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MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT

State of Montana

Project No. F-7-R-14 Name: Northwest Montana Fishery Study

Job No. III Title: Survey of Cutthroat Trout and Dolly Varden in the Flathead River and Tributaries Above Flathead Lake

ABSTRACT

Flathead Lake and its tributaries are an integral system as interdependent as are the various rooms of a man'domicile. While this study is concerned primarily with the extent of movement of cutthroat trout and Dolly Varden as shown by tagged and recaptured fish, it demonstrates beyond doubt that the fishery of the entire lake and stream complex cannot be divided into segments, isolated by barriers, without destruction of the complete fishery. Mature cutthroat inhabiting stream areas at long distances from the lake or lower river tend to be more sedentary than mature fish in the middle or lower stream areas. These latter fish usually become lake residents after their immature years in the rivers.

Cutthroat trout movements within the lake appear random except for an indication of concentrations near Big Arm Bay during winter months.

Dolly Varden movements within the lake indicate a preference for shoal or shore areas, however in May and June there is a concentration off the Flathead River mouth just prior to migration upstream.

RECOMMENDATIONS:

The documented movements recorded on the cutthroat trout and Dolly Varden in the Flathead River system have governed the formulation of the following recommendations:

1. To insure for the future, a natural reproducing population of cutthroat trout and Dolly Varden for sport fishing in the lower 50 miles of the North and Middle Fork Rivers, in the 180 miles of Flathead river and in 126,000 acre Flathead Lake, the free flowing waters of the river and lake system, the natural spawning grounds and rearing areas must be maintained and preserved.

2. To insure maximum recruitment to the lake population from the upper river spawning areas; an investigation should be initiated to determine what might limit such recruitment and whether there is intraspecific competition in these spawning streams.

3. To facilitate the maintenance of water quality now present in the waters above Flathead Lake, the water quality monitoring study should be continued.

4. To complete the fisheries study on cutthroat and Dolly Varden, it is recommended that an intensive study be made on the fish population in Flathead Lake to determine seasonal changes, trends from year to year, and inter-specific relationships.

OBJECTIVES:

The Flathead River and tributary streams above Flathead Lake have provided an important fishery on cutthroat trout and Dolly Varden. Little is known about the extent of fish recruitment from the upper tributaries to the larger river system and from the river system to the lake below. The objectives of this investigation are to determine distances involved in cutthroat trout and Dolly Varden spawning migration in this drainage, the timing of the migration, and the extent to which some of the major tributaries of the North and Middle Fork Rivers are used for spawning. A secondary objective is to obtain information on other fish species--- particularly information that will aid in understanding fish production in these waters and the recruitment of the native fishes in the Flathead River system.

TECHNIQUES USED:

Major emphasis in the field work was placed on the continuation of water quality study on the Flathead River. Standard water measurements were made at the four established collection stations at two week intervals. The water quality data collected were: (1) dissolved oxygen concentration; (2) total alkalinity; (3) standard conductance: (4) pH; (5) water temperature (Taylor recording thermometers were maintained at two stations - Hungry Horse Gauge Station and Holt Bridge).

The intensive tagging of Dolly Varden and cutthroat trout in the upper Flathead River drainage was discontinued in 1963 however catch and recapture data has been recorded as received for final analysis and reporting. This report includes all tagging and movement data conducted on this river system, 1953 - 1965.

FINDINGS:

WATER QUALITY. In this report there is no presentation or discussion of the results of the water quality monitoring on the upper Flathead River. A portion of the results, July 1964 through December 1964, was included in the F-7-R-13 Job III Completion report. The remainder of the data will be presented in the report for F-7-R-15, Job III.

MOVEMENTS OF CUTTHROAT TROUT AND DOLLY VARDEN. The major tagging projects on upper Flathead River drainage consisted of: (1) a two year (1953-54) tagging analysis of Dolly Varden and cutthroat trout in the North Fork River (Projects F-7-R-3 & 4, prepared as M. S. thesis, Montana State University, Missoula by Daniel G. Block in 1955); (2) a one year 1957 cooperative Fish and Game - U. S. Fish and Wildlife Service tagging program on the Middle Fork of the Flathead River (F-7-R-7, Job IV - Stefanich, 1957; (3) a three year intensive tagging study on cutthroat trout in the North and Middle Forks and main stem of the Flathead River above Flathead Lake (Completion reports by Delano A. Hanzel and Howard E. Johnson, Projects F-7-R-10 Job III, F-7-R-11 Job III and F-7-R-12 Job III).

The tagging work in 1953-54 and 1957 was accomplished by the use of two-way weirs in the upper reaches of the North and Middle Fork Rivers. The use of the weirs in the fall season was found to be an effective way to sample the mature Dolly Varden. During these years 385 mature Dolly Varden were tagged and released. Other methods of collecting and tagging fish were tried; these included electro-fishing, angling, gill nets, pirate traps and fyke nets. All of these methods except angling failed to produce adequate numbers of cutthroat trout. The difficulty in these methods was attributed to: too much water to operate the equipment during the time the mature cutthroat were in the sampled areas; insufficient knowledge of the movements of the cutthroat trout in these waters to permit the most advantageous use of available collecting methods.

Block stated during his work, that all of the methods of collecting cutthroat trout, fly fishing produced the most fish with the lease effort. He spent most of his field time on the operation of the weirs that were collecting Dolly Varden. Yet the limited angling effort provided over 50 percent (54 of a total of 99) of the cutthroat trout tagged in his study. He also collected 41 by electro-fishing; 3 in weirs; 1 by gill net in the lower Flathead River. The weirs were located on the North Fork of the Flathead River six miles downstream from the Canadian border and on Trail Creek.

During the 1957 study on the Middle Fork, weir placement at the mouth of Bear Creek had to be postponed until the spring run-off had subsided. High water remained a deterent to trap operation until late July, and by this time many upstream migrant Dolly Varden were already seen and caught above the trap site. The weir collected the majority of mature Dolly Varden taken, but the bulk of the cutthroat were collected by angling. Tagging mortality was experienced during 1957. Over 30 Dolly Varden were found dead on the racks. Block, 1953-54, described only one tagging mortality. In 1957 a total of 188 Dolly Varden and 38 cutthroat trout were tagged on the Middle Fork.

The 1961-63 tagging program was designed to concentrate on cutthroat trout. Four men floated, angled and tagged fish in the 171 miles of river system above Flathead Lake. Many float trips ranging in time from 2 - 10 hours were made during the months of July, August and September. A summary of the crew's tagging efforts was as follows:

	Trips made	Catch of fish 1/ per hour per man	Catch of taggable 2/ fish per hour per man	Percent taggable fish
1961	37	2.80	1.80	54.0
1962	33	2.05	1.61	78.5

1/ Catch figures include float time.
2/ Taggable fish - fish 7.0 inches or greater in total length.

The experience gained in familiarization with the river in fishing techniques, and in finding the larger cutthroat enabled the crew to increase the number of cutthroat trout tagged on the river in 1962. During the 1961-63 phase the round monel jaw tag previously used was replaced by a

plastic jaw tag. Less irritation to the fish's jaw and better public acceptance has been noted during this last study. The total number of tagged fish in the lake and river system (including those tagged by sportsmen) is as follows:

	Year	Ct. 1/	DV 1/	Other 1/	Total
North Fork	1953-54	99	197		296
	1961-62	1006	24	5	1035
	1963-65	0	1	0	1
Middle Fork	1957	38	188	0	226
	1961-63	396	15	3	414
	1964-65	0	0	0	0
Flathead River	1964-65	242	29	47	318
	1964-65	3	2	1	7
Flathead Lake	1961-63	25	228	9	262
	1964-65	0	8	11	18
Swan River	1961-63	7	1	16	24
	1964-65	1	20	11	30
South Fork	1961-62	1	1	0	2
	1964-65	82	5	2	89
Total	1953-54	99	197		296
	1957	38	188	0	226
	1961-62	1677	298	80	2054
	1964-65	86	36	25	147
		1900	719	105	2720

1/Ct=cutthroat trout, DV=Dolly Varden. Other includes rainbow trout, brook trout and whitefish.

In addition to the wild trouttagged, 411 and 487 excess brood cutthroat from the Libby Hatchery were tagged and released in the river in 1961 and 1962 respectively. Release points in 1961 w ere: in Hatchery Bay at the north end of Flathead Lake and in the Flathead River below the confluence of the Middle and North Fork Rivers. All the fish in 1962 were released in the Middle Fork of the Flathead River at three access points.

Tag return data, in all studies, were dependent upon voluntary fisherman returns. The fishermen were kept aware of the tagging program through the advertising media of the newspaper, radio and posters placed at access points along the river system.

Cutthroat trout. A total of 217 recaptures (11.4 percent) from 1,900 tagged wild cutthroat trout have been recorded. A breakdown of the tag recaptures is as follows:

Place Tagged	Available tags	Recaptures	Percent Return	Movement: Down Stream	Movement: Up Stream	Movement: None
North Fork	1006	96	9.5	64	11	21
1953-54	99	9	10.0	1	0	8
Middle Fork	396	62	15.7	27	8	27
1957	38	4	10.5	0	0	4
Flathead R.	245	30	12.2	19	7	4
Flathead L.	25	3	12.0	Recaptured in lake		
Swan R.	8	2	28.6-	1	1	0
South Fork	83	11	13.3	3	3	5
	1900	217	11.4	115	30	69

Half (53.7 percent) of all cutthroat trout recaptures showed downstream movements. A third (32.3 percent) were recaptured within one mile of the tagging release point. Movements over 10 miles were shown by 74.6 percent of downstream migrants, while upstream movements over 10 miles were exhibited by 26.8 percent of upstream migrants. A summary of up and downstream movements for the river areas is as follows:

Number of fish recaptured up-and downstream from point of tagging.

Place tagged	Max. movement (miles)	Downstream movement in miles: Up to 10	11-30	31-50	5-100	101-143	Total
North Fork	102	16	17	13	17	1	64
Middle Fork	143	4	5	7	10	1	27
Flathead R.	76	6	6	3	4	0	19
Swan R.	1	1	0	0	0	0	1
South Fork	24	2	1	0	0	0	3
		29	29	23	31	2	114
		Upstream movement in miles					
North Fork	23	8	3	0	0	0	11
Middle Fork	12	8	1	0	0	0	9
Flathead R.	72	5	1	0	1	0	7
Swan R.	2	1	0	0	0	0	1
South Fork	20	2	1	0	0	0	3
		24	6	0	1	0	31

When considering movements, the time lapse between tagging and recapturing is important. A breakdown of this is as follows:

Place Tagged	Max. Time (Months)	Number of tagged fish recaptured — Time lapse in months <1	1-11	12-23	24-36	Total Recaptures
North Fork	32	52	37	14	2	105
Middle Fork	23	34	22	10	0	66
Flathead R.) Flathead L.) Swan R.) South Fork)	26	6	22	6	1	35
	4	6	5	0	0	11
		98	86	30	3	217

The recaptures of the hatchery reared, tagged and released cutthroat trout is as follows:

	Total Released	Recaptures	Percent Return	Mortalities Observed
1961	411	13	3.0	5
1962	487	103	20.5	3

With the exception of one, all recaptures occurred within two weeks after released; 80 percent were caught within three days. Movements indicated by these fish were small; with 83.0 percent caught within two miles of the release point. The one exception was a fish released in Flathead Lake. It was recaptured 12 months later 20 miles south of the point of release.

Dolly Varden Ninety-seven recaptures (13.4 percent) from 719 available tagged Dolly Varden in the Flathead River system showed downstream movement, from the point of release. The recaptures from the fish tagged in the North and Middle Forks have been all downstream. The fish released in Flathead Lake were either recaptured upstream or in the lake. A breakdown of these movements is as follows:

Place Tagged	Max. Movement (miles)	Numbers of Dolly Varden Recaptures — Caught Same Area	Downstream Movements <10	11-30	31-50	51-100	>100 MILES	Total Recaptures
North Fork 1953-54	127	2	0	3	0	8	15	28
Middle Fork 1957	119	5	1	1	1	1	4	13
			Upstream Movements					
Flathead L. 1962-65	120	6	1	2	4	2	1	16
		13	2	6	5	11	20	57

Fifty-five of the Dolly Varden tagged and released in Flathead Lake were recaptured; 39 in the lake; and the rest were taken upstream.

Eighty-four (86.6 percent) of all Dolly Varden recaptured were taken more than two miles from the release point. Maximum time between release and recapture of Dolly Varden in the North Fork, Middle Fork, Flathead Lake and South Fork were respectively 55, 33, 47 and 10 months. A breakdown of time between release and recapture is as follows:

Place Tagged	Number of tagged fish recaptured: Time lapse in months <1	1-11	12-23	24-36	>36	Total recaptures
North Fork 1953-54	0	18	7	2	1	28
Middle Fork 1957	6	6	0	1	0	13
Flathead L	5	22	19	6	3	55
South Fork	0	1	0	0	0	1
	11	47	26	9	4	97

DISCUSSION:

The spawning movements of the Dolly Varden and cutthroat trout in the Flathead River and Lake has historically governed the fishing patterns along this river. During the last ten years, tag and recovery of fish has been employed to document these movements.

After hatching, cutthroat trout remain two years in the lower 50 miles of the North and Middle Forks of the Flathead River. During their third summer, they make a mass downstream migration. While on the d ownstream journey, these fish concentrate in the larger, deep pool areas of the lower 20 miles of the river above the lake. The time taken by these fish to descend from these rivers varies from two weeks to two months. During this period they move 50 to 80 miles. From late fall through the winter months descending cutthroat reach and enter the lake. They remain here until they reach maturity which is generally the following spring.

The predominance of immature fish in the Forks of the Flathead River is evidenced by the average sizes of cutthroat trout measured in creel census conducted on the North Fork. In 1953 Block stated the average total length was 8.5 inches. Eight and nine years later (1961 and 1962) the sizes were 8.4 and 8.5 respectively.

Data from the extreme upper river areas indicate a year around resident cutthroat population. Mature cutthroat tagged in the upper reaches have been recaptured within five miles of the release point during three consecutive years. The recapture data also indicates a portion of the cutthroat population in the North and Middle Fork Rivers are attracted to many of the waters draining Glacier National Park. Fish tagged and released in these rivers have been recovered in Kintla, Bowman and MacDonald Lake. This is an upstream movement of 10 to 20 miles.

Limited data indicates that once the cutthroat enter Flathead Lake, they disperse along the entire shoreline. There is an apparent winter concentration in the lake that was pin-pointed by two fish tagged the same day, 55 miles above the lake. These fish were recaptured in November one year apart in the same area near Dayton, Montana (Big Arm Bay - north of Wildhorse Island). With a life expectancy of six years, they could not be expected to make more than two spawning runs into the upper river spawning areas during their life time.

There is an apparent escapement of cutthroat trout to the lower Flathead River below Kerr Dam. Two fish tagged in Flathead River above Flathead Lake descended the river into the lake, passed through the lake and were caught one mile below Kerr Dam.

Studies of movements of the Dolly Varden have been entirely on mature fish. The three studies indicate that mature Dolly Varden use the two free flowing forks of the Flathead River for spawning. All the data exemplifies an inter-dependent relationship between the lake and river system. Four of the thirteen recaptures from the Middle Fork (Bear Creek weir - 99 miles above the lake) tagging were recaptured in the lake. Fourteen of twenty-eight recaptures from the North Fork (Trail Creek weir - 105 miles above the lake) tagging were recaptured in the lake. Nine of the fifty-five returns from fish released in Flathead Lake were caught upstream on their spawning run. Two of the lake tagged fish were recaptured above the weir sites on the Middle and North Fork Rivers. Movements within the lake show constant traveling of the entire shoreline except during the spring, when concentrations occur near the mouths of the Flathead and Swan Rivers.

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