

INSTITUTE FOR FISHERIES RESEARCH  
UNIVERSITY MUSEUMS  
UNIVERSITY OF MICHIGAN  
ANN ARBOR, MICHIGAN

Report 51

February 1, 1931

FIRST ANNUAL REPORT OF THE INSTITUTE FOR FISHERIES RESEARCH  
WITH FINANCIAL STATEMENT

Origin of the

Institute for

Fisheries Research

In February, 1929, the Regents of the University of Michigan founded an Institute for Fisheries Research. This action was taken as the result of the request of the Department of Conservation that the University undertake fisheries research within the state. The arrangement was essentially this: that the University should undertake to carry on investigations into biological problems which the Department needs to have solved, and which must be solved to provide the fullest possible development of the fish supply of the state. To make these investigations possible, the Department agreed to provide a Trust Fund, in amount \$16,000 for the first year, to be paid in quarterly installments to the Treasurer of the University. The disbursal of the Trust Fund has been made by the University Treasurer, on vouchers submitted by the Director of the Institute for Fisheries Research, Dr. Carl L. Hubbs.

Lake development

work sponsored by

Isaac Walton League

It was evident at the start that an annual sum of \$16,000 was insufficient to carry on investigations intensively enough to yield results most effectively. It was, for instance, impossible to inaugurate the vitally needed investigations fundamental to the development and increase of the inland lake fish supply. Consequently, the State Division of the Isaac Walton League of America,

through its President Mr. H. F. Harper of Lansing, proffered the support of this aspect of the work of the Institute, by providing funds to enable three men (as graduate students of the University) to work on problems connected with fishery development of the inland lakes. The total sum furnished was \$3600 (~~half~~<sup>7/12</sup> of this sum, or ~~\$1800~~<sup>2100</sup>), has been ~~used~~<sup>available</sup> over the period from the inauguration of this support on June 1, 1930, to the end of first year of the operations of the Institute, on February 1, 1931.

It is now very clear, that without this support from the Isaac Walton League that the fisheries research work for the state would have been very seriously handicapped. It is equally true, even more so, that our program of work leading toward an increase in our fish supply will be materially set back if funds are not sufficient in 1931 to carry on this lake work which was supported by the League.

Organization and

The initial year of the work of the Institute for Fisheries Research, it was expected, would largely be consumed in the organization of staff, assistants and investigations.

Staff of the Institute

Owing to the death on duty of Dr. Jan Metzelaar in 1929, and the acceptance of an Ohio position by Mr. T. H. Langlois, the staff of the Institute had to be build up from the ground. Dr. Walter Koelz, who had recently been taken on by the Department as ichthyologist, joined the staff of the Institute at its organization, but before long resigned to accept <sup>a</sup> position as biological explorer in Asia. Mr. Gerald McCrimmon, who had assisted Dr. Metzelaar, has been retained as general assistant in the Institute, and Miss Orel Shoebriidge has been made Secretary. During the year the following staff members were added: Mr. Wendell H. Krull, Fish Pathologist; Dr. John R. Greeley, Assistant to Director; Mr. Samuel N. Jones, Assistant; Esther ~~E.~~<sup>E.</sup> Stover, Clerk (on creel census work). The following have become fellows in

fisheries research, and as such have carried on field ~~work~~ and laboratory work of various sorts: R. W. Eschmeyer (lake survey); Lawrence M. Ashley (growth of vegetation in lakes); Clarence Tarzwell (resnagging trout streams) and J. Clark Salyer (food of fish-eating birds, etc.). In addition one temporary field assistant, David S. Shetter, was employed for lake survey work in 1930. Several others have been employed for short periods of time in the trout-tagging, the stream-snagging and the general laboratory investigations.

Accomplishments of  
the Institute in 1930

Despite the fact that the first year was one of organization, and of building up and training a new staff, the Institute feels that it has made real accomplishments during its first year. In a way the prime accomplishment was

- (1) the building up a trained staff;
- (2) the acquiring of the necessary field and laboratory equipment and materials for the carrying on of extensive investigations,
- (3) the making of the necessary contacts with the general public of the state, especially with the sportsmen and conservationists, and
- (4) the carrying on of various preliminary experiments and the outlining of consistent programs of work for the future.

The Institute feels that it has built a foundation on which the fisheries research work of the following years in Michigan may be securely built.

In addition to this work of organization, an amount of investigation has been carried on which the Institute believes at least equals that done in previous years. A very brief outline of the work accomplished along each of several lines may be of interest.

1. Lake and stream survey Thanks to the lake development project sponsored and supported by the State Division of the Isaac Walton League, extensive progress can be reported on the inventory of Michigan lakes. More lakes have been examined than in most previous years, and they have been examined much more intensively. Features of the expanded lake survey are:

- (1) The preparation of a map of every lake examined, showing by colors the kind of bottom in each part of the lake; by soundings and contours, the depths of the lake; by symbols, the location, shape, size and composition of the weed beds; by accurate outline and by different types of outline, the details of the shape of the lake, especially of the bays and points, and the character of the shore line; by stippling, the location of spawning beds.
- (2) The determination of the chemical and physical characters of the water of the lake at all depths; this includes color and transparency of water, temperatures, dissolved oxygen and carbon dioxide, alkalinity and hardness—all of which are related to fish life.
- (3) The determination of the kinds of plants present and their abundance in each bed—a matter of importance from the standpoint of the duck as well as the fish supply.
- (4) The determination of the present fish life of the lake, as to species and relative abundance.
- (5) The history of the lake, as to general fishing conditions, and as to changes in abundance of each species.
- (6) The suitability of the lake for various fishes, determined by food production, shelter, spawning beds, etc.
- (7) The possibilities of improving the lake for fish, by increasing weeds, by adding shelter, by fertilizing the water or bottom soil and by connecting the lake with adjacent swales, etc., in addition to fish planting and the protection of spawning areas.

In the 1930 season all of the lakes of any consequence in Kalkaska County were surveyed. The maps of these lakes were completed by the end of the first year (Feb. 1), and the many cards giving the data not presented on the maps were nearly ready for the Lansing and Ann Arbor files. A number of lakes about Ann Arbor have also been surveyed.

This general lake inventory work has been supported by the Isaac Walton League to give us a better idea of the varied conditions in our inland lakes; to make the lake investigators familiar with the varied types of lakes, and thus to pave the way toward more intensive investigations into lake productivity. Special lines of work will be followed out if funds are available; such as the determination of the practicability of increasing fish production by introducing cover; by increasing the weed beds; by fertilizing the bottom soils or the water; by addition of spawning material, as gravel, where needed, etc. Only two preliminary reports specifically dealing with the lake survey work have been prepared (Reports 21 and 36).

As stated above, the lake work has been the project of the Michigan Division of the Isaac Walton League. This organization furnished the men (Fischmeyer, Ashley, Jones) and their subsistence expenses for this work. The Department of Conservation and the Institute furnished the field equipment and supplies.

Some stream survey work was also carried on, in Lake, Manistee, Kalkaska, Livingston, Washtenaw and other counties, by Dr. Hubbs and Dr. Greeley.

2. Fish disease Much attention has been given to investigations into the cause investigations of the death of fishes, both in nature and in the state fish hatcheries. The epidemics which have developed, and these have been numerous and destructive during the year, have been so far as possible definitely diagnosed. This of course is an initial step toward the development of means to treat the diseases, and of more importance, of means to prevent them becoming epidemic. Some initial experiments toward this end have been carried out, some in the Experimental Aquarium at headquarters, but mostly in the hatcheries, where the whole work has gone forward with the courteous and effective aid of the hatchery superintendents.

An investigation of the fungus diseases of fish has been begun at the University

by Dr. Bessie B. Kanouse.

Investigations of hatchery epidemics, which have been made by Fish Pathologist Wendell H. Krull during the year, may be briefly outlined--

- (1) A very destructive outbreak of bacterial gill disease of trout fry and fingerlings at the Thompson Hatchery was quickly diagnosed, and some experiments on its treatment carried out. (Report 6).
- (2) A peculiar and apparently undescribed bacterial disease of the fins of trout at the Hart Hatchery, occurring in association with the gill disease, was studied. (Report 10).
- (3) The serious epidemic of trout in the Oden Hatchery and associated feeding stations was diagnosed as due to the gill bacillus. Dr. Krull cooperated with Mr. Lincoln in experimental treatment of the disease at Oden. (Report 14).
- (4) An unusual though not serious disease of brown trout yearlings at the Grayling Hatchery received passing attention. (Report 19).
- (5) An undescribed and very peculiar disease of brown trout fingerlings at the Marquette Hatchery was studied at some length by bacteriological methods. (Report 24).
- (6) A mouth disease of brook trout fingerlings at the Benton Harbor Hatchery was also reported on. (Report 25).
- (7) A rather extensive study was made of the farunculosis disease of brood trout at the Grayling Hatchery. The identity of the disease was accurately confirmed, and the conclusion was drawn that it would be difficult to eliminate the disease and that the elimination of the older fish would be important in the curtailment of the disease. (Report 35).
- (8) Study was also made of the great difficulties experienced in fertilizing trout spawn at Grayling, and some experiments carried out to determine causes and cures,

in cooperation with Mr. Zalsman. (Report 41).

(9) These investigations led to a requested report on the desirability of maintaining Grayling as an egg-rearing station. (Report 44).

(10) A definite diagnosis was made from preserved specimens of the disease which has for some years been destructive to bluegill fingerlings in one of the Comstock Park ponds. (Report 48).

(11) One report was made on the death of trout in a private pond. (Report 13).

Numerous investigations have been made into the cause of the mortality of fish in natural waters. These included one by Dr. Hubbs on the death of fish due presumably to under-ice suffocation in Clark Lake, Tuscola County (Report 5), and others, mostly by Mr. Krull, on the cause of death of fishes suspected of having been killed by disease, dynamite or pollution (Reports 1, 8, 12, 15, 20, 23, 28, 31, 32, 37, 40, 46 and 49).

A general report has also been prepared, for educational use, on "Why do fish die in Michigan lakes"? (Report 18).

Related to the investigations on the disease and health of hatchery fish are the studies occasionally called for on proposed hatchery sites. During the year such an examination was made of the Wolf Lake trout-hatchery project. (Report 16).

3. Experiments on transportation of fish

With the development of the fingerling production program has come the urgent need for improving the methods of transporting fish economically and safely.

Experiments are being carried on now to determine --

(1) the relative value of different types of transporting cans,

(2) the possible value and danger in using tank oxygen in transporting fish, and

(3) the possible treatment of the water to hold down the spreading of disease and the accumulation of carbon dioxide and other waste products when the fish are crowded in the cans. Only two very preliminary reports on these experiments have as yet been made. (Reports 39 and 43). This work is being continued.

4.) Cover control            The research of the Institute which has perhaps attracted greatest interest, and which promises much in the way of successful application is the experimental work on the environmental control of trout streams. The resnagging experiments begun by Dr. Metzelaar have been followed out, and greatly extended through the year. Other types of barriers have also been tried out, to determine which kinds under different conditions of stream and of available material will be most beneficial, most permanent and most practical. The benefits accruing in the way of increased in protective cover, in home-quarters, in feeding waters, in food supply, and in nursery grounds, are being estimated. To what degree long stretches of streams of too even and shallow depth to support the trout which otherwise would be expected to live there, can be made productive, is an object of this work.

During the year more than 200 experimental barriers were placed in the Little Manistee River. These, and about 300 others made by Dr. Metzelaar or of natural occurrence were metal tagged to permit of their continued observation and record (by Clarence Tarzwell of the Institute staff). A start was also made along similar lines in the warmer streams about Ann Arbor. It may be expected that the bass supply of many southern streams may be increased by putting in hole-digging barriers.



Progress reports on the resnagging experiments were given in Reports 22 and 33.

It is planned to extend this work greatly in 1931, and if possible to start a related project: a study of the practicability of shading streams by planting willows or alders, or by bending down streamside brush over the stream. The proper solution of such a problem will demand the full attention of one man, and the Institute has no one now available for this pressing investigation.

5. General fish management The investigations of the practicability of improving fish conditions in our lakes and streams by such means as cover control should lead as fast as possible into undertaking general fish management projects. To a degree, but altogether too vaguely and too weakly, the lake and stream survey involves fish management projects. What is intensely needed is the very careful survey and experimental fish management of certain restricted areas which can be kept under controlled observations. Preliminary plans for undertaking such an experiment~~al~~ in 1931 have been made, and are discussed in Report 34.

6. The creel census The preliminary tabulation of the creel census given on p. 230 of the Fifth Biennial Report of the Department of Conservation shows that this valuable project is rapidly enlarging. The number of cards reported has increased from 4437 in 1927, to 8722 in 1928, to 10326 in 1929, and now 13590 in 1930. The figure last given is not complete and does not include the records obtained directly by the staff of the Institute. The Institute is actively making tallies of the fishing by line and spear through the ice, in order to get a real estimate as to the species caught, in the usual terms of numbers of each species taken per hour of fishing.

In the expansion of the creel census, the Institute has had generous cooperation from the Division of Fisheries and from the Conservation officers.

A preliminary statement of 1930 work on the creel census is given in

Report 3.

The creel census records for 1928 and half of those ~~for~~ 1929 have been tabulated during the year by the Institute, separately according to each lake and stream in each county. During 1931 it may be expected that all of the data for 1929 and 1930 will be so tabulated. An analysis of all these tabulations will then give us an idea of the relative abundance of the different game fishes in the more important lakes and streams, in each county, etc. We can also obtain figures on the relative numbers of legal and undersized fish caught in each water and in each region. It is believed that these analyses, and such others as may be made, will give a better picture of fishing conditions over the state than can be obtained in any other way.

7. Tagging experiments The experimental study of trout migration, begun by the late Dr. Metzelaar, has been continued and greatly extended. Emphasis this year was placed on the more difficult tagging of wild caught adult trout, to determine their movements especially into and out of closed "feeder streams". A few hundred wild trout were tagged in the spring and summer, and about eleven hundred in the fall. Questions it may be hoped can be at least partially answered by the tagging experiments include:

1. Do brook trout remain in one place? Some remarkable examples of home retention have appeared in the records.
2. Do adults remain in closed streams, where they may decimate the planted fingerlings?
3. Are upstream migrations so extensive and important as to make fish ways in dams across brooktrout streams desirable?
4. Are plantings in one part of a stream sufficient to stock its whole length, or sufficient to stock depleted branches?

5. How migratory are the brown trout?
6. How extensively do the rainbow (steelhead) trout migrate? Examples of crossing Lake Michigan in both directions have come to light.
7. How fast do the rainbow trout migrate? One crossing of Lake Michigan in seven days is on the records.
8. Do the rainbow trout return to the parent stream for spawning? A little affirmative evidence has come from the returns.
9. How fast do each kind of trout grow?
10. How do the movements of different ages compare?
11. What percentage of planted trout survive?
12. What percentage of the trout caught are planted fish and what percentage are of natural spawning origin?

The answers to these important questions will increase <sup>in</sup> ~~the~~ reliability as this work is extended and expanded. The marking of fingerling fish is an important project which has been avoided on account of the lack of a suitable tag of very small size. The Institute has encouraged the manufacturer to put such a tag on the market, and extensive fingerling tagging will probably be undertaken in 1931, to begin to accumulate better information on questions 9 to 12 as just listed.

A bare start was made in 1930 on extension of the tagging experiments to other species. It is hoped that this work too may be carried on in real earnest in 1931.

The whole mass of tagging data obtained to date has been arranged, and its analysis begun at the close of the Institute's first year. A report will soon be prepared. During the year only the preliminary Reports 17 and 45 on the work could be prepared.

8. Legal size investigations Several studies are underway by the Institute, designed to provide data on the problem of the proper legal size for each species. The Institute cooperated with the Department in the first of a series of actual determinations of the mortality due to hooking and releasing undersized fish (Report 42). The preliminary work of Dr. Greeley on the probable effects of overcrowding on the growth rate of trout-- as in the Little Manistee where about 98% of the approximately 22,000 trout per mile of stream were found to be under the 7 inch limit, many apparently dwarfed so as to be but little under the limit, are very significant (Report 50). It is imperative that such studies be greatly extended.

9. Dwarfing investigations Preliminary work on dwarfing in trout has just been mentioned. The necessary long-term analysis of the cause of dwarfing in perch has been begun by Samuel N. Jones of the Institute staff.

A rapid extension of this and similar work, so vital to fish cultural and fish management projects, is to be hoped for in 1931.

10. Growth studies Work on the rate of growth of our various game fishes is underway, but the time of the limited staff was too meager to make much progress along this line in 1930. A large number of scale samples were obtained, however, of lake fish and of trout. These growth studies bear not only on the dwarfing problem, but also on the determinations of age and size at maturity, which is of importance in reference to protective legislation. Relative growth rates in different waters, as in cold feeders and warmer trout creeks, has also an important bearing on the most satisfactory places for planting fingerlings.

Experimental studies were made by Dr. Hubbs <sup>with</sup> aquaria on the production of the seasonal marks on the scales, by which age is determined. He also studied the forced growth of sunfish over winter, and the increased growth of hybrids in the sunfishes. While such work is now chiefly of scientific interest, it may have applications to fish cultural practice.

11. The condition of fish for food Many letters were written and persons consulted in answer to questions as to the edibility of fishes affected with various parasites. Advice was given on this subject to the general public, for game fishes, and to the State Board of Health, for food fishes. Some examinations were also made of fish from a Bay City freezer which were found to be in bad condition. (Report 47)

12. Predator investigations Realizing that in no other aspect of conservation work is opinion so varied and so biased, the Institute is emphasizing studies of the actual amount of harm done by predators on food and game fishes. The investigations of the effect of the terns and gulls of Saginaw Bay on the commercial fishes, which has been carried on for some time by Canuto G. Manuel, was continued well toward final and reliable conclusions in 1930. A preliminary statement regarding this work was given early in Report 9, and a semifinal Report is in preparation.

With the cooperation of the Department of Conservation, much material is being gathered for extensive studies of the effects of fish eating birds and other predators of our inland game fishes. Although many stomachs have already been studied, a report on but one has been given (Report 29). As the investigator

assigned this problem (J. Clark Salyer) begins to catch up with the material accumulated for months and in part for years, progress reports will be forthcoming. It is hoped that funds will permit Mr. Salyer to make extensive collections of material during the summer of 1931.

Some attention is being given to all kinds of fish enemies-- as mink, shrews, snakes, turtles, and, of course fishes themselves, especially gars, dogfish and pike. General food studies of the game fishes have also been continued over the year.

13. Bait minnow investigations Some attention has been given to the problems of bait minnows, especially as to the depletion of the native minnows, and as to the advantages and possible dangers of using goldfish minnows. (Report 2)

14. Smelt investigations The investigation of the establishment and spread of the smelt in Michigan, and of its effect on the native species was continued this year by Prof. Charles W. Creaser. The reports (4 and 11) covered particularly the newly developed runs in the Charlevoix region. The need for extending this work to cover the food of the smelt in the Great Lakes, and an appraisal of its possible effects on the commercial fish supply, was stressed in Report 11.

15. Identification and education service One of the functions of the Institute is to serve the Department and the general public in the identification of fishes, and in answering a multitude of questions on varied ichthyological topics. This has been done in Reports 7 and 30 and in many letters and conferences. Specimens of Michigan fishes and of

the  
clams have been prepared for reference collection in the office of the  
Division of Fisheries at Lansing. A number of lectures and informal talks  
on fish topics have also been given. Some thought has been given to the pro-  
duction of several publications on Michigan fishes: (1) A very brief illustrated  
pamphlet on the food and game fishes of the state, for general distribution  
to sportsmen, schools, etc.;

(2) A handbook of rather popular nature, and

(3) A large scientific treatise on the fishes of the state.

16. Clam depletion                      Some cooperation has been given, through the  
investigations                              Division of Molluscs of the University Museum of  
Zoology, on the investigation of the ominous depletion  
in the supply of the button mussels of Michigan rivers. Such work could be  
expanded if funds were available.

#### FINANCIAL STATEMENT

This report of the first year's activities of the Institute for Fisheries  
Research will show that the investigations which this institute is called on to  
make are numerous and varied. It is hoped that the need for not only continuing  
but also expanding this work will be evident. The game fish supply of the  
state is facing increased strain through overfishing. Means must be developed,  
and must be developed through scientific investigation, to stem this tide of  
depletion. The staff of the Institute is optimistic enough to look forward to

an actual increase in the fish supply, if funds are provided for the required investigations and fishcultural and general fish management activities.

In placing the rock-bottom minimum need for the Institute at \$21,000 for the fiscal year 1931-1932, several points were in mind. One of these is that the salary budget without any increase in staff will be materially increased, because the staff was only gradually added during 1930 and the salary item was low for several months. Another point is that a very considerable portion of the support during 1930 was given by the Isaac Walton League, with the definite statement that this fund was allotted for one year only. The Institute hopes that the League will continue its interest in the fisheries work, and even that it will continue to support some phases of work. But such support is sorely needed over and above the minimum figure of \$21,000 proposed to the Department and Commission some months ago.

We offer the suggestion, that the development of the game fish supply is too vital to the economic progress of this state, even the economic solvency of a considerable portion of its wild-life area, to make any curtailment of the fish investigational work desirable. An extreme minimum of \$21,000. is needed, to hold the work above a serious handicapping of its efficiency. A larger sum is really needed to properly develop this field of service.



Income and expenditures of the Institute for Fisheries  
Research, first year, February 1, 1930 to February 1, 1931.

A. Income

1. Four quarterly payments of \$4000.00 from Department of Conservation.....	\$16000.00
2. Two quarterly payments (beginning June 1, 1930) from Isaac Walton League..	1800.00
3. Due from Isaac Walton League, one month (January, 1931).....	300.00
4. Payment for investigations of non-public waters.....	72.47
	Total income
	\$18172.47

B. Expenditures

(Including outstanding orders on February 1, 1931)

1. Salaries of regular staff.....	\$7885.29
2. Salaries of lake investigators (Isaac Walton League project).....	1686.70
3. Extra field help.....	251.95
4. Extra laboratory help.....	375.58
5. Office equipment and more or less permanent supplies.....	609.07
6. Stationary, postage, filing cards, etc.....	302.17
7. Telephone and telegraph.....	60.83
8. Laboratory equipment and supplies.....	20.98
9. Aquarium equipment (for work on growth, disease, resistance to oxygen, etc.).....	724.10
10. Microscope equipment.....	474.55
11. Maps; photostating and blueprinting; reprints of publications for distribution.....	81.13

12. Nets, twine and boats.....	400.99
13. Field equipment and supplies.....	318.57
14. Chemicals and apparatus.....	403.55
15. Bacteriology equipment (for study of fish diseases).....	286.88
16. Travel and subsistence in field (regular staff).....	1766.47
17. Travel and subsistence in field (Isaac Walton project).....	588.78
18. New car; outboard motor; tires; parts and repairs in Ann Arbor.	778.58
19. Express and freight.....	102.77
20. Fish tags (for tagging experiments).....	151.08
21. Shells (for collecting birds for food studies).....	28.14
22. Drafting equipment and supplies.....	85.56
23. Camp equipment.....	201.03

---

Total expenditures	\$17584.75
Balance on hand, as of Feb. 1, 1931	\$587.72