

HIGHLIGHTS OF PROGRESS IN FISH MANAGEMENT IN THE SOUTHEAST, 1946-1955

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Progress in fish management implies that more fishing or better fishing is being provided anglers. The degree of progress is debatable and sometimes difficult to measure, but there are some highlights. By way of further definition, management is interpreted in a broad sense to include fishery investigations and the development of new techniques. This paper will point out highlights in the Southeast although reference to happenings in this region cannot always be made without inclusion of a broader area. Even though the report is primarily concerned with sport fishing, it will not be so narrow as to overlook significant developments in commercial fishing. After a brief review of accomplishments, a look will be taken at some of our failures to make satisfactory progress, and where further application of brain and brawn are needed.

HIGHLIGHTS IN FISHERY RESEARCH

First, let's look at some of the highlights that have characterized fishery investigations. As in most fields of research, progress in fishery research is often difficult to measure. Important results may be slow in coming to recognition and money for basic research studies has been hard to obtain. Sometimes the application of proven research findings to practical situations is difficult to accomplish because of inertia, or other reasons. A few exceptions can be pointed out. Two of the most productive sources of new facts and concepts relative to freshwater fisheries have been the Farm Ponds Laboratory at Alabama Polytechnic Institute, Auburn, and the Fish and Game Branch of the Tennessee Valley Authority. The work at Auburn covers two decades, and the basic pattern for farm pond management as developed by H. S. Swingle and others was laid down prior to the period covered by this report. The publication, "Relationships and Dynamics of Balanced and Unbalanced Fish Populations" (Bulletin No. 274, June 1950) is based on a long series of experiments and summarizes conclusions of recognized merit. "Balanced populations are defined as those capable of producing satisfactory crops of harvestable fish." The work at Auburn continues to be fruitful, and the findings have a direct application to fishery management in the Southeast.

The work by TVA Biologists, under R. W. Eschmeyer's leadership, began in the 1930's and several important publications came out in the 1940's. The concepts that more fish were being produced by nature than environmental conditions would allow to reach maturity, and that only a small percent of these were taken by anglers, led to the liberalizing of fishing regulations, principally the elimination of closed seasons and size limits not only in the Southeast but over much of the nation. The fallacy of stocking warm water fish in habitat already containing the same kind of fish was pointed out. There is not a state in the Southeast that did not receive the impact of this philosophy, and modify its regulations and fishery programs to some degree in keeping with the findings of TVA biologists.

The interest of the Southeastern States in fishery research is attested by the attention given research projects under the Federal Aid in Fish Restoration program which got under way in 1951. Every state has had at least one research project, and of the total funds apportioned (1951-1955) more than half has gone for research. For the 12 Southeastern States, this amounted to over one million dollars for the first four years of the program. To cite individual projects would be unfair and space does not permit listing all of them. It can be safely said that without Dingell-Johnson, our knowledge of fish resources and how to manage them would be considerably behind where it is today. This is an achievement of the past four years. Much of the investigational work has dealt with surveys, inventories, and the gathering of facts needed to carry on effective management. Results of such studies are not usually spectacular, but without them progress is much slower. There have been many well planned and executed productive projects.

In the field of marine fishery research several Federal, State and university laboratories have made valuable contributions to our knowledge of fish distribution, ecology, and populations. Studies on shad migration and populations along our east coast are making possible the prediction of the size of annual runs (Fredin, 1954). The work on red tide off the coast of Florida by Fish and Wildlife Service biologists and scientists from the University of Miami Marine Laboratory is outstanding. Not only has the offending organism been identified (*Gymnodinium brevis*), but it is being cultured in the laboratory. Many of the environmental factors which contribute to outbreaks of red tide are understood. Eruptions have been found to occur when larges masses of fresh water move off the lower west coast of Florida, and when certain nutrients are present in unusual abundance. The additional relationships of currents, winds, and temperature present a complex and fascinating picture. It may be possible to control red tide in the future, saving millions of dollars to Florida's west coast tourist industry, commercial and sport fisheries as a result of this research.

DEVELOPMENT OF NEW TECHNIQUES

Fishery workers in the Southeast have done their share in finding new means of attacking old problems, and adapting partially known techniques to local conditions. The progress made in the use of electricity in guiding fish, analyzing fish populations and noxious species control is little short of phenomenal. Pioneering in this field began in Europe, was greatly enhanced from work on the West Coast in connection with diverting fish from irrigation ditches and electric turbines. Skills were further developed in the Great Lakes fishery investigations where electric screens are used to prevent the migration of the destructive sea lamprey. In the Southeast we have used electricity principally as a means of sampling fish populations. Using information available from many sources, local ingenuity has been applied to constructing and improving electric shockers by workers in several of the States of this region—Kentucky, Tennessee and Florida particularly. An example of the interest and progress in this technique was shown by the field conference and demonstration on electric fish shockers held in Tennessee in April, 1955, where representatives from five states and three service branches participated. Several types of shockers were demonstrated and conversations on the subject were on a technical level unheard of in this particular subject ten years ago.

A second major technique brought into general use during the past ten years is the application of rotenone and other chemicals in sampling, controlling, or destroying fish populations. At first, chemicals were used to take fish only from small areas, to obtain a sample, to learn the species present, get material for study of growth rates, feeding habits and reproduction success. We became bolder and applied rotenone to entire ponds and lakes to eradicate an undesirable fish population. In September 1954, I witnessed a reclamation operation on 3,000-acre Diamond Lake, Oregon. Elsewhere up to 6,000 acres of water have been successfully treated in one operation. In relatively shallow bodies of water, the ability to get public support and money to buy rotenone are the primary limiting factors. Deeper waters and larger lakes are more difficult to handle. In addition to being able to completely eradicate a fish population, we are now learning to remove only certain species, such as shad, or certain age groups of fishes, creating more favorable conditions for game species and better fishing for the angler. Use of chemicals in fish management will certainly be of increasing importance in the Southeast in restoring waters to a more productive condition.

Substantial progress has been made in techniques of aquatic weed control and fertilization of waters, but much is yet to be learned before uniformly successful results can be anticipated. The use of 2, 4-D and other chemicals in controlling water hyacinth and some other water weeds has been the brightest spot in weed control. Use of airplanes, power barges and better equipment have made possible the reclamation of large lakes and watersheds in Louisiana and Florida. Some species, particularly the *Myriophyllums*, have not been conquered at the field level.

Commercial and organic fertilizers are used successfully in many ponds, lakes and fish hatcheries to increase fish production. We have made little

progress in understanding the chemical-biological reactions that go on in waters, and consequently our use of fertilizers as a management tool is still limited to rather narrow limits. That is brought home forcefully to anyone who has observed two hatchery ponds, situated side by side, fed from the same water supply line, stocked with the same kinds and numbers of fish, develop different blooms and react quite differently to similar efforts at fertilization. More basic work is needed in this field.

There have been some improvements in techniques of fish culture and distribution of the hatchery product. Use of pellets in feeding trout has resulted in a saving of labor at many hatcheries. Better designed raceways and pools are being constructed. More is known about disease control and the relation between fish diseases and nutrition. Control of furunculosis, ulcer disease, and other devastating diseases can be accomplished in the hatchery. Work at the Service's laboratories at Cortland, New York and Leetown, West Virginia, is particularly significant in eastern United States. Progress has been made in selective breeding of trout to develop disease resistant strains. Use of oxygen and oxygen producing compounds has been developed as an aid in fish distribution and further advancement of techniques appears to be just ahead.

HIGHLIGHTS IN MANAGEMENT

Here a more restricted definition of management must be used. Investigations and development of techniques have already been segregated within the management field. There remain several lines of activity carried out by State fish and game departments and to some degree by the Federal Government, wherein fishes and their environment are manipulated with the objectives of producing more or better fishing.

One of the surest ways to provide more fishing is to create new fishable waters. When farm ponds were first constructed in large numbers, no longer than 15 years ago, there were many well informed fisheries workers who believed that small ponds were a fad, that their popularity and usefulness would fade quickly. This prediction has not proven true. According to presently available information, new farm ponds are being built at the rate of from 500 to 5,000 per year in each of the Southeastern States.

Active steps have been taken to promote better handling of the ponds by their owners. Oklahoma, Kentucky, North Carolina and Georgia have carried on Dingell-Johnson projects aimed at getting the information needed. Modifications of the generally recommended stocking ratio of 1,000 small bluegill and 100 small bass per acre of fertilized water are being studied. Fertilization procedures and weed control are recommended in line with present knowledge.

At least half the Southern States are emphasizing the construction and management of public fishing lakes in their fishery programs. A survey made by H. S. Swingle in 1951 showed eight Southern States to have 163 public fishing lakes under some sort of operating plan. Since the advent of Dingell-Johnson, seven States—Alabama, Arkansas, Kentucky, Maryland, Mississippi, South Carolina and Virginia, have acquired or built 21 lakes having 1,871 surface acres under this program. More lakes are now being planned and several States have acquired public fishing lakes without assistance of Federal Aid.

Advancement can be credited to better utilization of fish crops in farm ponds and public waters alike. Removal of fish, to the extent they can be taken by hook and line under liberal creel limits, and sometimes by net, trap or other commercial gear, is recommended. The concept of rapid replenishment of fish populations is a relatively new one in fishery management, and has been the basis for increased harvests.

Recent developments in watershed protection and flood prevention programs under the Department of Agriculture hold considerable promise for enlargement of fishing opportunities. Three principal programs are under way. Flood prevention programs have been especially authorized for the Coosa, Little Tallahatchie, Yazoo, and Potomac River watersheds. On the Coosa River above Rome, Georgia, 165 structures are in the original plan, 16

have been completed. The Pilot Watershed program, authorized by Public Law 46, 74th Congress, involves 10 watersheds in the Southeast. These are in various degrees of development. The most recent and extensive of the small watershed programs is based on Public Law 566, known as the Hope-Aiken Act. In the Southeast 22 watersheds have been approved for planning, with no projects yet in the construction stages. The management of the new waters created under these programs will place increasing demands on State and Federal fishery workers and fish hatcheries.

There is not time to discuss the impact of recent construction of large reservoirs on public fishing. Suffice it to say many States have had their water area doubled or more by large impoundments within the past decade. We are learning a little about the relationship between water level fluctuation and fish management, enough so that we do not believe stable levels are necessarily the best. Fluctuating levels on reservoirs offer a means of fish population control, vegetation control and waterfowl management. Several excellent studies of fish resources in reservoirs have been made—those of Virginia, Tennessee, Kentucky and Oklahoma come to mind. A few examples of successful introduction of fishes not originally found in a given reservoir can be cited—white bass in Dale Hollow Reservoir in Tennessee, and walleyes in Lake James, North Carolina. Several States are experimenting with the thread fin shad (*Signalosa petensis atchafaylae*) as a forage fish in reservoirs. There are indications of good results, particularly in the more southern waters. To date, management activities on large reservoirs have been relatively limited.

Good management requires that an inventory of fish stocks in important waters be maintained. Whether or not natural reproduction has occurred is important in setting regulations and planning hatchery operations. Annual population sampling of important or representative waters has become routine in most States. Ten years ago it was the exception.

Beside inventorying the fish, we also inventory the fishermen and their catch. It is important to know where fishing pressures are heavy, how many fish of the various species are being taken, both the daily catch and the seasonal harvest. More and more creel census studies are being set up so that the data is subject to statistical analysis. Creel census must be regarded as a tool, not an end in itself. Creel censuses can be costly and to be effective must be carefully planned to meet a definite objective. Some unofficial standards are often referred to in analyzing catch data. If the average catch equals one catchable-size fish per hour, the fish manager doesn't worry too much about a particular water. If it exceeds it, he sleeps well, if it falls below for long, he may lose some hair, or even his job.

Progress has been made in hatchery operations and the better use of hatchery fish. There is general agreement among hatchery men and field biologists that the hatchery product must be tailored to meet management needs. Hatcheries are not suffering under the new philosophy, where their operations have been keyed to management knowledge and needs. For stocking new waters, reclaimed waters, waters where natural reproduction does not occur but where growth is satisfactory (*e. g.*, certain tailwaters) and for put-and-take trout stocking, no substitute has been found for the hatchery product, comparable in quality or cost.

Many changes in fishing regulations have been made during the past decade. The trend has been toward removal of unnecessary restrictions. Liberalized fishing was born and grew up in the South. Except for trout, there are no closed seasons on most waters and only a few species have size limits imposed on them. Creel limits have become larger on the sunfishes, but have been reduced on trout, bass and other large predators where information of biological or economic nature so dictated.

PROGRESS IN COMMERCIAL FISHERIES

The field of commercial fisheries has shown extensive progress in the past decade. In inland waters, sportsmen are gradually learning of the close tie between sport and commercial fishing. The net fisherman who is removing large quantities of fish that are perfectly good food, yet don't care

for the angler's bait, are not only utilizing a resource otherwise wasted, but may be improving conditions for the angler. The biologist, if he knows the fish population and the human psychology with which he has to deal, can do much to maintain understanding and cooperation between the two groups. The gap is closing in many areas.

Information on commercial harvest of fishes has, until recently, been very meager in the South. Changes are being made. Two Fishery Market News offices are maintained by the Fish and Wildlife Service at Hampton, Virginia and New Orleans, Louisiana where daily information is gathered on fish landings and market conditions in these important coastal areas. This is wired to Chicago, Washington, New York and other large fish markets. Broader statistical coverage is now a reality with Fishery Marketing Specialists scheduled for placement in 17 coastal cities—Maryland to Texas. Most of these positions are now filled. Monthly bulletins on fish landings, storage of fishery products, and general status of the industry are now prepared for North Carolina, Florida, Alabama, Mississippi, and Texas with a partial coverage on Maryland, Virginia and Louisiana.

Important studies of both a research and management nature are getting under way in a variety of subjects made possible by Saltonstall-Kennedy funds. (Public Law 466, 83rd Congress.)

The work of the Fish and Wildlife Service in exploratory fishing in the Gulf of Mexico makes a tremendously interesting study. The discovery of the red shrimp a few years ago stimulated the shrimp fishery greatly and allowed public use of a delicious food item. The more recent findings of large numbers of yellow-fin tuna in the Gulf has opened the way for a greatly expanded commercial fishing industry. One of the important features of this find is that a large food reserve exists in waters where fishing could probably be carried on in a national emergency. Much more could be said about developments in gear, boats, and fishing methods. Nylon nets and lines are replacing linen and hemp. Machinery now does much of the backbreaking work that ten years ago was man-powered. There have been many improvements in marine refrigeration and radio communication, while radar and sonar (echo-sounding) have taken much of the hazard and guesswork out of oceanic commercial fishing. Important experiments using underwater television are now under way, which promise to modify past commercial fishing procedures. Vast improvements in processing, preserving and canning fish have been brought about in the past ten years. The swing now is strongly in the direction of frozen sea foods, and more recently pre-cooked frozen foods (*e. g.*, fish sticks) are to be found in most food stores.

PROGRESS IN PERSONNEL MANAGEMENT

Finally, let's take a look at ourselves—the fishery workers. Our number has grown since the first post-war Southeastern meeting held at St. Petersburg, Florida in 1946. At that meeting there were only about 20 fishery workers present. In 1954, 87 fishery personnel attended the New Orleans conference, and the number attending this year approximates 100. Furthermore, a Southern Division of the American Fisheries Society was organized in 1952, and has been important in influencing the affairs of the Society since that time.

The number of trained fishery workers in the State fish and game departments and in Federal employment in the Southeast has trebled in the past ten years. The Southeast has kept pace with other regions in providing a small but steady increase in salaries. Comparable figures are available only for Federal Aid fishery biologists. In 1951 the salaries of 68 Dingell-Johnson workers averaged \$3,387.00 over the nation. In 1954 the average for Southeastern workers was \$4,304.00; the national average for 262 biologists, \$4,187.00. The increase, nationwide, amounts to \$200.00 per year. Most of us feel this is inadequate, and the principal reason so few intelligent people are going into fisheries.

Recent graduates seem more specialized within the fisheries field than was formerly true. Statistics is emphasized over taxonomy and students learn the latest methods of how to count and measure, but whether they are

better observers than graduates of a decade ago is a debatable question. A wide variety of training is still found in the different colleges and universities with standardization of course materials not yet achieved. There is presently a shortage of fishery personnel which seems to be growing more acute yearly. The schools are not catching up with the needs of the profession, particularly in the Southeast.

FIELDS WHERE PROGRESS IS TOO SLOW OR LACKING

Impressive as are our gains, continued progress will depend on several things. Some of these which I think are of the greatest importance are:

1. Not enough basic research is being carried out, particularly at the State and University level. This involves such subjects as population dynamics, fish physiology and behavior, biochemistry as applied to water fertilization and water nutrients.
2. Fish habitats are being lost to pollution in some areas at a rapid rate. Pollution abatement is making progress, but new industries, expanded plants, and growing human populations, are increasing the pollution load on many waters faster than improvement is shown in others.
3. Important stream habitats are being lost to impoundment. Some of the finest rivers in this region have recently, or will shortly, cease to exist or will be modified in such a way that the fish faunas will change radically. I need mention only two—tributaries of the White River in Arkansas, and the Little Tennessee in Tennessee.
4. The fishery biologist must further broaden his perspective and become more skilled at selling his proposals to administrative officials, sportsmen, and the public who have some interest in the resource. Our human relations problems are usually our toughest.
5. More incentive must be given young people of college age to enter the fisheries field. This will require better salaries, more reasonable security, and earlier recognition of ability.

CONCLUSION

Striking progress has been made in the field of fish management during the past decade, but there is little basis for resting on our accomplishments. Fishing opportunities need to be further expanded, and many unsolved problems challenge the fishery research worker and manager. The future looks bright if we will put our best thinking and skills to work. To keep abreast of growing public needs, we must continue to go only in one direction—forward.

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