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ACTIVITIES OF INSTITUTE FOR FISHERIES RESEARCH FOR BIENNIIUM
1934-1935

The Institute is the technical and research agency of the Fish Division of the Conservation Department, operating in cooperation with the University of Michigan. The Department supplies the funds and the University provides office and laboratory facilities. The Institute Director and most of his assistants are regular full-time members of the Department's permanent staff, but part of the work is done by special investigators and by candidates for advanced University degrees.

Informal cooperation between the Department and the University in connection with various more-or-less technical phases of fisheries work, began as early as 1883. This established a policy for the Department of having specific, current problems reported on by the best-available specialists (as to the suitability of proposed hatchery sites, as to the identification of fish specimens, causes of large and sudden mortalities, etc.).

The number of such requests was so great that by 1924 the regular University Staff found itself unable to attend them all, and the first full-time specialist in fisheries work, Dr. Jan Metzelaar, was secured and began to function as the Department's technical investigator and advisor in connection with fish problems, the number and urgency of which were rapidly increasing.

Upon the death of Dr. Metzelaar in 1929 a new arrangement was negotiated and the Institute was formally established as such, with Dr. Carl L. Hubbs, University ichthyologist, serving as its Director on a part-time basis during

the period of organization, with the bulk of the work being done by advanced students working under faculty direction; the Department designating the specific problems it desired worked upon, and supplying funds to cover field expenses, office help and equipment.

This arrangement continued until 1935, by which date the very large opportunities for bettering fishing through lake and stream improvements had become evident and were being demonstrated. It had also become evident that in many places fish supplies were much below what given waters should seemingly produce or support; in other places the presence of too many fish had resulted in a wholesale dwarfing; parasites and diseases were causing serious losses in various parts of the State; the seriousness of various predators such as the fish-ducks, herons, king-fishers and otter was being debated, along with many other specific questions, such as the value of fish-ladders over dams; whether beaver did or did not affect trout supplies in given streams; as to whether natural reproduction was or was not adequate to keep given waters properly stocked; as to whether fingerlings or larger fish should be produced for field plantings; as to the most desirable and available substitutes for the increasingly expensive meat diet in the hatcheries, and so on.

The number and variety of these questions and problems, many involving intricate tangles of highly technical character, had by now become so great and so pressing, that it was decided that the work of the Institute should be expanded and intensified, and that it required a full-time Director and Staff. Dr. A. S. Hazzard was secured as Director and began his work in September, 1935, with three full-time assistants, and with Dr. Hubbs readily available for counsel and advice.

As it happened, various federal Departments and Bureaus, and various other States, at about this time, had become aware of the increasingly urgent needs for competent technology in the administration of wildlife affairs, and all were suddenly looking for trained and experienced personnel. Since Michigan had become a leader in the training and use of such technologists, and had originated

the modern technic of lake and stream improvement, etc., the Institute and other branches of the Department presently lost many of the men who had been in charge of special investigations or lines of research, and in several instances such investigations have consequently had to be slowed down or stopped until new personnel might become available. Another consequence of this loss of trained and experienced investigators is that the remaining members of the Institute Staff have had to "spread themselves thinner".

In this connection it should be considered that our fishes (along with other forms of wildlife) have, of late years, come into "crop status"; - that is to say that certain preferred species are wanted, in quantities, from given lands and waters and at frequent intervals - as has long been the case for potatoes, alfalfa, apples, corn, and the domesticated animals. For each of these domesticated species, an elaborate "management" technic has been developed, backed with experiment stations, laboratory facilities and large staffs of highly trained specialists, federal, state and privately employed; and with no end in sight for the refinements and advances which may yet be made in the quantity, quality and dependability with which the several crop-species may be made to yield with less and less effort or investment. Parallel developments will doubtless prove desirable, and increasingly practicable, in connection with the handling and management of the "wild" crops.

If research in fish and game yields results similar to research in agriculture-- that is, greatly increased production--such production will not present the hazards involved with farm crop surpluses which often result in ruinous prices. It is inconceivable that too much fish and game can be produced for the sportsmen or that this increased production will lessen its value. On the contrary, such increased production should enable longer seasons and more generous bag limits and should attract increased utilization of Michigan's recreational facilities by both resident and non-resident sportsmen.

The work of the Institute divides into the following sorts:

1. Miscellaneous correspondence involving relatively minor matters which may be answered or attended to with little special effort--such as the identification of specimens as sent in for examination; location of data or references in the Institute files or library; the character of certain specific fish waters which have been inventoried by the Institute; the life histories and possible injurious effects of common fish parasites; methods of safely controlling obnoxiously abundant plant life in lakes of high recreational value.

2. Field investigations requiring relatively short periods of time but competence of special sorts - such as determinations of the causes and significance of sudden and heavy fish mortalities occurring in lakes; the determination of the best type of stream or lake improvement for certain waters; whether the small and unsatisfactory fish in a given lake or stream are old, stunted individuals or are young fish resulting from a recent, too-successful spawning season.

3. Field and laboratory investigations necessitating long and continuous effort, and indefinitely intricate, perhaps requiring a number of years before any considerable or satisfactory results are available: As for working out better and cheaper feeding-rations for hatchery fish, so as to become, if possible, increasingly independent of the raw liver which, of late, it has been difficult or impossible to get in the quantities needed, or at reasonable prices.

Studies of the rate of growth typical of given species (as bass or trout) and of the combinations of conditions (water-depths, temperature ranges, chemical-content, aquatic vegetation and associates, etc.), under which the most dependable natural reproduction and best growth takes place in nature, and experiments to determine what artificial amendments in or to such waters may prove useful and practicable in increasing the yields therefrom.

Tracing the movements of fish in streams and lakes to learn how widespread plantings must be in order to fully stock any given water, and the proper size of fish and season for stocking.

Ascertaining the kind and quantity of the local fish food supplies and means for increasing or improving them.

The following projects of this biennium may be considered as having been brought to completion or to a point justifying their adoption as bases for the establishment of definite programs:

1. Stream improvement and its evaluation. Since the publication, in 1932, of a bulletin setting forth methods for the construction and installation of mechanical stream improvement devices, follow-up investigations have been carried on with the aim of finding out the actual value of such devices. Data are now available to show approximately what may be expected of a given type of structure in a given setting, from the standpoint of food production and alteration in the physical character of a stream. This makes it possible to proceed on a program of stream improvement with fairly predictable results. The original bulletin is now being revised to include the more recent advances in this type of work.

2. Lake improvement methods. Work on the problem of developing feasible methods for the design and installation of lake improvement structures was initiated at the same time as that on stream improvement (1930). A sufficient amount of experimental work has now been completed to justify publication of a manual describing in detail various of the available methods for increasing fish yield in lakes. This bulletin is scheduled to appear at an early date.

3. Creel census. Tabulation of fish-yields produced by many of the waters of the state begun on a state-wide scale in 1928 has proceeded far enough to provide an exceedingly useful tool in planning future fish management programs. Methods for analyzing data supplied on creel census forms have been perfected and standardized so that this valuable record may be continued and used to increasingly good advantage.

4. Tagging. The nonal-metal jaw tag as developed in Michigan, has now been thoroughly tested and found to be satisfactory for marking trout. A similar

tag used on one of the bones of the upper jaw (the maxillary) of warm water species such as bass is likewise proving successful.

5. Studies on Distribution and life histories of Michigan fishes. Obviously, a very important phase of the inventory of stream systems and lakes to discover what kinds of fish exist in the various waters of the state. Of equal importance are studies directed towards the discovery of the life histories of the various fishes--their feeding habits, growth rate, breeding requirements and seasons, etc.

Investigations on these problems have been carried on in cooperation with the University of Michigan for a number of years, and this information, as brought up to date is about to appear in the form of a preliminary bulletin, which should serve not only to answer many queries but to indicate what further work of the sort is most urgent.

The projects listed below are long-time studies on fundamental problems which have not reached completion but which are contributing immediately useful information as they proceed;

1. Food supply and production of up(ri) areas. Work on these problems was initiated as one step in the determination of the value of stream improvement devices, and was continued when it became apparent that the data being acquired would prove invaluable in the development of methods for the fulfillment of a need now growing quite acute--a practical system of classifying trout streams to facilitate effective stocking and improvement.

Repeated counts of the food organisms sustaining themselves on different types of stream-bottom, have made it possible to gauge with reasonable accuracy the relative values of these bottom types. At present, emphasis is being placed on the seasonal fluctuations in the local abundance of food organisms, and on their availability to trout. The latter phase is approached by analysis of stomach contents of trout taken in sections where the bottom feed and surface drift feed are known.

2. Lake and stream inventory. The recording of physical, chemical and biological data on Michigan lakes continues to receive much attention. Stocking and improvement operations can be carried on far more profitably if the existing fish fauna is known. Information concerning the suitability of a lake for a given species, as regards such factors as temperature, acidity or alkalinity, available oxygen, adequacy of spawning facilities and of food supply, etc., may be even more important.

This work has been furthered by the cooperation of such agencies as MECW, U. S. Forest Service and U. S. Park Service, which have in many cases prepared outline maps of lakes and taken soundings in advance of such inventory.

Stream inventory has proceeded more slowly than that of lakes, because well-tested, or standardized methods of procedure are not available, but have had to be developed as the work has progressed.

3. Creel census. Individual card records of fishing parties taken by Conservation Officers during their field patrols prior to 1936 have been tabulated and analyzed. The resulting reports gave the Department the first such specific information as to sport fishing in Michigan. The relative importance of the principal game species in different portions of the state was shown by the "random sample" method of this sort of census. Michigan is unique in having such a reliable index to its fishing for a period of more than 8 years.

In addition to this general, state-wide census, a number of intensive records of fishing have been secured through the cooperation of the MECW, the U. S. Forest Service and the National Park Service. These agencies collected complete or nearly complete fish yield data for a number of lakes in the vicinity of CCC camps. On Pife Lake the complete catch record is nearing the end of its third full year. Analysis and interpretation of these data should provide the basis for a more competent regulation and planting of such waters than ever before available.

4. Tagging. Tagging of various species of fish is now being expanded from its original purpose (investigations of migration), so as to check growth-rate studies made from scale readings, estimation of total fish populations, and survival ratios from plantings. The value of "nursery" streams, a much debated question, may find at least partial solution in this work. Valuable records of migration are secured from reports of captures of tagged fish by anglers, but for estimation of populations, and for checking growth, repeated seining, where tagging has been done provides the most reliable data.

5. Predator investigations. The damage to fishing from predators has been much debated. Resignation of the investigator assigned to the studies as to the importance of fish predators has delayed the solution of this important problem but a good start has been made, in conjunction with other investigations, in the collection of stomachs, seats and data on abundance and concentrations of fish eating birds, otter and others.

6. Forage fish studies. The most suitable minnows and other forage fish for use at bass hatcheries, and for distribution in natural waters, has been investigated intensively during this biennium. Detailed studies of the life histories of a number of common forage species have demonstrated which species can be propagated successfully in hatchery ponds. Determination of spawning habits has shown how their numbers may be increased in lakes naturally lacking suitable conditions for minnow reproduction. Additional work on this problem so as to fully utilize the information already gained and more clearly establish workable procedures to increase the forage fish supply, has been deferred as a result of the resignation of the investigator concerned with this study.

7. Age and growth studies. Collection of scale samples and length data for the important game fish species has been continued during the biennium in order that eventually standards of normal growth may be established. Once such standards are established, it will be possible to determine how satisfactory the local fish growth is in a given lake or stream, thus indicating the suitability of the species present and the need for increase, decrease or change in the

current stocking program. Such studies, to date, have demonstrated great variations in growth in different waters but the reasons for such variations are often difficult to determine, although the introduction of species outside their adaptable range of temperature or food supply seems to be largely responsible.

8. Fish nutrition. New diets which will reduce the cost of purchased fish food at our hatcheries are being worked out through the cooperation of Michigan State College. A number of combinations of dried foods, as supplements to fresh meat, are being tested at several state hatcheries. The physical form of such foods is believed to be highly important and is receiving special attention.

9. Winter conditions. Since winter may be a critical period for warm water species as well as trout, detailed investigations of certain streams and lakes are being expanded. The available food supplies and the essential shelter and protection are receiving most attention. Methods to decrease or eliminate suffocation under the ice are being tested.

In the quest for better fishing, the solution of certain problems creates or exposes new and often unexpected difficulties, in the same manner as the improvement of automobiles has generated new problems in road engineering and traffic control. Rapid development of fish culture to the point where large-sized fingerlings or legal sized fish instead of fry are being planted, has emphasized the need for cheaper and better fish foods, effective control of disease and faster growing, disease-resistant strains of trout, bass and other species. Thus the culture of fish crops increasingly finds direct parallels in the history of the culture of the farm and other, older crops, and is susceptible to the same development technique.

If the fish as raised were delivered to the angler at the hatchery (as the farmer sells his crop to a buyer), the problem would be relatively simple. At present the question--"How many of the fish as 'planted' actually reach the

angler's creel?"--is being asked with increasing frequency. While the Institute has investigations in progress which will help to answer this query (such as creel census and tagging studies) the establishment of test streams and lakes corresponding to the experimental plots used at the agricultural experiment stations, will doubtless be required before the question can be satisfactorily answered.

Such test-waters may also be used to get dependable answers to many other vexing questions, such as the mortalities to be expected in planting fish of various sizes; the best methods of distribution; the most satisfactory season for survival of planted fish; how rapidly hatchery fish become acclimated to stream and lake conditions (i.e., resemble "wild" fish in appearance and ability to survive) and the many such problems related to food, shelter and spawning.

Where formerly relatively few streams and lakes were readily accessible to fishermen or in need of stocking, extension of our highway systems, and improved transportation, now subjects nearly every water to intensive fishing, and with resulting demand for greater plantings. What species are best adapted to given waters and in what numbers plantings should be made, has often perplexed the Department. Extension of the Michigan technic for lake inventory, and further development of stream survey methods, should soon provide increasingly dependable ways of managing the fish crops in our public waters.

INSTITUTE FOR FISHERIES RESEARCH

A. S. Hazzard
Director