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Report 261

REPORT ON THE WORK OF THE INSTITUTE FOR FISHERIES RESEARCH BIENNIUM 1932-1934

By Carl L. Hubbs, Director

Fisheries research work over the 1932-1934 biennium was considerably curtailed and in part interrupted by economic conditions. Despite this handicap, an effort was made (1) to conduct the investigations requested by the Fish Division and by the Stream Control Commission; (2) to carry on a number of studies which were begun during the preceding biennium, and (3) to assist in developing and supervising the new fields of lake and stream improvement.

The fisheries investigations were conducted, as previously, by the Institute for Fisheries Research. This department was organized at the University of Michigan in February, 1930, for the purpose of carrying on scientific fisheries research for the Department of Conservation. Whereas a part of the expense of the lake survey and improvement activities was again borne by the Izaak Walton League, the main financial support for the Institute came from the Department. The small amount of work done on private waters was financed by the property owners. Some work was also done by the Institute staff for other states, at <sup>their</sup> this expense.

The staff of the Institute during the biennium consisted of Dr. Carl L. Hubbs, Director, in a part-time basis; Dr. John R. Greeley, also on a part-time basis, Assistant to Director during the first year and Research Associate in charge of trout investigations for the second year, with a leave of absence for the summer (called for by economy, and enabling Dr. Greeley to continue his fish survey work for the New York Conservation Commission); Milton B. Trautman, Assistant Director, on part-time basis, appointed March 1, 1934, following the resignation of Dr. Greeley to accept the position of Ichthyologist with the New York Conservation Commission; J. Clark Salyer, Research Associate in charge of beaver-trout investigations, on a full-time basis, for the year

1933-1934; Gladys R. Brown, Secretary; R. W. Eschmeyer, Fellow in Fisheries Research, in charge of lake surveys and lake improvement investigations; on leave in 1933-1934 supervising lake improvement work by the Michigan Emergency Conservation Work; Clarence M. Tarzwell, Fellow in Fisheries Research, in charge of stream improvement investigations, on leave in 1933-1934 supervising stream improvement work by the Michigan Emergency Conservation Work, later taken over by the U. S. Bureau of Fisheries for similar work; Laurence M. Ashley, Fellow in Fisheries Research, in charge of vegetation planting experiments, on leave after the summer of 1933; Eugene R. Kuhne, assistant on lake survey, summer of 1932 (loaned to the M.E.C.W. for stream improvement work in 1933-1934, and to the U. S. Bureau of Fisheries for similar work in the summer of 1934); Charles M. Davis, Geographer on lake surveys, summer of 1932; Ralph G. Janes, Leslie H. Doty, and Wesley H. Ayer, volunteer assistants, lake survey and improvement work, summer of 1932; Gerald P. Cooper, Fellow in Fisheries Research (second year only), and H. Wesley Curran, graduate students, in charge respectively of the forage fish investigations and of the Experimental Aquarium, both working during the summer on the New York Biological Survey; David S. Shetter, graduate student, in charge of fish migration studies. In addition, a number of others were hired from time to time, or obtained on C.W.A. and F.E.R.A. basis, to assist in collecting and tabulating the creel census data, and in miscellaneous laboratory and field work. While the staff has been rather large, it has almost entirely served on a part-time basis, and several of the men have been lost to the Institute service during the summers, when most needed in Michigan, or during the whole year, because they received better offers from other conservation organizations. These factors have gravely limited the extent and the efficiency of the Institute work.

Several publications, covering some phases of the investigations conducted by the staff under the auspices of the Institute, appeared during the biennium:

The Improvement of Trout Streams. By Carl L. Hubbs. American Forests, Vol. 38, 1932, pp. 394-395, 430-431, 4 figs.

How Michigan is Making Better Trout Streams. By John H. Greeley and Clarence M. Tarzwell. American Forests, Vol. 38, 1932, pp. 452-454, 479-480, 10 figs.

The Species of Black Bass. By Carl L. Hubbs. Transactions of the American Fisheries Society, Vol. 61, 1931 (1932), pp. 86-88.

Methods for the Improvement of Michigan Trout Streams. By Carl L. Hubbs, John R. Greeley and Clarence M. Tarzwell. Bulletin of the Institute for Fisheries Research, No. 1, August 1, 1932, pp. 1-54, pls. 1-4, figs. 1-18. Second printing, November 30, 1932; third printing, April 30, 1934.

The Increased Growth, Predominant Maleness and Apparent Infertility of Hybrid Sunfishes. Carl L. and Laura C. Hubbs. Papers of the Michigan Academy of Science, Arts and Letters, Vol. 17, 1932 (1933), pp. 613-641, figs. 69-71, pls. 64-65.

Objectives and Methods in the Lake Inventory in Michigan. By K. C. McMurry, R. W. Eschmeyer, and C. M. Davis. Papers of the Michigan Academy of Science, Arts and Letters, Vol. 18, 1932 (1933), pp. 259-276, map 24, pls. 23-24.

The Technique of Improving our Fishing Waters. By Carl L. Hubbs and John R. Greeley. Transactions of the 19th American Game Conference, 1932 (1933), pp. 37-46, 4 figs.

The Spawning Habits of Brook, Brown and Rainbow Trout, and the Problem of Egg Predators. By John R. Greeley. Transactions of the American Fisheries Society, Vol. 62, 1932 (1933), pp. 239-248, 2 figs.

The C.C.C. at Work for Fish and Game. By Carl L. Hubbs. The National Waltonian, Vol. 1, 1933, pp. 4-5, <sup>15</sup>3 figs.

Suggestions for Local Fish Studies. By Carl L. Hubbs. Journal of the Michigan Schoolmaster's Club, 1933, pp. 49-53.

Sewage Treatment and Fish Life. By Carl L. Hubbs. Sewage Works Journal, Vol. 5, 1933, pp. 1033-1040.

Lake Improvement Devices. Institute for Fisheries Research. [1934] Leaflet, 4 pp., 20 figs.

Racial and Individual Variation in Animals, Especially Fishes. By Carl L. Hubbs. American Naturalist, Vol. 68, 1934: 115-128.

Some Experiences and Suggestions on Forage Fish Culture. By Carl L. Hubbs. Transactions of the American Fisheries Society, Vol. 63, 1933 (1934), pp. 53-63.

C.C.C. [Lake and] Stream Improvement Work in Michigan. By Carl L. Hubbs, Clarence M. Tarzwell and R. W. Eschmeyer. Transactions of the American Fisheries Society, Vol. 63, 1933 (1934), pp. 404-414.

Many of the reports on the investigations of the Institute remain unpublished, for they are submitted in manuscript form only. During the biennium 1932-1934, Institute reports 156 to 251, inclusive, were prepared, mostly for the Department of Conservation. These reports, covering a wide range of subjects, may be classified as follows (some reports are listed two or three times, when covering more than one subject):

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A number of the manuscript reports could be published to good advantage.

Following is an outline of the work of the Institute for Fisheries Research for the biennium 1932-1934, with brief references to the results of the investigations

Lake Surveys and Recommendations.—In the 1932 season surveys, maps, rather full reports as to conditions for fish life and fish management programs were drawn up for 6 lakes in Mason County (Hamlin, Bass, Long, Ford, Crystal and Gun); for 6 lakes in Manistee County (Bear, Pine, Chief, Lemon, Dickson and Mud); for 13 lakes on the Pigeon River Tract, and for a few private lakes, at the expense of the owners. The Mason and Manistee county surveys were sponsored and financed by local chapters of the Izaak Walton League of America. In all, 26 lakes aggregating 8715 acres were surveyed. In these surveys, attention was given to plans for lake improvement work. During and subsequent to the summer of 1933, numerous lakes over the state were examined, primarily for lake improvement recommendations.

Lake Improvement Work.—Most of August, 1932, was devoted to the installation, for experiment and demonstration, of improvement devices in a number of the lakes surveyed in 1930, 1931 and 1932. Experimental plantings of water weeds were also made, in the summers of 1932 and 1933. Opportunity to extensively apply and test the methods for lake improvement were furnished by the Emergency Conservation Work in 1933 and 1934. A leaflet describing some of these methods was published, and the preparation of a bulletin on lake improvement work was begun.

Stream Surveys.—The survey of Michigan streams was continued here and there over the state. Most intensive work was done on the Pere Marquette and Pigeon River systems. The latter stream was mapped in detail, as an experiment in extensive survey methods. A number of possible trout streams in southern Michigan were examined. Many of the northern streams were omitted in drawing up the stream improvement projects.

Stream Improvement Work.—The summer of 1932 was devoted to: (1) the final

preparation and publication of the stream improvement bulletin; (2) checking the permanence and the desirable effects of the experimental installations of the two previous summers; (3) installing further experimental improvements in the Pigeon River State Forest, and, at the owner's expense, in several private streams in the state, and (4) extending the Michigan methods to Iowa, at the request and expense of the Iowa Department of Fish and Game. During 1933 and 1934 very extensive installations were made by the M.E.C.W. carrying into practice the results of the previous experiments. It is source of some gratification to observe how this work, in which Michigan pioneered, has spread over the country.

Federal Relief Projects.—A considerable amount of time was devoted by the Institute staff to ~~the~~ <sup>the</sup> preparation of general projects for lake and stream improvement by the Michigan Emergency Conservation Work. After these were approved, numerous additional projects and estimates were prepared, especially by the staff members who were taken over by the M.E.C.W.

Fish Management Work, Other States.—At the expense of other states, members of the Institute staff carried on fisheries investigations outside of Michigan. Hubbs and Salyer prepared the fish section of the Iowa Twenty-five Year Conservation Plan, and Salyer, on leave, served as Technician for the Iowa Department of Fish and Game prior to his return to take over the beaver-trout investigation. At the end of the biennium, Salyer again took leave from the Institute staff to organize the new Migratory Wildfowl Division of the U. S. Biological Survey. Tarzwell made a survey of Iowa trout streams and introduced the Michigan methods of trout stream improvement to that state. About the end of the fiscal year, Tarzwell, Kuhne and Rodeheffer were called from Institute service to work for the U. S. Bureau of Fisheries in lake and stream surveys and improvements. Greeley, Cooper and Curran took part summers in the New York Biological Survey, and Greeley accepted a permanent position with the N. Y. Commission on March 1, 1934. Hubbs and Trautman made a survey of the Mad River in Ohio.

Fish Management Work, Private Waters.—A small amount of consulting work was

carried out on private waters, in Michigan, Wisconsin and Illinois. The full cost of such work, for services as well as expenses was paid for by the parties benefited. The fees, reverting to the Institute's Trust Fund, became available for the regular, public work of the Institute.

Pollution Investigations.—At the request of the Stream Control Commission, the Institute determined the effects on fish life of various chemical compounds and trade wastes involved in the pollution of Michigan streams and lakes. Some of these tests, especially those on cyanide wastes, have proved useful in the technical studies of pollution control being conducted at Michigan State College. All of the studies have a bearing on the movement to clean Michigan waters of harmful pollution.

Fish Mortality Reports.—Routine reports on the cause of extensive fish deaths in certain waters were continued. These results were correlated with the pollution investigations, with the predator studies and with the disease investigations. A special study was made into the cause of death of fishes found dead in our trout streams.

Disease and Parasite Studies.—It was not possible to return Dr. Wandell H. Krull, on leave, to active duty as Fish Pathologist, nor to replace him. Without such specialized help, it was not possible to do more than make a few routine examinations and reports on the effects of diseases and parasites on the fish life of the state.

Predator Investigations.—The loss of J. C. Salyer to the staff in 1932-1933, and his assignment to the beaver-trout investigation in 1933-1934, greatly curtailed these important investigations, which had rapidly approached definite conclusions and report. New material was gathered for further analysis, however, and the predator aspects of the beaver-trout problem were given due attention. The problem of predators on trout eggs was considered and reported upon by Dr. Greeley.

Forage Fish and Bait Minnow Studies.—Work was actively begun to determine the desirability of different species of minnows for use as forage fishes, so as to increase the food for game fishes in hatcheries and in natural lakes, and to determine how the desired species may be reared or increased in numbers. The augmented numbers of game fish being reared, the movement to increase the stock of fish in our lakes, and the depletion of minnows in natural waters unite to make this problem an urgent one.

Age and Growth Studies.—Work was continued on the growth of trout, as related to the fundamental problem of natural trout production in our streams and lakes. Similar studies were carried to completion, dealing with the age and growth of two species of sunfish which now receive legal protection though they seldom reach legal size in Michigan, but act as competitors against the better species.

Legal Size and Season Inquiries.—The studies just mentioned bear directly on the problem of proper legal size for sunfish species. Observations were continued on the breeding season of various fishes.

Identification of Specimens.—This line of work, continued through the two years, is of value from the standpoints of education and of law enforcement.

Fish Survey of State.—The survey of the fish life of the state, aiming to determine what species inhabit each of the lakes and streams and to provide material for future bulletins and books on the subject, was continued though not stressed during the years 1932 to 1934. A detailed outline map of the lakes and streams of Michigan, drawn by a C.W.A. assistant, was printed so as to allow the plotting of the very numerous fish records already obtained.

Migration Studies.—The tagging of trout and other fishes was actively continued, and the rather numerous returns to date were tabulated in 1934. Studies on the methods of tagging lead to the development of a new type of numbered tag, encircling the lower jaw.

Spawning and Nursery Studies.—Limitations of staff and time allowed only incidental observations on these vital problems.

Food Production Studies.—Except for rather generalized observations made on the lake and stream surveys, and for some quantitative work on trout stream food organisms made in evaluating stream improvement work, little was done toward solving the basic projects, of analyzing and of increasing the natural food production in our waters.

Analysis of Creel Census.—The first formal report on the Michigan creel census, the first real inventory of the game fish yield by any state, was prepared during 1933 and 1934. It covered the period from 1927 to 1932, inclusive, and involved the analysis



of more than 50000 cards, reporting 287505 legal-sized fishes, of which 273725 were caught in 274336 reported hours of fishing. The trend of fishing over the 5 years 1928 to 1932 was determined, for the main species in each region of the state. The many entries for 1933 were tabulated in preparation for final analysis, and a special effort was made to collect and analyze an adequate amount of data to indicate the relative catch of the summer and winter seasons.

Beaver-Trout Investigation.—Realizing how acute the beaver-trout problem had become, the Department in 1933 determined to get the facts. Opinion as to the benefit or harm done trout by beaver occupancy of trout waters had become too diverse to expect any solution of the question to come from anything but a sound unbiased scientific investigation. The Institute, requested to assume major responsibility for this project, was fortunate in being able to reappoint J. C. Salyer to its staff and to assign him on a full-time basis to this project. Although it was generally assumed that the problem would require three years for solution, the main aspects were solved in the first year of work. A management policy was determined which would allow the retention of the beaver in trout territory without harm, probably with benefit, to the trout.