

MONTANA DEPARTMENT OF FISH AND GAME
FISHERIES DIVISION

JOB PROGRESS REPORT

State Montana Title Flathead Lake Fisheries Studies
Project No. F-33-R-7 Title Develop techniques for sampling juveniles
Job No. I-c and Determining trends in Flathead Lake Kok-
anee Populations
Period Covered July 1, 1972 through June 30, 1973

ABSTRACT

The newly developed purse seine was successful in capturing kokanee alive in the limnetic areas of this large deep lake. Sonar was useful in locating seining areas but fish indicated by sonar could not be correlated to the catch of the net.

The seine collected an average of 46 fish per haul; with a maximum catch of 110 fish. The 3/8 inch nylon mesh seine was capable of collecting fish that ranged in size from 79 to 344 mm T.L. Kokanee represented 98.7 percent of the seine catch; other species included the cutthroat trout, mountain and pygmy whitefish.

Extreme care was necessary while handling the salmon during the mark and release phase of the operation.

The seine provided a technique to collect both adult and juvenile salmon and the establishment of numbers, sizes and ages within a particular sample area or school.

BACKGROUND

Flathead Lake in northwest Montana is the state's largest natural lake and one of the most important fishing lakes. The fishery depends almost entirely on natural reproduction and recruitment from the lake and tributary system. Flathead drainage is a part of the Clark Fork River drainage, and joins the Columbia River via the Pend Oreille River. It is an area that is rapidly changing due to the development of its more important natural resources: water, land, timber and recreation.

The lake contains 20 fish species, knowledge of their habitats and the relationships that exist between them is essential to programs to manage the fisheries resource.

Specially designed gill nets have been used to collect fish samples on this lake. The sampling does not provide an effective method of catching small-sized open water fish such as kokanee. Data on young year classes are essential in making management recommendations for the fisheries resources of this lake.

OBJECTIVE

It is the objective of this job to develop a method of estimating year to year population trends of the kokanee in Flathead Lake. An effective method of capturing large numbers of juvenile kokanee is needed for use in a marking and recapture program. A statistical model will have to be developed using estimates of year-class strength, mortality rates, growth rates and migratory patterns which will show the effect of these variables on population density and individual fish size.

PROCEDURES

Sampling large numbers of juvenile fish in lakes is difficult. Each species has specific habitat requirements which vary seasonally and during the numerous life stages, requiring special techniques and gear. Kokanee, the species of immediate concern, is generally known to occupy the limnetic zone of a lake where it has been difficult to obtain samples of young fish.

A review of the fishing techniques for kokanee and other juvenile salmon along the Pacific Coast, indicated success when using small meshed purse seines. A modification of this type of seine, described by Hanzel, 1972, was completed and readied for fishing during the 1972 season.

The seine, of 3/8 inch nylon mesh, 560 feet long and 65 feet deep, was designed to fish to a maximum depth of 48 feet below the surface. Although the diameter of the encircled net is 178 feet (area 0.57 acre) the area actually seined is approximately eight acres.

The seine was fished using a 12' x 20' barge powered by a 40 hp outboard engine and the 35-foot research vessel, the "Dolly Varden." The barge provided a spacious working platform to arrange and carry the bulk of the netting material. The only permanent installations in the deck of the barge were the motor control console and purse ring stripper bar mounted aft on the starboard side. The seiner-type research boat was used to pull the net off the barge. Once the seine was in the water, the ends were brought together to complete the circle and the net pursed with as much haste as possible. The power winch and boom of the "Dolly Varden" were used to purse and lift the net. Once pursed, the bundle of rings were lifted with the boom which allowed space to bring the barge alongside the seiner. The bundle of rings was dropped to the deck of the barge leaving the remainder of the net retrieval and storage to be done by hand. A 12' aluminum boat, powered with an outboard was available during the entire operation to handle any possible emergencies. The optimum size crew for the net operation would be five men, three aboard the barge and two on the seiner.

Fish collected in the seine were transferred to a hold box, anesthetized, weighed to the nearest gram, measured total length (T.L.) in millimeters, scale sample extracted and then marked with fluorescent pigment (Hanzel, 1973) particles before being released in the lake. Stomach contents and otolith bones were taken periodically through the sampling season.

FINDINGS

Net Operations-Fish Handling

Fish reconnaissance, using a recording sonar, was initiated in late May to locate off-shore or limnetic concentrations of fish. The first large schools were recorded on June 15 in an area off Yellow Bay where fish were found occupying water depths from the surface to 32 feet in areas where lake depths were greater than 230 feet. The initial purse seine was set after the presence of juvenile kokanee was verified in the area by floating gill net sets, Hanzel, 1974a.

Purse seining efforts were continued within the same general area until the last of July when schools of kokanee dropped below 35 feet and moved out of the area.

The initial phase of the seining operation was devoted toward the development of the operational procedures and the handling of the fish. The skills were acquired readily by the crew of four men. Within a week, the crew could set, pull and have the seine ready for another haul within one hour. Time in handling the seine did not change even though the fourth member of the crew was unfamiliar with the setting procedures.

The holding and handling of the fish so that they could be marked and released unharmed proved to be more of an obstacle than first anticipated. Both the juvenile and adult salmon were found to be extremely delicate and easy to excite. Extra caution had to be exerted continuously during the pulling of the seine and especially when the fish were gathered together for dip-netting. They were easily excited by quick movement resulting in blind thrashing against the abrasive nylon webbing bruising themselves and loosing large amounts of scales. Slow and deliberate movements of the crew were required to minimize the excitability of the fish. A 300 gallon aluminum stock water tank was first used to hold the fish. The tank had to be replaced by a live car because the water maintained in the tank warmed quickly and caused some mortality. The fish continued to thrash about nervously in the tank, even with a tank cover. The live car, 2 feet by 3 feet by 2 feet, was more confining but provided the environment of natural lake water whose movements settled the fish down causing less abrasive bruises and allowed easy dip-netting into the anesthetizing solution.

All seine hauls were made during the daylight hours between 10:00 a.m. and 2:00 p.m. Water clarity during the seining as measured with a secchi disc, ranged from 5 feet at the beginning to 20 feet at termination. No direct correlation was noted between the catch of the net and clarity of the water. Large catches were experienced both during the morning and afternoon hours with the secchi disc readings between 7 and 20 feet.

The time it took the crew to completely enclose the net and purse it seemed to be the most critical factor effecting the number of fish in the catch. Best catches were produced when encircling was completed from 6 to 10 minutes and pursing was done in 5 to 8 minutes. Wind and proper alignment of seine could aid the pursing operation if the vessel ended the circling phase in a downwind position. A slight wind, from 5 to 10 mph, created the necessary wind resistance against the boat to off-set the pulling force of the purse line during the closing of the seine. The off-setting force kept the boat from being pulled into the middle of the seine, resulting in less opportunity to foul the seine around the boat and produced a

faster and more efficient haul. Seining was accomplished during higher wind velocities but more time and caution had to be expended during the hauling phase thus reducing the efficiency.

Catch of Purse Seine

A total of 12 seine hauls made in the Yellow Bay area produced an average of 46 fish per haul or a total of 552 fish. The largest single haul was 110 fish. Kokanee was the major fish species taken in the seine and represented 98.7 percent of the total catch. Other species captured included the mountain whitefish, cutthroat trout and pygmy whitefish. Dolly Varden and lake trout were known to frequent the seine area (Hanzel, 1974a) but none were taken in the seine.

The size range of fish collected in 3/8 inch bar measure seine were as follows: kokanee, 79 to 323 mm; cutthroat trout, 195 to 344 mm; mountain whitefish, 262 to 268 mm; pygmy whitefish, 101 to 153 mm. The smallest fish, a kokanee 79 mm T.L., collected during pursing was not completely entrapped and had to be dip-netted. This size fish could swim through the stretched mesh.

Kokanee collected in the seine were aged (Hanzel, 1974b) and found to represent fish of ages 1 through 4 years old (I through IV annuli). The largest single age group collected in the seine was two-year old salmon representing 65.3 percent of the total fish. The size of the two year olds ranged from 193 to 218 mm. The youngest age group, 1 year olds, represented 18.2 percent of seined fish ranged in size from 79 to 150 mm. This was the first sampling of small kokanee from the lake other than by finding them in the stomachs of Dolly Varden. The percent of three and four year old kokanee taken by the seine were 12.7 and 3.8 percent, respectively. It is not determined from the present seining whether the larger and faster swimming fish were able to outswim the seine during the haul or whether the numbers represented by the seine hauls was indicative of the actual age composition of the fish occupying that area. Angler caught kokanee in the seine area and other fishing areas of the lake are predominately fish 3 years old and older. Angler caught fish, larger than 240 mm T.L., represent 97.4 percent of the kokanee creeled.

A total of 401 kokanee were marked with orange fluorescent pigment and returned to the lake. No serious problems were encountered adapting the shore marking equipment for use on the boat. Predation by gulls on the marked fish was minimized by allowing fish to regain complete consciousness from the effect of the anesthetic before being released.

Checks for the marked fish will be made on fish collected during fall shoreline gill net series and subsequent seining operations. Recoveries from the gill net series would trace migrational patterns of mature salmon from summer concentrations to specific natal spawning areas, while recaptured from subsequent seining would aid in defining the movements of both juvenile and adult fish in the lake.

The new purse seine and its design did prove that inexperienced fishery workers could learn to operate effectively in a relatively short period of time and that both juvenile and adult salmon could be collected in the limnetic area of the lake. The technique also provided a method of establishing fish numbers, sizes and ages of a particular school so that population trends might be measured.

Further analysis of the seining information would be premature without (1) more knowledge of the nets limitations, bias and selectivity or (2) more knowledge of the kokanee population and its variability in the lake. The sampling did, however, provide an adequate supply and size range of fish so that a comprehensive age and growth analysis could be made (Hanzel, 1974b). Although the sonar was used to locate the schools and determine their depth, no correlation could be made by comparing numbers of fish indicated by the sonar and the catch of the seine in the same area.

RECOMMENDATIONS

It is recommended that the technique of collecting kokanee in the limnetic areas of the lake with the aid of the newly developed purse seine be continued. The research vessel should first locate the shallow fish concentration early in the spring with the seining operation to commence and continue in one area as long as the fish are available. The sampling should be conducted in both daylight and dark hours to ascertain the optimum seining time. Marking of kokanee with fluorescent pigment which aids in defining the movements and migration patterns of this fish should also be continued.

LITERATURE CITED

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Waters referred to:

Flathead Lake 7-6400-03