

HISTORY AND ORGANIZATION OF THE PREDATOR-STOCKING-EVALUATION BY THE RESERVOIR COMMITTEE, SOUTHERN DIVISION, AMERICAN FISHERIES SOCIETY

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ABSTRACT

The Reservoir Committee, Southern Division, American Fisheries Society, undertook to measure the influence of stocked predator fishes on existing fish populations and sport fishing in selected reservoirs through a coordinated interagency study. Field data collection consisted of (1) fish population biomass estimation, (2) limnological survey, and (3) sport fish harvest estimation, with data being collected in 1972 and 1973. Twenty-six reservoirs, totaling 368,000 acres, were included in the project. The work plan used to standardize field data collection is described. Six years were required to plan, execute, analyze, and publish the results.

INTRODUCTION

Warmwater reservoirs support a large percentage of the total freshwater sport fishery in the southern United States. Following impoundment, these reservoirs generally afford excellent fishing, with a decline in harvest as the reservoir ages. The clupeids, primarily gizzard shad, *Dorosoma cepedianum*, usually become the most abundant fishes and constitute the principal prey for predators. However, few of the adult predators native to the southern United States are large enough to swallow adult gizzard shad.

In an attempt to better use this potential prey resource and provide an additional sport fishery, many southern states introduce predatory sport species that can attain a large size. Species such as striped bass, *Morone saxatilis*, and walleye, *Stizostedion vitreum vitreum*, can feed on large gizzard shad. However, accurate determination of the influence of introduced predators on the existing fish populations and on sport fish harvest is needed.

Since most of the southern states are actively participating in predator introductions, a concerted effort is justified to evaluate this management practice. Because of its past success with a multiagency cooperative evaluation of cove rotenone sampling (Hayne, Hall, and Nichols, 1967), the Reservoir Committee of the Southern Division, American Fisheries Society, appeared to be the most appropriate group to undertake this task.

The Reservoir Committee is the oldest of the standing committees in the Southern Division and certainly one of its most active and productive. It evolved from a meeting of representatives from two states and five Federal agencies in Atlanta, Georgia, in February 1958. Representation was changed at the following meeting to nine members, six of which were from interested States and the other three from TVA, Corps of Engineers, and Fish and Wildlife Service. In 1959, the format was changed again to include one member from each of the 14 Southern Division states and the same three Federal agencies. Essentially this Committee representation has existed until the present time, although in some years special members have been appointed to assist with specific tasks.

Primary objectives of the Reservoir Committee are as follows: 1) to provide opportunities for biologists to meet and discuss reservoir problems and to expose new ideas and hypotheses for critical review; 2) to coordinate reservoir research and

management in the southern states and to minimize duplication of effort; 3) to consolidate and disseminate accumulated knowledge of reservoir and the fishes that inhabit them; 4) to promote optimum reservoir fishing by encouraging more effective research and more active management.

Major accomplishments of the Reservoir Committee prior to this study include the following publications and activities: Some Investigational Needs on Large Reservoirs in the Southeastern United States (1958); Reservoir Bibliography (1959); Subcommittee Report on Exotic Fishes (1959); Standard Methods of Reporting Fish Population Data for Reservoirs (1959); Report of a Survey of all Southern Division States Pertinent to Their Desires Concerning the Stocking of Walleyes and Their Ability to Secure Adequate Eggs and/or Fry Annually (1960); List of Publications and Personnel Associated with Gear Research (1962); A Survey of Fish Population Sampling Methods in Southern Reservoirs (1962); Recommended Methods of Reporting Creel Survey Data for Reservoirs (1963); Summary of Published and Unpublished Creel Data from Southeastern Reservoirs (1963); Reservoir Bibliography Revision (1965); Cooperative rotenone evaluation field study on Douglas Reservoir, September 23-30, 1965; Survey of Fish Managements Methods Used in Reservoirs (1965); An Evaluation of Cove Sampling of Fish Populations in Douglas Reservoir, Tennessee (1967); Reservoir Fishery Resources Symposium, Athens, Georgia, (1967) published by University of Georgia Press, 1968, 576 p; Survey of Desirability, History, and Present Status of Striped Bass in Reservoirs, (1967).

In 1970, member agencies of the Reservoir Committee responded favorably to a proposal for a cooperative program to evaluate predator fish introductions, concluding that a coordinated study constituted one of the most efficient and economical means of evaluating this and other widely-used management techniques. Objectives as originally conceived were to collect data on ecological factors that may influence the success of predatory fish introductions and to enable the evaluation of the effects of an introduced predator fish on the existing fish population and sport fisheries of warmwater reservoirs.

Each member state, their directors, fishery chiefs, and committee members who served through the years of study are thanked for their efforts and cooperation. The state agencies, the Tennessee Valley Authority (TVA), and the U. S. Fish and Wildlife Services's National Reservoir Research Program (NRRP) actively participating in the study deserve special recognition. Appreciation is expressed to Dr. Don W. Hayne, North Carolina State University, for invaluable help with creel census design; and Sam Jackson, Jr., Spavinaw Lakes Supervisor, City of Tulsa, Oklahoma, Water and Sewer Department, for furnishing data on two reservoirs outside the realm of the Reservoir Committee. Special appreciation is extended to Robert M. Jenkins, National Reservoir Research Program, Fayetteville, Arkansas, who prepared the data for statistical analysis and served as editor of these papers.

HISTORY OF THE PSE

The development of the evaluation had its beginning following the presentation of the Douglas Reservoir cove sampling results at the Reservoir Fisheries Resources Symposium held in April, 1967. A sub-committee was appointed at that time to review the goals and accomplishments of the Reservoir Committee since 1958 and to suggest profitable avenues for new Committee efforts. At the 1967 summer meeting, the sub-committee presented a list of 21 possible projects for consideration as future studies, and a request was made to select five of the ideas considered best for committee projects. Seventeen of the twenty Committee members responded, and the project receiving the greatest number of votes was; "Conduct studies to determine the success of stockings of walleye, striped bass, white bass, trout, and their effects upon other species of fish in reservoirs—especially other predators."

The major business of the 1968 spring meeting of the Committee, held in Atlanta, was an in-depth discussion by members for the representative agencies of their State's involvement in stocking predatory fishes. Donald Baker (North Carolina) was appointed to draw up a detailed questionnaire in an attempt to evaluate stocking by polling the 50 state fishery agencies. The questionnaire was mailed to all Committee members for

changes and suggestions. At the 1968 summer meeting, the questionnaire was discussed in detail, and final revisions were made before mailing. The questionnaire requested information on 1) basic physical and limnological data on reservoirs stocked, 2) stocking data and results, and 3) species composition and relative abundance at time of introduction. Information was requested on 20 predator species stocked in reservoirs over 500 acres.

Responses from the State were slow, and a decision was made at the 1969 fall meeting to limit detailed analysis to reservoirs within the Southern Division, American Fisheries Society. The data analysis sub-committee chairman, Norval Netsch (USFWS) reported in January, 1970, that based on data received, it would be difficult to answer the original objective of determining the success and effort of predator stocking. However, he concluded that it would be possible to present reasonably sound data on species, sizes and numbers introduced, and certain physical and chemical characteristics of reservoirs involved. It was apparent from the data received that evaluation of predator stocking had commanded little attention.

At the 1970 spring meeting, Robert Jenkins (USFWS) volunteered to assemble the questionnaire data for statistical analysis. Statistical treatment of the data was performed by Dr. James E. Dunn, University of Arkansas, using discriminant function analysis. Results indicated that white bass were introduced most successfully and walleye showed promise of establishing reproducing populations in older waters. Although discriminant function analysis showed some promise as a predictor of walleye stocking success based on 11 environmental variables, overlap of "relative success" categories weakened its utility. An inter-agency study was then proposed by Jenkins wherein each member agency would select two reservoirs and gather data on physico-chemical characteristics, creel census, and cove sampling for two consecutive years. It was believed that this would provide the data base to answer some questions on effects of stocking predators into existing fish populations. The committee chairman instructed each member to discuss this suggestion within his agency and report on possible participation at the next meeting.

At the 1970 fall meeting, three agencies indicated approval and four indicated interest in such a study. The main objection given to cooperating in the study was cost associated with conducting creel censuses. However, it was concluded that enough interest had been shown to actively pursue the evaluation. A sub-committee on Predatory Fish Introductions, chaired by Bob Grinstead (Oklahoma), was formed and instructed to proceed with establishment of standard methods and work plans relative to setting up the cooperative study.

At the January, 1971 meeting, John Hall, U. S. Fish and Wildlife Service, Atlanta, discussed how individual states could conduct the studies as Federal Aid to Fisheries (D-J) projects. The general work plan would encompass three jobs: 1) fish population, 2) limnology, and 3) creel census. The discussion helped to confirm the decision of several States to proceed. A revised list of study reservoirs was prepared, with criteria for selection being those reservoirs that had been stocked with predators, with emphasis on striped bass and walleye. The subcommittee was instructed to mail each member a tentative work plan before the next meeting for critical review, and also to give each member time to discuss the plan again with his superiors.

The revised work plan was presented to the committee at the 1971 summer meeting by the sub-committee. Several changes were suggested in work plans to meet Federal-Aid requirements and individual state needs. A list of reservoirs to be evaluated was prepared. Dr. Don Hayne, Institute of Statistics, North Carolina State University, attended this meeting and queried each state concerning the need for aid in designing creel censuses. Dr. Hayne discussed data collection in general and gave specific sampling requirements for meeting certain confidence limits.

At the meeting in October, 1971, sub-committee chairman Grinstead discussed the final work plan, and Jenkins explained the standard data forms that would be used by all states for reporting data. Jenkins also requested each state to name a project leader for the duration of the study so that lines of communication could be maintained. Dr. Hayne informed members that creel sampling designs would be mailed before January 1, 1972.

The field data collection portion of the Predator Stocking Evaluation was officially launched January 1, 1972. At the meeting in February, each committee member gave a progress report of his state's participation in the PSE study. Some reported that they would be "out-of-phase" from one to six months for various reasons. The committee agreed that if a state was "out-of-phase", the project for that state would be continued for two full years from beginning date.

At the 1972 summer meeting in Tulsa, Oklahoma, three states reported that they could not participate in the project. Sam Jackson, Jr., Tulsa Water and Sewer Department biologist, asked the Committee if two Tulsa municipal reservoirs could be included in the study. The offer was accepted, and Lakes Eucha and Spavinaw were added to the list of PSE reservoirs.

At the 1973 summer meeting in Florence, Alabama, members gave status reports of data collected and problems encountered with field collections. Although most members reported slight delays in the analysis of the creel data, other data were being tabulated and forwarded to NRRP for statistical analysis in a timely manner. The general consensus of the Committee members was that the project was progressing satisfactorily, and the desired results should be obtained as previously scheduled. At the October 1973, meeting, Jenkins distributed preliminary summaries of data collected in the 1972 cove sampling, and stated he was hopeful that by mid-February the data collected on 17 of the reservoirs during 1972 would be completed.

At the February, 1974 meeting in Atlanta, Georgia, members reported that the individual projects were near completion without major difficulties. All field work for the investigation was to be completed by July 1, 1974. A deadline for the submission of all data to NRRP for analysis was set for November, 1974. At the October 1974 meeting, Jenkins reported that the field data collection portion of the project was complete, and statistical analyses of the data that had been received had begun.

At the February, 1975 meeting, Jenkins reported a considerable amount of data had not been submitted for analysis. A deadline of April 1, 1975 was reestablished for submittal of all data to NRRP. The committee agreed that the finding of the study should be presented at the 1976 Southeastern Association of Game and Fish Commissioners Conference, with Committee members presenting papers on various phases of the project. The committee also agreed that a summary of the development of the entire project should be presented at the session.

The 1975 summer meeting was held in Fayetteville, Arkansas, and sub-committees were organized for the preparation of manuscripts for publication. The various sub-committees were as follows: History and Organization; Physico-Chemistry Data Analysis; Cove Population and Mark-Recapture Data Analysis; Predatory-Prey Data Analysis; Angler Use and Harvest Analysis; Predator Stocking Record and Techniques. In summary, about two years of planning, two years of field study and two years of data analysis and manuscript preparation were required to complete the cooperative study.

METHODS AND MATERIALS

Only general procedures for the overall study are outlined here, as detailed procedures are given in other papers dealing with the individual phases of the study.

Fish population data were obtained by rotenone sampling conducted during August of each year. Reservoirs containing less than 10,000 acres were sampled at three locations, with each sample having a minimum area of one acre. Reservoirs greater than 10,000 acres were to have a minimum of three samples, with the desired total area of all samples to exceed 10 acres. Samples would be taken from as many habitat types as possible.

Surface area of sample coves was accurately measured, and mean depth estimated. Sample sites were blocked with a net having a mesh size of one half inch or less (bar measure). Rotenone was dispensed at a rate of 1 ppm, and fish were picked up for a two-day period. Marked fish (100 per acre in the cove) of several species were used to estimate percent recovery. Fish recovered were reported as number and biomass per acre in inch groups by species. The number of marked fish recovered by species was also reported.

Basic limnological data were collected monthly (between the 10th and 20th) at three stations in the main channel in the lower, middle, and upper portions of each reservoir. Temperature (in degrees C or F), dissolved oxygen (in mg/l), and conductivity (in μ mhos at 25° C) were taken monthly, at mid-day, from profiles at one meter depth intervals. Secchi disk readings were also made monthly at these stations. Additional physical data required on each reservoir was as follows: a) Year impounded; b) drainage area in square miles; c) mean annual surface area in acres; d) evaluation (msl) of pool at stated area; e) mean depth, in feet, at stated area; f) maximum depth, in feet, at stated area; g) outlet depth, evaluation (msl) of midline of outlet; h) thermocline depth—top of thermocline on August 1 at upper, middle and lower stations in 1972 and 1973; i) water level fluctuation—mean annual in feet, plus weekly water level evaluations, 1972 and 1973; j) storage ratio (i.e., water exchange rate)—mean annual and for 1972 and 1973; k) total dissolved solids average for each year; l) shoreline length (miles, at stated area); m) growing season (frost-free days)—mean annual, and for 1972-73.

Sport Fish Harvest and Angler Use Estimates

Since a detailed work plan was derived for each reservoir, the procedure presented is an indication of minimum requirements, rather than a complete creel census design. Information requested for this project included effort in angler-hours and days and harvest of species by weight and number. The interview technique included determination of catch per hour and length of angler-day. Survey requirements included one creel clerk for interviews and instantaneous counts from airplane or boat on most reservoirs. The creel survey utilized the complete trip method, and if an airplane was used, 30 flights or more per year were to be scheduled. When pressure was determined by boat, the clerk spent approximately six hours on fishermen interview, and two hours on fishermen counts.

Results of the foregoing are reported in the following five papers by members of the Reservoir Committee.

LITERATURE CITED

Hayne, Don W., Gordon E. Hall, and Hudson M. Nichols. 1968. An evaluation of cove sampling of fish populations in Douglas Reservoir, Tennessee. P. 244-297 in *Am. Fish. Soc. Reservoir Fish Resour. Symp.*