MONTANA DEPARTMENT OF FISH AND GAME
FISHERIES DIVISION

JOB PROGRESS REPORT

State Montana Title Flathead Lake Fisheries Studies

Project No. F-33-R-6 Title Develop Techniques for sampling Juveniles and

Job No. I-c Determining Trends in Flathead Lake Kokanee Populations

Period Covered July 1, 1971 through June 30, 1972

ABSTRACT

An experimental purse seine 560 feet long was designed to collect juvenile kokanee in Flathead Lake. It was not completed before the concentrations of salmon had dispersed from their wintering areas where they occupy water depths less than 30 feet. The seine was test fished for configuration and workmanship and found to be satisfactory. The net was stowed on a 12' x 20' barge and was laid and pursed with power aboard the "Dolly Varden."

Fluorescent fish marking was found to be an acceptable method for identifying previously captured salmon for checking movement and distribution patterns in Flathead Lake. This mark was tested on fish ranging from 40 to 80 mm total length (T. L.) (1.5 to 3.2 inches) retained under hatchery conditions. After four months, the mark was recognizable from 70 to 100 percent of the individuals if the fish were marked on both sides.

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 maintain the fisheries resource.

Specially designed gill nets have been used to collect fish samples on this lake. This 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 a problem. Each species has specific habitat requirements which vary seasonally and during the numerous life stages. If all stages are to be sampled, special techniques and gear are required. 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 salmon along the Pacific Coast, indicated successful use of small meshed experimental purse seines of this type, (Durkin and Park, 1967). Floating traps and mid-water trawls either failed to collect adequate numbers of fish or caused fish to be in such poor condition that they could not be used in marking programs.

Development of a mass marking technique for kokanee caught with the seine was another phase of this job. Since large numbers of fish were anticipated and because kokanee are extremely sensitive to handling by conventional methods, the granual fluorescent pigment technique (Jackson, 1959) (Phinney, 1967 and 1969) (Hennick, 1970) (Stober, 1970) was selected and field tested. Marked salmon were held in facilities at the Flathead Lake Salmon Hatchery, near Somers. Three groups of fish were tested; cutthroat trout, 80 mm T.L. (3.2 inches), Kokanee, 40 mm T.L. (1.5 inches) and 60 mm T.L. (2.4 inches).

Marking material was commercially prepared pigment ground so that 70 percent of the granuals were between 50-350 microns in size. Orange and green marks were tested. All spraying was performed out-of-doors at pressures of 100 psi with equipment similar to that described by Phinney, 1967.

A holding frame described by Mattson and Bailey (1969) was constructed to hold the fish during the spray operation. Their technique was slightly modified by first anesthetizing the fish in a small tub and then transferring them to the marking frame. This allowed minimum exposure time in the anesthetizing solution, lessened the possibility of physical damage to the fish and could be used for marking fry as well as larger fish.

FINDINGS

Purse Seine

Construction of the experimental purse seine described by Hanzel (1972) was completed during this report period but not before the fish had already dispersed from wintering areas in the southern part of the lake. Sonar records indicated after mid-July, kokanee were found to occupy areas deeper than 30 feet. Since the fish were no longer concentrated and were occupying depths near the lower limits of the net, the seine was only test fished to check the configurative and design used in the net. This operation allowed personnel to become familiar with the net and become aquainted with the use of power equipment necessary to set and pull it.

During the test operation the net configuration, materials and workmanship were found to be satisfactory, however, several minor modifications were necessary to adapt the power equipment and barge.

The net 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 on 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 net 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'foot 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 Marking Test

Two lots of 100 cutthroat trout averaging 80 mm T.L. (3.2 inches) were spray-marked on both sides with granular fluorescent pigment. One lot was marked with orange, the other with green material. The only noticable post-marking mortality occurred within two days, which accounted for 5.0 percent of the fish. The fish were checked for mark retention four months later at an average size of 165 mm (6.5 inches). A portable Blak-Ray ultra-violet-longwave light was used to detect the fluorescent mark on the fish. All fish were anesthetized and handled individually to check for mark retention. The orange pigment was by far the most striking mark of the two colors tested and was easier to detect. The fish marked with orange pigment had 96 percent retention compared to 70 percent for the green color. Although all fish were sprayed on both sides, only 53 percent of the orange and 73 percent of the green-sprayed fish retained the marks on both sides of the fish.

Marking of fry kokanee averaging 40 mm T.L. (1.5 inches) was also tested. A group of 100 fish were sprayed on both sides using the same techniques as on the larger cutthroat trout. Post-marking mortality was noted with the bulk occurring the following day after marking and was believed to be the result of physical damage rather than air pressure of 100 psi used on the fish. Total mortalities were 5 percent. These fish were to be held separately and checked at a later date for mark retention but unintensionally were mixed with a production lot of kokanee. Three months after marking when the fish averaged 70 mm T.L. (2.8 inches), a portion of the trough containing the fish was darkened and examined with ultra violet light. Although the numbers of marked fish represented about 5 percent of the total lot, the marked individuals could be readily recognized as they passed under the light. Marked fish could be seen swimming under the light in more than 18 inches of water. No further check was made on this lot of fish.

The mass marking of 8,000 kokanee (average size - 60 mm, 2.4 inches) was accomplished using the same techniques as previously described. The entire operation took three hours, including the cleaning of equipment and measuring 100 fish. Post-marking mortalities were tallied during the eight days following the marking. The numbers lost on successive days were 36, 6, 1, 0, 0, 0, 1, 1, or a total of 0.6 percent. One month after marking, three random samples of 25-30 fish from the lot were anesthetized and examined for marks. All fish examined were found to contain pigment on one or both sides of the fish.

The use of the fluorescent pigment technique of marking fish was found to be a satisfactory method of rapidly marking large numbers of fry and larger kokanee.

RECOMMENDATIONS

It is recommended the research vessel locate the shallow concentrations of juvenile kokanee in the southern bay areas with sonar as soon as possible in the spring of 1972. The use of the purse seine should be used to make a collection of the juvenile salmon. A field test of the fluorescent marking technique on wild fish should be evaluated prior to any large-scale mark and release program anticipated for the lake.

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