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MONTANA DEPARTMENT OF FISH AND GAME

FISHERIES DIVISION

JOB PERFORMANCE REPORT

STATE: Montana PROJECT TITLE: Flathead Lake Fisheries Investigation

PROJECT NO: F-33-R-10

JOB NO: I-b JOB TITLE: Measure annual trends in recruitment and migration of kokanee populations and identify major factors affecting trends

PERIOD COVERED July 1, 1975 through June 30, 1976

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

All procedural objectives described under the present segment of this job were met with the exception of the specific sampling of kokanee with the purse seine to establish age-class compositions. As an alternative, efforts were directed toward development of a hydroacoustical data collection system. Such a system (Thorne, Nunnallee and Green, 1972), would be capable of making the population assessments by age group.

The project leader did attend a short course on acoustical stock assessment sponsored by the School of Fisheries at the University of Washington. With the assistance of personnel at the Fishery Research Institute and Applied Physics Laboratory, the project's echo sounder was modified into a data collection system and the necessary equipment was installed aboard the Dolly Varden. The "direct count" method, made from replays of acoustical tapes on an oscilloscope, will be used for the survey work. The taped data also has the capability of being analyzed by computer.

Several population survey transects in the northern areas were recorded on magnetic tape before the boat was dry docked.

A mid-water trawl with a rigid eight foot square opening, was utilized to verify species and size groups recorded by the system. The net was fished both

during daylight and dark hours with the greatest success occurring at night. The net was towed at 1.4 m/sec or 3.1 mph and was fished at depths ranging from the surface to 70 feet. Kokanee ranging in size from 41 to 276 mm (2.6 to 10.9 inches) total length, made up the bulk of the catch. Other species taken in the net in decreasing order of catch included pygmy whitefish, peamouth, yellow perch, sculpin subsp., lake whitefish, largescale suckers and longnose suckers. The largest fish taken in the tow was a longnose sucker 345 mm (13.6 inches) with the smallest a 13 mm (0.5 inch)peamouth.

Age composition of spawning populations of salmon were determined by analysis of otolith bones collected from five lakeshore and three upper river spawning sites. Five year old salmon were predominant in the shore spawners group while four year old fish made up the majority of the river spawning group (Table 1). This same relationship was found during the 1974 season. The age composition between specific sites (Table 2), reflect differences, but generally follow the pattern for that type of spawning site. One exception to this established site pattern was the age percentage found in Hatchery Bay where 98.0 percent were four year olds and 2.0 percent were five year olds. The school of salmon at this site is the only group that is almost entirely dependent upon artificial or hatchery reared fry. A portion (8,000 two inch kokanee) of the fish released into Hatchery Bay in 1972 were marked with green fluorescent pigment. Under ultra-violet examination, 99 or two percent of the 5,570 salmon checked from Hatchery Bay displayed green pigment. This incident was the longest time interval that pigment marked fish have been recovered in the Flathead Study.

Table 2. Percentage of spawning salmon by age class found on specific sites along the upper Flathead River and Lake

Area	No Fish	Age comp-sexes combined 4	5	6
River				
MacDonald	85	68.2	31.7	--
Eleanor	83	57.8	42.2	--
Brenneman	50	70.0	30.0	--
Lakeshore				
Hatchery	200	98.0	2.0	--
Crescent	43	55.8	44.2	--
Woods	91	38.5	58.2	3.3
Yellow	66	39.4	57.6	3.0
Skidoo	76	40.8	59.2	--

Table 1. Percent age of spawning salmon by age class and sex found on lakeshore and river spawning sites in and above Flathead Lake

	Age Composition (percent)									
	Males Age Class					Females Age Class				
	3	4	5	6	No.[1]	3	4	5	6	No.
Lake Spawners										
1954			100.0		25		16.0	84.0		25
1961		16.2	80.8	3.0	99		18.8	80.2	1.1	96
1965	4.0	48.0	48.0		25		63.6	36.4		33
1970		71.1	28.9		195	1.5	67.2	31.3		195
1971	2.2	78.7	19.1		136		95.2	4.8		126
1972	2.7	51.4	45.9		37	1.5	58.2	40.3		67
1973	2.1	68.4	29.5		190	7.0	71.5	21.5		172
1974		35.1	64.9		393		40.6	59.4		436
1975		32.4	64.7	2.9	236		51.4	47.9	0.7	240
River Spawners										
1970		33.8	66.2		25		31.3	68.7		83
1971		39.0	41.5	19.5	41	9.4	62.5	28.1		32
1972		40.6	59.4		64		54.0	46.0		50
1973	2.3	81.8	15.9		44	13.6	72.7	13.6		22
1974		60.2	39.8		113		73.2	26.8		82
1975		57.7	42.3		97		69.4	30.6		121

[1] Number of fish in sample

At the present time no direct correlation can be drawn between the changes in age class composition in Table 1 and the changes exhibited by the size of the maturing salmon in Flathead Lake (Hanzel, 1973). Further analysis and monitoring of the annual growth patterns of salmon and how growth relates to fluctuations in the salmon populations will afford the opportunity to understand the size changes occurring within this lake.

In addition to the determination of age from the otolith bones, several specific measurements on the sagittae were made in an attempt to identify or separate races of spawning site groups. Most measurements and techniques used were those described by McKern, Horton and Koski, 1974, when they separated summer and winter races and wild from hatchery stocked steelhead trout. Measurements made were the nucleus diameter, length, width and radial diagonal (center of nucleus to tip of outer ostrum). The radial measurement was taken along a line where age determinations are made. Regression coefficients (r-degree of linearity) were determined from various measurements on total length for both sexes. However, more investigational work comparing sagittae measurements is needed before final analysis is made.

Comparison of the sagittae nucleus diameters did show minor variations between area, age and sex, but significant differences were not found. However, a significant post-nucleus mark was noted when comparing the naturally reared fish and the marked hatchery fish held for an additional four months before planting. The mark occurred at a distance twice that of the normal nucleus diameter. Hatchery fish planted as swim-up fry in Hatchery Bay and returned as adults, had nucleii similar to the naturally reproduced fry. One nucleus marked otolith was taken on another spawning site at Crescent Bay located some 14 miles south of the hatchery.

Assistance was given in summarizing the IBM analysis of the creel census and harvest program conducted on the upper Flathead River during the 1975 fishing season.

LITERATURE CITED

Thorne, Richard E., Edmund P. Nunnallee, and James H. Green. 1972. A portable Hydroacoustic Data Acquisition System for Fish Stock Assessment. Washington Sea Grant Publ. 72-4. University of Washington, Seattle. 13p.

McKern, J.L., H.F. Horton, and K.V. Koski, 1974. Development of steelhead trout (Salmo gairdneri) otoliths and their use for age analysis and for separating summer from winter races and wild from hatchery stocks. J. Fish. Res. Board Can. 31:1420-1426.

Hanzel, Delano A. 1973. The seasonal and depth distribution of fish populations in Flathead Lake. Comp. Report. Montana Department of Fish and Game. F-33-R-6, Job I-a. Multilith.

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Water referred to: Flathead Lake - 07-6400