MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION

JOB PROGRESS REPORT

State Montana Name Northwest Montana Fisheries Study

Project No. F-7-R-18 Title Lake Mary Ronan Summer Creel Census

Job No. 3

Period Covered April 1, 1968 to March 31, 1969

ABSTRACT

A creel census was conducted at Lake Mary Ronan during the general fishing season of 1968. A calculated total estimate of 20,588 anglers caught 13,290 game fish for 59,554 hours of fishing effort. The average catch per man hour was 0.22 fish while the average catch per angler was 0.68 fish. Fifty-six percent of the fishermen were successful in catching one or more game fish. The total fishing pressure and harvest estimates were considerably lower than those reported for Georgetown Lake, Montana in the summer of 1962.

The composition of the catch was 46.1 percent rainbow trout, 30.7 percent kokanee, and 23.2 percent largemouth bass. Approximately 65 percent of the rainbow trout caught were age group 0+ while 81 percent of the kokanee caught were of age group 3+.

Resident anglers comprised 59.4 percent of the anglers checked while nonresidents from 23 states and Canada made up the remaining 40.6 percent of the anglers. Approximately 92 percent of the anglers preferred fishing for kokanee or rainbow trout as compared with 8 percent that showed preference to bass fishing.

BACKGROUND

Lake Mary Ronan has been noted for its quality kokanee fishing in years past. Excellent catches of this species were reported by anglers and resort owners in the early 1960's. A reported decline in the fishing success for kokanee in recent years prompted a pilot creel census in 1966 to determine the harvest rate for kokanee and rainbow trout. Because of the low catch rate (0.23 fish per angler hour), a creel census was initiated to obtain total fishing pressure and harvest during the summer of 1968.

OBJECTIVES

The objective of this study is to determine the total estimated fishing pressure and harvest of game fish from Lake Mary Ronan during the summer fishing season of 1968.

PROCEDURES

Fishing Seasons

In 1968, the summer fishing season at Lake Mary Ronan coincided with Montana's general stream fishing season. The season opened May 19 and extended through November 30. Angling was permitted during the hours of 5:00 A.M. through 11:00 P.M. Other fishing seasons included a kokanee snagging season that opened October 1 and extended through January 31, 1969, and a special winter ice fishing season that began January 19, 1968 and extended through November 30, 1968.

Stocking History

The Lake Mary Ronan fishery is dependent largely on annual plants of hatchery reared kokanee and rainbow trout. Although some degree of spawning success of rainbow has been noted in tributary streams, no kokanee spawning success has been observed in either the tributary streams or along the beaches. Largemouth bass and sunfish spawn successfully in the shoal areas.

Kokanee are planted as swim-up fry shortly after ice-out in April. In recent years annual kokanee plants have numbered about 500,000 fish as compared to annual plants of 300,000 fish prior to 1966.

Prior to 1967, plants of catchable rainbow trout (6" to 9") were stocked in addition to fingerling plants. In recent years only 4-inch fingerling plants were made.

A summary of game fish introductions since 1962 is shown in Table 1.

TABLE 1. Number and size of game species stocked in Lake Mary Ronan from 1962 through 1968

Year	Rainbow Trout			Kokanee
	2-4"	6"	7-9"	Swim-up fry
1962	--	63,000	21,735	297,000
1963	89,620	42,780	20,600	296,950
1964	45,000	--	55,304	310,585
1965	75,900	--	12,920	301,920
1966	--	--	48,000	572,258
1967	70,400	--	--	*109,086
1968	71,700	--	--	503,340

* Reduced number due to mortality experienced in the hatchery. Fish were stocked as one-inch fry in June.

Creel Census Design and Application

The framework of the census design used to estimate fishing pressure and total harvest is similar to the one used in 1960 by the *Minnesota Conservation Department.

With the exception of opening day, the creel census was designed to operate on a five-day week schedule. The length of the census day was eight hours. This schedule was in effect until September 15. Thereafter, the census operation was reduced to three days a week until October 31 when the census was terminated.

Census days were designated as either "morning" or "evening" census days. The census schedule was arranged so that an equal number of "morning" and "evening" days were censused. The morning census day began at 7:00 A.M. and continued until 3:00 P.M. Thus, creel census coverage over a "morning" and "evening" census period included a span of 14 hours with an overlap period of two hours between 1:00 P.M. and 3:00 P.M. Although fishing was permitted for an 18 hour period during the day, the summer fishing day was considered to be 14 hours long. Adjustments to the hourly census schedule were made late in the season as the daylight hours grew shorter. Thus, late in the season the morning census day began at 9:00 A.M. and the evening day would terminate at 7:00 P.M. A schedule of the 1968 summer creel census is presented in Table 2.

TABLE 2. Lake Mary Ronan Summer Creel Census Schedule - 1968

	May	June	July
Weekends & Holidays	[19] (25) 26 (30) (31)	1 (2) (8) 9 15 (16) (22) 23 29 (30)	4 (5) (6) 7 13 (14) (20) 21 27 (28)
Week Days	20 (21) (22) 29 30 31	(3) 4 7 (10) 13 (14) 17 (18) (19) 26 (27) 28	(1) 8 9 11 (17) (18) 19 (22) (23) 24

	August	September	October
Weekends & Holidays	(3) 4 10 (11) (17) 18 24 (25) (31)	1 (2) 7 (8) (14) 15 21 29	5 13 19 (27)
Week Days	1 (2) 5 (6) 9 (14) (15) (16) (19) 20 21 (28) 29 30	(3) (5) 9 12 13 19 (20) 23 (24)	1 (2) (10) 11 (16) 17 21 (22) (28)

[19] = Designates opening day census

(25) = Designates morning census day

26 = Designates evening census day

*Statistical methods used in computation of lake census data, Job Completion Report F-4-R-5, (1960).

During the 8-hour census day, the census operator was instructed to contact as many boat anglers as possible for complete trip information. For the most part, angler contacts were made at the mooring areas of two resorts and one public camping site. A 14-foot boat, powered with an 18 H.P. outboard motor, was used to travel between contact areas. No attempt was made to census shore anglers since few game fish other than largemouth bass were caught from shore. However, angler interviews were obtained from kokanee snaggers during the special snagging season in October.

Creel information collected from anglers included: the number of anglers per boat, residency of anglers, the number of hours fished, species caught, types of bait used, and the numbers of game fish caught. An attempt was also made to distinguish between anglers fishing for rainbow trout or kokanee versus those fishing for bass. Total lengths, weights, and scale samples were obtained from game fish at the convenience of the angler.

In addition to completed trip information, the census operator recorded instantaneous boat counts at 2-hour intervals from the beginning to the end of each census day. Angler boats were counted from near the middle of the lake at a point where the entire lake surface could be viewed with a pair of binoculars. On a few occasions, boat counts were taken from shore when adverse weather conditions prevented the census operator from venturing out onto the lake. Boat count data were used in conjunction with the contact data obtained from anglers to estimate fishing pressure and harvest.

For purposes of data analysis, the fishing season was stratified into four strata. Each stratum was treated independently.

Stratum 1 (opening day) boat counts and angler contacts were made throughout the 14 hour fishing day. In addition to the census operator, permanent personnel were present to assist with census duties.

Stratum 2 included weekend days and holidays for the period of May 25 through September 15. All weekends and holidays in stratum 2 were censused. Weekdays in association with long holiday weekends were treated as holidays.

Stratum 3 included weekday census coverage for the period of May 20 through September 13. During this period three days a week or approximately 60 percent of the possible fishing days were censused.

Stratum 4 included that period of the season from September 16 through October 31. Creel census coverage during this period included one weekend and two weekdays a week. Approximately 45 percent of the fishing days in stratum 4 were censused.

Data analysis is dependent on: (1) the relationship between boat counts and contact data, (2) the expansion of those data to include the period of day not censused, and (3) an expansion of the data for days not censused.

Calculation of total fishing pressure for each stratum: (1) estimated total fishing hours were computed by multiplying the estimated total boat counts by 2 (the 2 hour interval count), by the average number of anglers per boat; (2) the estimated total angling trips can then be calculated by dividing the total fishing hours by the average length of trip.

FINDINGS

Lake Mary Ronan is located in Lake County approximately 35 miles southwest of Kalispell. The lake has a surface area of 1,506 acres with a maximum depth of 47 feet. About 40 percent of the lake area is less than 30 feet in depth.

Lake Mary Ronan has a drainage area of about 25 square miles and is fed primarily by two small tributary streams, Hilburn and Donaldson Creeks. Stream flows vary with the season and the amount of spring run-off. In years of normal run-off, spring flows will average an estimated 10 to 12 cfs, late summer flows 1 to 2 cfs, and the lake will be drawn down about 1 to 2 feet. Lake levels have dropped 3 to 4 feet below normal in the past two years due to low spring run-off flows and irrigation use.

Water surface temperatures were recorded periodically from May 22 through October 22 in 1968. Water temperatures varied between 55° and 65° F. from the period of May 25 through July 4 and from 65° to 71° F. between July 4 and August 18. The high of 71° F. was recorded on July 8 and 9. After August 18 surface temperatures began to slowly cool and a low of 46° F. was recorded on October 12 and 17.

The outlet draining Lake Mary Ronan is Dayton Creek, a tributary to Flathead Lake. In dry seasons and periods of heavy irrigation use, portions of the stream go dry.

Both Hilburn and Donaldson Creeks attract large concentrations of rainbow trout during spring spawning migration. In former years fish traps have been installed at the mouth of these streams to collect rainbow trout for spawning purposes.

A cursory examination of several redds in the lower quarter mile of Donaldson Creek during the spring of 1967 revealed a poor survival of eggs. Over-grazing along the stream bank was apparent and the resulting siltation was probably the contributing cause to the heavy egg mortality. Several hundred fingerling rainbow trout were observed in Donaldson Creek in the summers of 1967 and 1968 which would indicate at least a partial spawning success. However, it is not known whether these fingerlings were successful in their downstream migration into the lake. Occasional predation on spawning rainbow in Donaldson Creek by black bear and kingfisher was reported by area residents.

Fishing Methods

The primary method of angling for rainbow trout and kokanee was by trolling with small lures with or without leaded line. The depth at which these species were caught varied with the season. In May and June fishing within 15 feet of the surface seemed to be quite effective. As the season progressed and a thermocline developed most anglers used leaded line and fished at depths ranging between 15 and 35 feet below the surface. In late September and October trolling near the surface was the most common method used by rainbow trout anglers. Few kokanee were caught after mid-September by trolling. After October 1 all kokanee were caught by snagging with treble hooks.

Still fishing was the method used by many rainbow trout anglers. Organic bait such as worms and corn was fished close to the bottom. Very few kokanee were caught by still fishing.

Peripheral areas of the lake were used predomiantly for largemouth bass angling. Spin casting with small lures was preferred by most anglers for this species.

Angler Success

The following species of fish were checked by the creel census operator during the summer fishing season of 1968: rainbow trout (Salmo gairdneri), kokanee (Oncorhynchus nerka), largemouth bass (Micropterus salmoides), and pumpkinseed (Lepomis gibbosus). Numerous pumpkinseed, a non-game species, were caught but were not included in the angler harvest.

Completed trip information was collected from a total of 3,610 anglers during the 1968 general fishing season. These anglers caught a total of 2,449 game fish for 10,971 man hours of fishing effort. A summary of completed trip information for each stratum is presented in Table 3. Only 56 percent of the anglers (2,032) were successful in catching one or more game fish per angler trip.

TABLE 3. Summary of completed trip information collected at Lake Mary Ronan during the 1968 summer fishing season

	Stratum I (opening day)	Stratum II (weekend & holidays)*	Stratum III (week days) **	Stratum IV (all days) ***	Total all census days
Days censused	1	39	46	19	105
Total fishing days	1	39	80	46	166
Number parties	94	816	787	63	1,760
Number fishermen	215	1,723	1,552	120	3,610
Number hours fished	1,386	4,888	4,416	281	10,971
Number fish caught	348	1,015	985	101	2,449
Rainbow trout	131	386	466	100	1,083
Kokanee	177	302	326	0	805
Largemouth bass	40	327	193	1	561

* May 25th through September 15th
** May 20th through September 13th
*** September 16th through October 31st

During the general fishing season an estimated total of 20,588 anglers fished a total of 59,554 hours and harvested 13,290 game fish. The average catch per man hour was 0.22 fish, and per angler 0.68 fish. The composition of the game fish harvest over the entire summer fishing season was 46.1 percent rainbow trout, 30.7 percent kokanee, and 23.2 percent largemouth bass. Summaries of estimated totals and averages of fishermen, hours fished and harvest for the summer fishing season are presented in Table 4. Seasonal variation in the composition of the catch was evident. Kokanee were most abundant in the catch comprising 50 and 41 percent of the harvest respectively in May and June and declined to 24 and 27 percent for July and August. In September the kokanee reached a seasonal low of 4 percent of the catch.

TABLE 4. Estimated totals and average numbers of fishermen, hours fished and harvest for the summer fishing season at Lake Mary Ronan, 1968 (species composition in parenthesis)

	Stratum I opening day	Stratum II weekends and *week days	Stratum III **week days	Stratum IV weekends and ***week days	Totals for season
Estimate:					
Number of anglers	386	9,000	10,227	975	20,588
Hours fished	2,487	25,560	29,147	2,360	59,544
Fish caught	624	5,316	6,500	850	13,290
Rainbow trout	235	2,024	3,075	824	6,158(46.1%)
Kokanee	317	1,581	2,151	17	4,066(30.7%)
Largemouth bass	72	1,711	1,274	9	3,066(23.2%)
Average:					
Anglers per day	386.0	230.7	127.8	21.2	124.0
Anglers per acre	0.26	5.98	6.79	0.65	136.70
Catch per day	624.0	136.3	81.3	18.5	80.1
Catch per acre	0.41	3.53	4.32	0.56	8.82
Catch per angler	1.62	0.59	0.63	0.84	0.68
Catch per hour	0.25	0.21	0.22	0.36	0.22
Lenth of trip	6.44	2.84	2.85	2.42	2.90

* May 25th through September 15th
** May 20th through September 13th
*** September 16th through October 31st

No attempt was made to determine total harvest and estimates of fishing effort for kokanee snagging which started October 1. Snagging success was determined for 112 snaggers. They caught 375 fish at the rate of 3.4 fish per man.

Rainbow trout were the major fish in the catch from July through October. They made up 50 percent of the catch in July, 45 percent in August, 83 percent in September and 100 percent in October.

Largemouth bass varied between 26 and 31 percent of the catch through August. In September, bass composed 4 percent of the catch and bass did not enter the catch in October.

The majority of anglers fished specifically for rainbow trout and kokanee. Approximately 92 percent of anglers interviewed preferred fishing for trout or kokanee while 8 percent preferred bass fishing. No breakdown of angler selection of kokanee versus trout fishermen could be established since fishing methods and habitat areas utilized by these species were similar. However, it was evident through angler interviews that angler preference was greater for kokanee than for rainbow trout.

Bass fishermen were more successful than trout and kokanee fishermen. The average catch rate for bass fishermen was 0.46 fish per hour as compared to 0.20 fish per hour for trout and kokanee fishermen.

Age and growth determinations were made from scale samples collected from 146 rainbow and 154 kokanee through the course of the fishing season. The average calculated total lengths of these species at each annulus are presented in Table 5.

TABLE 5. The average calculated total lengths of rainbow trout and kokanee collected from anglers - Lake Mary Ronan, summer census 1968. (Sample size in parentheses)

Species	Average calculated total length (inches) at each annulus					
	0+	I	II	III	IV	V
Kokanee	--	5.1(154)	8.9(153)	13.4(125)	16.9(6)	19.0(1)
Rainbow trout	(146)	8.7(74)	12.0(56)	16.0(56)	17.9(5)	--

Total length measurements were collected throughout the season from 402 rainbow trout and 184 kokanee in an attempt to correlate age group composition with total length measurements.

Approximately 65 percent of the rainbow trout measured ranged between 7.8 and 14.0 inches. This size range approximates the young-of-the-year age group (0+) as determined by scale reading determinations. The majority of the 0+ age group is believed to have originated from a plant of 71,400 four-inch rainbow trout planted in early April, 1968. This age group became an increasingly important segment of angler harvest as the season progressed. The 0+ age group first entered the catch in June averaging 8.2 inches and comprising 31 percent of the rainbow measured that month. The 0+ age group averaged 11.7

Discussion of Decline in Kokanee Fishing Success

In the past, angler satisfaction for kokanee has been quite high at Lake Mary Ronan, particularly by non-resident anglers. Undocumented reports of excellent catches of this species were reported by anglers and resort owners in the early 60's.

A slow deterioration of the kokanee fishery since 1964 initiated a pilot creel census conducted during the summer of 1966 to determine the harvest rate for kokanee and rainbow. A total of 106 fishermen contacted at random during the summer of 1966 caught kokanee and rainbow at the rate of 0.23 fish per hour for a total of 147 fish of combined species.

The relatively low combined catch rate of 0.20 fish per hour in 1968 for both kokanee and rainbow substantiated the claims of poor fishing for these species. Correspondingly, the number of immature kokanee collected during spring and fall netting operations has declined in recent years. Considering all lakes containing kokanee, generally the largest individuals are recorded from waters with relatively low populations of this species. Mature spawning male kokanee in 1966 averaged 15.4 inches in total length as compared to 19.6 inches in 1968, thus substantiating the declining population indicated by the netting.

The possible cause or causes of the decline in the kokanee population may be related to: (1) a change in the size of rainbow trout plants beginning in 1962 which included larger numbers of larger size fish and caused increased competition and predation; (2) a deterioration of the water quality of the lake; or (3) a combination of both of these factors.

Prior to 1962, Lake Mary Ronan was stocked with rainbow trout ranging in size from 1 to 3 inches. From 1962 through 1966, the lake was stocked with rainbow trout ranging from 3 to 9 inches, the majority being 6 to 9 inch fish (Table 1). The change in management in 1962 to larger numbers and larger sized rainbows may have accelerated the predation rate on young-of-the-year kokanee planted as fry. This factor could be of particular significance in a relatively shallow lake such as Lake Mary Ronan where the habitat association of these species tend to overlap. The following 1966 plants were of much smaller fish, although numbers remained high enough to maintain a rainbow fishery commensurate to the kokanee fishery.

A rapid deterioration of water quality may have attributed to the low survival rate of kokanee fry plants in recent years. Over-grazing by cattle on State, Federal and private lands within the watershed may have accelerated lake eutrophication increasing the oxygen demand of decomposing plants and animals on the lake bottom.

Dissolved oxygen deficiencies were found in the cool waters of the lower and middle segments of the thermocline normally inhabited by kokanee in late summer. A series of water temperature-oxygen profile data collected on August 9, 1968 showed that thermal stratification was evident at depths ranging from 20 to 35 feet below the surface. Dissolved oxygen concentrations decreased rapidly below the 25 foot level reaching critical levels of 2.1 ppm at the 28 foot level. The water temperature at this depth was 60° F., the maximum temperature tolerance limits for young kokanee.

inches and comprised 71 percent of the rainbow harvested by the end of September. The average growth increment for this age group was 1.4 inches per month from their time of introduction in April.

The remaining 35 percent of the rainbow trout harvested ranged from 14.0 to 21.0 inches comprising age groups 1, 2, 3, and 4. Because of considerable overlap in size, the age composition of the fish measured could not be determined from length frequency distribution.

About 81 percent of the kokanee measured ranged in length from 13.7 to 20.3 inches and were judged to be in the 3+ age group. Age group 2+,with a size range 10.4 to 13.7 inches, comprised 13 percent of the kokanee measured. Age groups 1+, 4+ and 5+ collectively comprised the remaining 6 percent of the sample.

A total of 2,489 anglers were checked for place of residence. Montana residents made up 1,479 or 59.4 percent while 1,010 or 40.6 percent were non-residents from twenty-three states and Canada.

The composition of resident anglers ranked by county were as follows: Missoula, 39 percent; Flathead, 16 percent; Lake, 11 percent; Ravalli, 6 percent; and Sanders 4 percent. Anglers from twenty other counties in the state composed the remaining 24 percent of the resident angling pressure.

The composition of the non-resident anglers ranked by states were as follows: Washington, 42 percent; California, 24 percent; Idaho, 12 percent; and Oregon, 6 percent. Anglers from eighteen other states and Canada comprised 11 percent of the non-resident anglers.

A comparison of summer fishing pressure and harvest for Georgetown Lake and Lake Mary Ronan are shown in Table 6. These waters are similar in several respects, being relatively shallow and supporting populations of both rainbow and kokanee. Until recent years kokanee have been of primary importance as a game fish species for Lake Mary Ronan, whereas the rainbow trout is the mainstay of the Georgetown Lake fishery.

TABLE 6. A comparison of summer fishing pressure and harvest for Georgetown Lake and Lake Mary Ronan

	Year	Fishermen	Fishermen per acre	Game fish harvest	Fish per acre
Georgetown Lake	1962	44,500	14.8	82,970	29.9
Lake Mary Ronan	1968	20,588	13.7	13,290	8.8

Angler use per surface acre for Lake Mary Ronan in 1968 was slightly less than that of Georgetown Lake for 1962 and the harvest rate per acre was less than one-third that of Georgetown Lake. Georgetown Lake has received annual plants of sub-catchable rainbow and sub-catchable cutthroat trout at the rate of about 100 fish per acre as compared to approximately 50 per acre for Lake Mary Ronan. However, Lake Mary Ronan has also received kokanee at a rate of 200 to 380 fry per acre.

Low oxygen levels in lower and middle thermocline regions may have influenced the predator-prey relationship by forcing kokanee into the upper thermocline regions inhabited by rainbow trout. The close association of these two species could cause an abnormally high degree of predation on young-of-the-year kokanee planted as fry. Young kokanee may have suffered increased mortality from the stress of lowered oxygen levels available while still seeking to stay in non-lethal temperature ranges.

The future management of Lake Mary Ronan will be influenced by the success of kokanee survival to the creel. If kokanee are not successful in maintaining an adequate fishery, management emphasis will be shifted to a rainbow trout fishery by the stocking of sub-catchable rainbow trout. Rainbow trout will be able to tolerate the combination of higher water temperatures and lower oxygen concentrations which develop in the upper thermocline region in late summer. If lake eutrophication continues at the present rate it can be expected that a fishery for bass and sunfish will be all that can be sustained in relatively few years.

RECOMMENDATIONS

It is recommended that (1) a reduction be made in the annual rainbow trout plants for a three year trial period; (2) continue stocking kokanee salmon fry at the rate of 500,000 annually; (3) continue spring and fall gill net sampling to determine the success of annual kokanee fry stocking; and (4) conduct a bi-monthly water temperature-oxygen profile sampling during June, July, August and September to monitor temperature and dissolved oxygen changes in late summer.

Prepared by John J. Donoe

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Waters referred to in this report include:

Lake Mary Ronan - 07-7700-03
Georgetown Lake - 06-7961-05