

MONTANA DEPARTMENT OF FISH AND GAME  
FISHERIES DIVISION  
JOB PERFORMANCE REPORT

STATE: MontanaPROJECT TITLE: Flathead Lake Fisheries  
InvestigationsPROJECT NO: F-33-R-12JOB NO: I-bJOB TITLE: Measure annual trends in recruit-  
ment and migration of kokanee  
populations and identify major  
factors affecting trendsPERIOD COVERED: July 1, 1967 through June 30, 1978

## OBJECTIVES

The primary objective of this job is to establish the relative abundance of the six major game fish species with the present phase emphasizing kokanee, and to identify the environmental factors affecting population changes.

## ACCOMPLISHMENTS

Hydroacoustic data was collected on 22 survey days on the lake. The data collected was used to establish area and depth distribution patterns of the kokanee during the period. Density estimate counts were made using the "oscilloscope counting method". Since the data was collected with a system that had not been calibrated comparisons of densities were limited to total fish counts during a single survey. Survey time with the acoustical gear was shortened in the fall to return the instruments to the Applied Physics Lab in Seattle where the modifications were completed and the system calibrated.

The calibration work included the measurement and plotting of the transducers scanning cone or beam angle (directivity pattern). While the lake project's sounder was being calibrated, the Region's 200-A echo-sounder was also sent to Seattle to be checked out and tuned. Tuning at this time allowed both units to be matched, thus permitting the interchange of transducers without loss of power. This work allowed the broadened use of the acoustical gear by not limiting it to use aboard the Dolly Varden.

Mid-water trawling was conducted in conjunction with the acoustical survey work to verify fish species and information on detectable sizes by the system. Information collected on yearling salmon (0+ annuli) taken in the trawl during 1977, indicated an increase in growth from the 1976 season. The size of the yearling salmon ranged from 39 mm in late July to 76 mm in early October in 1977, while ranging from 33 mm to 57 mm in 1976.

Creel data was collected from four of the five major kokanee fishing areas in the lake during the summer fishing season (June, July, and August). This data provided comparative information of yearly sport fishing trends. The 1977 season was considered to be an average salmon fishing year over most of the lake. The southeast kokanee fishing area, Skidoo Bay area, was termed "below normal fishing success". The 1977 average size of the angler-caught fish increased 33 mm (1.3 inches) total length from the 1976 data. This increase was not indicative of accelerated growth but rather a shifting of the dominate year class of fish being caught by the anglers. The 1976 catch comprised an abnormally high percentage, 46.8 percent, of three-year-old kokanee (II+ annulus). Since 1972, the more normal representation of the age group has ranged between 11.4 percent in 1975 to 16.6 percent in 1977.

Age and growth calculations were made on salmon scales collected during the season. Growth comparisons of salmon from 1972 through 1977 are being prepared.

Age structure of mature kokanee utilizing eleven spawning sites that contribute to the Flathead Lake salmon were determined by the examination of otolith bones. The spawning sites included three areas in the river system above the lake and eight shoreline areas. Four-year-old salmon was the dominate age group in both the river and lake spawning sites, representing 91.8 and 87.1 percent, respectively.

The average length of the mature males (females generally 14 mm or 0.5 inches shorter than males) in the lake was 333 mm (13.1 inches) while those utilizing the river sites averaged 321 mm (12.7 inches). The tendency of lake fish being larger than river spawning fish has persisted throughout past records.

Age structure of spawning kokanee populations from eleven lakes within the region were also determined from otolith collections. Four-year-old salmon were the predominate age group in six of the lakes with three-year-old dominate in the rest. Average size of the males from these lakes ranged from 239 mm (9.4 inches) in Ashley and Tally Lakes, to 439 mm (17.3 inches) in Crystal lake.

An analysis of age structure comparisons for spawning populations in Flathead Lake and other salmon lakes in the region for the period 1972 through 1977 is being prepared.

Length measurement data in this study has only been taken as "total length" units. Problems have occurred when trying to compare data with other states and provinces working with kokanee that use other length measurements i.e., fork, standard, and mid-eye to fork. To aid data comparisons and exchange of information, a regression analysis was made for the conversion from total length data to the other conventional methods. The conversion data was derived after collecting four sets of length data from 356 male and 200 female salmon. To encompass the widest length span, data was collected from five lakes. The size range extended from 218 mm to 358 mm (8.6 to 14.7 inches).

The following equations (and accompanying coefficient of variations) were the results of the analysis and can be used to convert length measurements of salmon once the dimorphic changes occur.

Length Conversion Equations for Mature Kokanee after Dimorphic Changes Occur

SEX		$r^2$
	<u>Fork Length From Total Length</u>	
Male	$FL = 0.936 \times TL - 6mm$	0.972
Female	$FL = 0.968 \times TL - 9mm$	0.988
	<u>Standard Length From Total Length</u>	
Male	$SL = 0.839 \times TL - 4mm$	0.991
Female	$SL = 0.858 \times TL - 10mm$	0.989
Combined	$SL = 0.844 \times TL - 6mm$	0.990
	<u>Mid-eye Fork From Total Length</u>	
Male	$MEF = 0.800 \times TL - 8mm$	0.990
Female	$MEF = 0.913 \times TL - 11mm$	0.989

TL = total length, FL = fork length, SL = standard length,  
MEF = mid-eye to fork of tail,  $r^2$  = coefficient of variation

Samples of muscle tissue, an eye and a portion of the liver from spawning salmon taken at the 22 specific spawning sites were collected, frozen and forwarded to a graduate student at the University of Montana in Missoula. Most of these collections represented the second year such samples were taken at these sites. Group specificity will be determined by measuring protein variation using the electrophoretic technique.

Drift-net sampling in the upper Flathead River area was conducted from April 3 through June 29, 1978, to determine the extent of time kokanee fry spent in tributary streams and the main Flathead River before entering Flathead Lake. Three major sites were sampled weekly during the evening hours to determine the peak periods of fry movement. Water temperatures and river discharges were monitored in conjunction with the fry sampling.

The first fry to hatch and move into the upper river were those found at Nyack Flats Spring Creek on March 28, 1978. This spring is located some 70 miles above Flathead Lake and is tributary to the Middle Fork of the Flathead River. Kokanee fry were collected in the main Flathead River near Kalispell during the entire sampling period of 88 days. The number of fry taken at this site did not indicate any significant peak movement period. Numbers of fry collected in the Middle Fork River and McDonald Creek, 61 miles above Flathead Lake, did indicate peak movement periods. Peak numbers of fry were collected on the Middle Fork the day sampling was started April 13, 1978. Peak movement of fry from McDonald Creek, a tributary to the Middle Fork River just below that river sample site, occurred on May 23, 1978.

Sampling with the drift nets, one and one-half meter diameters, was considered effective if set in areas where the current was at least 0.4 meters per second (1.3 ft/sec). Size of fry collected at the various sample sites regardless of date ranged from 23 to 29 mm. Peak movements of fry were noted to have occurred when increased flows were experienced and/or associated increased turbidities.

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Waters Referred To

Flathead Lake 07-6400-03  
Flathead River Sec 02 07-1560-01