.2	5	0	5	0.6	10.2(5)
12	Ad-RV	Apr. 65	8.0	9,858	13.4	10	8	18	2.2	10.2(15)
	Totals			73,607	100.0	679	126	805	100.0	

1/ Plants from Bluewater Hatchery in late July and August 1965 (5.6-inch fish) and in September 1965 (7.0-inch fish) are not included as all creel census terminated before they were planted.

2/ Fin or maxillary bone clipped:

Ad = adipose, LV = left ventral, RV = right ventral, LP = left pectoral
RP = right pectoral, LM = left maxillary, RM = right maxillary, An = anal

3/ Pounds of marked fish shown for plant 11 were computed as one-half the total September 1964 plant from Bozeman Hatchery as this was the portion marked. Pounds of marked fish shown for other plants are from hatchery records.

4/ Marked fish from plants 1 and 2 were distinguished from those in plants 11 and 12 by size - the former being 13 inches and over total length; the latter, 12.5 inches and less.

5/ Average lengths are based only on fish with distinct markings. The number of fish is in parentheses.

Fish planting and catch data are presented in Table 2. An adipose fin clip in combination with another clip identifies fish from Bozeman Hatchery. Other planted fish were from Bluewater Hatchery.

Twenty percent of the marked fish checked by the census taker and 27 percent of those checked by the warden had non-valid clips, that is, clips that did not conform to the known markings. Nearly two-thirds of these had an adipose-only clip (Bozeman Hatchery). The three of these that were 12.5 inches or shorter were added to the marked fish from plant 12 (Table 2). The balance of the two-thirds was distributed among the marked fish from other Bozeman Hatchery plants (plants 1, 2, 3, 4, 7, and 8). The other one-third of the fish with non-valid clips were distributed among marked fish returned from Bluewater Hatchery plants.

For purposes of analyses the plants of marked fish were categorized as follows:

Fall plants from Bozeman Hatchery (plants 1, 3, 7, and 11).

Spring plants from Bozeman Hatchery (plants 2, 4, 8, and 12).

Early plants from Bluewater Hatchery (plants 5 and 9).

Late plants from Bluewater Hatchery (plants 6 and 10).

To facilitate analyses it was considered that for the size range involved, each pound of fish planted was of equal cost.

The creel census was not designed to determine total harvest by fishermen. Returns of marked fish to the creel in 1965 were compared to planting data to determine which planting categories provided most fishing in 1965. Data from Table 2 were summarized as follows:

	Marked Fish Planted 1961 - 1965			Marked Fish in Creel, 1965 (Data from Census Taker & Warden)		
Category	Av. Length (inches)	Total Pounds	% of Total Pounds	Number	% of Total Number	Av. Total Length (weighted)
Fall Bozeman	5.0 - 6.3	13,345	18.1	181	22.5	16.2 inches
Spring Bozeman	7.6 - 8.5	41,093	55.8	286	35.5	15.9 "
Early Bluewater	5.0 - 5.2	5,159	7.0	160	19.9	15.5 "
Late Bluewater	6.8 - 7.5	14,010	19.0	178	22.1	15.0 "
Totals		73,607	99.9	805	100.0	

These data are interpreted as showing the early plants of Bluewater Hatchery fish were the most effective since they comprised only 7% of the fish planted, yet comprised nearly 20% of the marked hatchery fish caught. The fall plants from Bozeman Hatchery and the late plants from the Bluewater Hatchery were about equal in effectiveness. The spring plants from Bozeman Hatchery were least effective.

The same procedure was used with the 1964 data. These were summarized as follows:

Marked Fish Planted 1961 - 1964[1]				Marked fish in Creel, 1964[1] (Data from Census Taker Only)[2]	
Category	Av. Length (inches)	Total Pounds	% of Total Pounds	Number	% of Total Number
Fall Bozeman	5.3 - 6.3	10,981	21.4	124	19.6
Spring Bozeman	7.6 - 8.5	31,235	61.0	335	52.8
Early Bluewater	5.0	2,656	5.2	106	16.7
Late Bluewater	6.8	6,370	12.4	69	10.9
Totals		51,242	100.0	634	100.0

Here again the data was interpreted as showing the early plant of Bluewater Hatchery fish was most effective. If this method of analysis is used to evaluate only Bozeman Hatchery plants, the results indicate that during 1964 the catchable and subcatchable plants were about equally effective in providing fishing, whereas for 1965 the subcatchable plants were more effective.

This method of analysis was not used to evaluate the catch for individual years prior to 1964. Earlier than this relatively few plants were represented by marked fish in the creel. Although the data are not presented in this progress report, the spring 1962 plant of catchables from Bozeman Hatchery was an outstanding contributor to the creel in 1962, 1963 and 1964. The reason for this has not been determined nor was this outstanding success repeated by subsequent spring plants from Bozeman Hatchery.

Discussion

Fish in plant 8 (Table 2) were marked in September 1963 by removal of adipose and the free end of the right maxillary. In April 1964, prior to planting, a sample of these were checked and the right maxillary on almost half the sample showed an unexpectedly high degree of regeneration. Regeneration of clipped maxillaries probably accounts for the comparatively poor return from plants 7 and 8. This was partly compensated for by the method used to distribute non-valid clips (see Findings).

The return from plants 9 and 10 was extremely low. The reason for this is not known.

1/ Planting and catch data from plants 9, 10, 11 and 12 were not used in this analysis as these fish were planted too small or too late to be in the 1964 catch.

2/ These data are from the April through September 1964 monthly summaries of the Bureau of Sport Fisheries and Wildlife creel census takers. Sixty-eight of the 634 marked fish observed in creels had marks which could not be definitely identified as to the plant. All of these had an adipose clip identifying them as fish from Bozeman Hatchery. They were therefore distributed proportionally among the fish with Bozeman Hatchery clips.

As stated, half of each plant of hatchery fish was marked, therefore each marked fish in the creel represented two fish that could be designated as to plant. The percentage of hatchery fish in the creel for which the plant could be designated has increased each year until in 1965 it was 84 percent of the hatchery fish observed by the creel census taker and the game warden. This leaves 16 percent unidentified. Nearly 10 percent of the marked hatchery fish observed in the 1965 creel were considered as being from the fall 1961 and spring 1962 plants. Therefore it may be that most of the unidentified hatchery fish were from still earlier plants rather than fish that should have been clipped but were missed, fish with regenerated fins, or wild fish that had erroneously been identified as hatchery fish.

Fish from the same lot at Bozeman Hatchery were used for a fall plant and the subsequent spring plant. Likewise fish from the lot used for an early plant from Bluewater Hatchery were held in the hatchery for the later plant the same year. Data in Table 2 indicates that trout in an earlier plant grew as fast in the reservoir as trout in the later plant grew in the hatchery. The good growth and relatively good survival of subcatchable trout in the reservoir makes these plants particularly effective. From 1954 to 1957 one-half million to a million 2-inch rainbow trout were planted in the reservoir each year but they failed to sustain the sport fishery. This indicated that this size fish was too small.

The .08 trout per hour recorded in the May and June 1965 census was the poorest catch rate so far. Data collected by the game warden confirmed this poor success. The 545 fishermen he checked during May and June had an average catch of only .09 trout per hour. The catch per hour for a comparable period in 1963 was .18 fish and in 1964 was .26 fish.

Conclusions

The conclusions drawn at this point in the study are: (1) Plants of subcatchable-size trout provide more fishing per pound and in turn per dollar spent than plants of catchable-size trout. (2) The earlier in the summer plants of subcatchables are made the better the return.

Recommendations

1. It is recommended the annual maintenance plant into Canyon Ferry Reservoir be 300,000 subcatchable rainbow trout averaging 5 inches. These should be planted as early in the summer as possible. The results of this study so far indicate this lower cost plant would provide better fishing than the 100,000 catchables and 100,000 subcatchables presently scheduled each year. In years when there are surplus hatchery fish due to extreme drawdowns of irrigation reservoirs, etc. extra fish can be planted in Canyon Ferry on an opportunity basis.

2. Experimental plants of kokanee should be made in Canyon Ferry Reservoir. Other desirable species that are relatively inexpensive should be tried when feasible.

3. It is anticipated that significant numbers of marked fish will be harvested from Canyon Ferry Reservoir each year for two or three years. In the interest of economy the creel census effort can be reduced to a fairly intensive non-scheduled creel census by local game wardens. It is believed this will be sufficient to show which plants of marked fish are contributing most to the creel and to fishing success from year to year.

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