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REMARKS BY JOHN S. GOTTSCHALK, DIRECTOR, BUREAU OF SPORT FISHERIES AND WILDLIFE, U. S. DEPARTMENT OF THE INTERIOR AT THE INTERNATIONAL GAME FISH CONFERENCE AT MIAMI BEACH, FLORIDA, NOVEMBER 12, 1965

Five Years of Federal Marine Sport Fish Research

I was pleased to be given the opportunity to talk to you today about the marine game fish research program. A combination of circumstances makes this an especially fitting occasion and place for me to render an account.

As many of you know, this program was authorized by the so-called Lennon Bill in 1959. At that time as Chief of the Division of Fisheries in Washington, I had a close, personal interest in laying the groundwork for this legislation. Shortly after passage of the Act, another assignment as Regional Director took me away from both personal and administrative contact with the program. Since my return to Washington 12 months ago as Director of the Bureau of Sport Fisheries and Wildlife, I have had an opportunity to reestablish this contact. In doing so, it has been interesting to see how well our early hopes and plans have been undertaken.

Five years, I think, is a suitable interval in which to gauge progress. And this conference, dedicated as it is to salt-water game fishing, is peculiarly appropriate as a forum for this purpose. From the beginning you have shown an intense interest in this program, and I believe I am correct in stating that some aspect of it has been reported on annually since 1961.

The subject of my talk is actually somewhat broader than the title indicates. The reason is that our program may best be viewed from the standpoint of the status of marine game fish conservation.

Before 1955, we had no idea of the dimensions of salt-water angling on a national basis. The National Hunting and Fishing Survey of 1955 gave us the first indication--4.5 million anglers who fished 58 million man-days. A similar survey in 1960 showed

that the number had grown to 6.3 million anglers in 5 years and the effort to more than 80 million man-days. This represented an increase of more than 35 percent in 5 years, 2 1/2 times the increase in fresh-water angling and 3 1/2 times the population growth in the same period. A comparison survey in 1960 showed that these anglers caught nearly 3/4 billion fishes weighing 1 1/4 billion pounds, and spent nearly 1 billion dollars in pursuit of their sport.

While the growth of salt-water angling has and will continue to contribute significantly to the economy of coastal communities, it has led to other consequences. It has changed the public use of our sea resources, and in doing so has changed profoundly the problems of conserving those resources. Anglers now catch more of certain species than commercial fishermen. Incredible as it seems, in one bay alone on Long Island, New York, anglers catch more than 1 1/2 million summer flounder in a few months of summer. Most coastal fish resources are now being fished with a far greater intensity than ever before.

This intensity will increase as the number of anglers and the exploitation of seafood resources keep pace with the growth of our population. How will these common resources respond? Can we do something to sustain their yield? What can we do? These problems are difficult enough to solve. But there are others more difficult. Most of the important sport fish of the Atlantic and Gulf Coasts spend some part of their lives in the estuaries. All of us here know too well that the most serious conservation problem today affecting these resources is man's destruction and degradation of the estuaries.

Already we see the efforts of increasing demands on marine resources in the face of shrinking habitats. We have lost several species, for example, in the Middle Atlantic region. The Spanish mackerel and the sheepshead have been gone so long people have forgotten that they were once fairly common shore fishes there. The weakfish, the croaker, and the spot went into a deep depression about 8 years ago after a long period of threatening decline. Fluke have been declining for several years. To determine how to correct such conditions we must learn their causes. Are they due to over-fishing, loss of critical habitat, or simply the result of long-term unfavorable changes in the natural environment?

Many years ago I started in this business as a fishery biologist. As time went on, I became increasingly occupied with administration--not only of fish but of wildlife as well. Today, one of my major responsibilities is waterfowl conservation. This is so, not necessarily through personal preference, but rather because primary responsibility for waterfowl rests with the Federal government.

At this point you may well wonder what on earth waterfowl have to do with marine sport fishes. There are many parallels. Both range over long distances. Both are subject to harvest by citizens of many States and sometimes several nations. Both require different kinds of habitat at certain stages of their life cycles after moving or being transported great distances from one stage to another. Both fluctuate in abundance due to the vicissitudes of nature. Both are subject to adverse effects through man's activities when they destroy or degrade critical breeding and nursery grounds. One of the knottiest problems to solve is to distinguish among these effects. And both require for good management some rather basic population statistics accumulated on a systematic and periodic basis.

What is the comparative state of our knowledge on these resources? Perhaps due to personal pride in my professional origins I am chagrined to admit that marine sport fish are a poor second.

Waterfowl biologists have delineated the range of most species and they can count the birds accurately enough to forecast the size of the fall flight into each flyway. Banding and recoveries have removed much of the mystery of travel routes, longevity, and hunting kill.

Banding to determine migrations of waterfowl started in 1916. One of the outstanding results was to define habitat requirements at different life history stages. As the records accumulated it became clear that the number, size, and distribution of wetlands determine to a large extent the abundance of waterfowl.

By 1942, nearly 3 million acres of land had been acquired to help safeguard production and over-winter survival. Continuing research and surveys pinpointed the critical need to preserve the rapidly dwindling supply of prairie potholes where 56 percent of the total continental breeding population of ducks nest. Knowledge

of these facts led to widespread agreement that something should be done and where to do it. Congress responded in 1961 by authorizing a loan fund of $105 million to acquire these wetlands. Good management requires an adequate assessment of population parameters--what we in fishery work call population dynamics. The waterfowl people are concerned about the same things that we are, though they may call them by different names.

Three major annual surveys are conducted to determine the size and distribution of the breeding population, to determine annual production, and to determine the size and distribution of the wintering population after the hunting season. Other surveys yield information on the size of the harvest, structure of the populations, and total mortality.

Finally, waterfowl hunting regulations are devised to permit an annual harvest that will return adequate breeding populations to production areas. Regulations are made after consideration of all the biological information derived from the annual surveys.

How does this record compare with that on marine game fishes? I think it is safe to say that except for the Pacific salmons we are 50 years behind. There are a few other instances among commercial species where comparable knowledge is available--New England ground-fishes and the Pacific halibut, for example. It is pertinent to note that the few fisheries mentioned are involved in international treaties. It appears that the only time we become concerned enough about a fish resource to seek the basic facts is when we must share it with other nations.

If I may summarize where we stand, therefore, it is clear that we have only fragmentary information on life histories and ecology of most of the important game fishes, virtually nothing on their population dynamics and no reliable annual measure of the sport fishing harvest. These gaps must be filled before we can undertake constructive management measures for conservation.

What sort of measures can be taken? I feel satisfied that protection of critical habitat in the estuaries is most important. But there are a host of other measures that can be taken. We need only look at the field of inland fishery management for ideas: introduction of new species, habitat development and improvement, and regulations.

Against this rather lengthy background, I would like to turn now to what we are doing and what we hope to do. In 1960, a laboratory was established at Sandy Hook, New Jersey, and in 1962, another at Tiburon, California. A third laboratory is under construction at Narragansett, Rhode Island, with completion scheduled for July 1966.

The biggest boost for our facilities came this year with appropriations for planning and design of two new Gulf of Mexico laboratories. One will be at Panama City, Florida, and the other in the vicinity of Corpus Christi, Texas. While it will be at least two years before these laboratories are functional, I believe that the addition of these laboratories is quite significant. We will soon have research centers exclusively for marine game fish research on all three coasts, a situation that will put us in a position to implement the comprehensive, coordinated national program of research envisioned in the authorizing legislation.

Compared to the job that needs to be done we have barely scratched the surface, but I would like to give you a brief account of our progress.

Sportsmen take a large portion of the total United States catch of edible salt-water fishes. It is important to measure this catch periodically for two reasons: (1) to determine man's total effect on the seafish resources of the United States, and (2) to provide a statistical base for biological research.

Nearly complete records of the catches of this country's commercial fishermen have been available for many years, but statistics for the sport catch are sparse. These statistics are extraordinarily difficult to obtain because salt-water anglers are dispersed along thousands of miles of shoreline, fishing from boats, jetties, piers, bridges, and the open beach. They fish night and day, 7 days a week throughout the year. California is the only State that continuously collects statistics for any part of its salt-water sport fishery (for example, the catches of party boats), and several other States have made full or partial surveys for certain years, but these efforts have been too sporadic to permit estimating the magnitude of salt-water angling on a national scale.

In 1960, the Bureau of Sport Fisheries and Wildlife made a "one-shot" estimate of the catch by species in conjunction with the National Survey of Hunting and Fishing conducted by the Bureau of the Census. This provided a crude but valuable baseline for planning the marine game fish research program, and pointed up the need for full annual accounting of the harvest of marine fishes. We plan to repeat this study next year.

The task of making this accounting for recreational angling will be formidable. It will require a sampling program especially tailored to fit the peculiarities of the problem and trained personnel to conduct it. A feasibility study has been completed for us by the Institute of Statistics, University of North Carolina. A larger scale, pilot study to be conducted simultaneously in three States is now under consideration.

If there is a dominant theme to the marine game fish research program I would say it is this: to determine how variations in the environment affect the distribution, abundance, migration, and well being of marine fishes. We are a long way from having the periodic and synoptic measures of the environment and its fish populations needed to understand these relationships. It will require a large-scale, cooperative effort on the part of all the coastal marine laboratories. Nevertheless, we are attempting to develop some of the necessary techniques. Activities under this program include surveys of temperature and currents.

Temperature has pronounced effects on the distribution of fish stocks, and current patterns determine the distribution of eggs and larvae of many game fishes. On all three coasts our laboratories, in cooperation with other agencies, are conducting monthly surveys of sea surface temperature with airborne infrared thermometers. Isotherm charts are prepared and distributed to interested laboratories, cooperators, and State conservation departments. During survey flights, bottom and surface drift devices are dropped to determine current patterns.

In 1964, studies were initiated to explore the Atlantic continental shelf and slope; to learn the winter distribution of species, such as mackerel, blue fish, sea bass, fluke, scup, and spot, which desert the shallow water zone in the autumn; and to discover the spawning grounds of the major coastal sport fishes in relation to environmental variables that could affect the survival of young.

No doubt, many of you here have become concerned during the last year over the increasingly heavy exploitation of marlin and sailfish in the eastern tropical Pacific by Japanese commercial long-line fishermen. Striped marlin, blue marlin, and sailfish are extraordinarily valuable to the resort communities on the Pacific coast of Mexico and Baja California, patronized by "Yankee" anglers. Fortunately, we had started a study on these species in 1963, a little ahead of the crisis. Though primarily a tagging program to help determine migrations and exploitation, we have set the stage to undertake a more comprehensive study to deal with this conservation problem. This program is also a cooperative one with participation by the Bureau through our Tiburon laboratory, by the International Game Fish Association, and by the Mexican Department of Fisheries.

Behavior studies are being pursued in the laboratory and under the sea. At Sandy Hook a new sea water tank has been completed that holds 30,000 gallons of water. The room in which the tank is housed is equipped to reproduce day-night cycles at any latitude. A school of adult bluefish here are being studied from the standpoint of day-night patterns of activity and the nature of rhythmic behavior patterns associated with feeding, reproduction, and migration.

Submarines and scuba are used on both the East and West coasts to study fish behavior under natural conditions. Edmund Hobson, working in Baja California, has observed and described the feeding behavior of groupers on herring, and how their daily migrations and aggregations are controlled by this relationship. In underwater studies off New Jersey, divers have observed the spawning rituals of cunner and the feeding of bluefish, both peacefully with round herring in daytime and savagely on them at night.

During the past summer the Sandy Hook laboratory has had the use of an underwater vehicle for ocean survey work. The Bathyscanner, nicknamed the "Schmoo" because of its resemblance to the Al Capp comic strip character, is a two-man towed sub with a depth capability of 600 feet. On one typical trip 40 miles off the coast, biologists saw miles of sandy bottom with very little life except for sand dollars. Last month, cruises were made to the depths of 300 feet plotting offshore fishing grounds and making preliminary surveys of an area proposed to be used for an artificial reef.

We have begun preliminary field tests of a method to study migratory behavior of bluefish. On three separate days in three different areas, bluefish caught with hook and line or gill net were transported alive to an area 8-10 miles from the point of capture. As the fish swam away from the boat, attached balloons which floated at the surface indicated the compass direction taken by the fish. In each of these preliminary experiments, most of the marked fish oriented and swam away in the same general direction, perhaps in response to some external cue. Whether this cue is a celestial or a submarine stimulus remains to be determined.

Biologists at Sandy Hook have begun field trials to evaluate chemically inert colloidal particles as game-fish attractants. A cloud of Kaolin clay particles seeded over Chlora Banks from the R.V. Challenger successfully attracted bait fishes and several large, unidentified pelagic fishes, according to sonar recordings taken from the R.V. Challenger and Blue Chip. Control areas on four sides of the cloud and a transect several miles long leading to the cloud showed no fishes on the sonar record of either ship. An additional field trial is planned to determine optimal size of cloud, holding properties of the cloud, and fish attraction characteristics from observations by divers watching from a protective cage beneath the cloud. This approach holds promise of performing some of the functions of an artificial reef with little expense.

A major study has been undertaken on bluefish, one of the top angling species on the Atlantic coast, to unravel the mysteries of their migration and erratic distribution in time and space. Results from tagging nearly 10,000 bluefish from New Jersey to Florida indicate the presence of major groups of bluefish along the coast, each apparently divided into subgroups. In addition to tracing migrations, we are undertaking studies on age and growth, parasitism, artificial incubation, anatomical analysis for indications of races, and the behavior research I mentioned before.

In 1964, we acquired a surplus Navy tug and converted it for fishery research. Put into operation late in 1964, the Dolphin participated in a large-scale interstate cooperative study of the distribution of eggs and early life stages of the summer flounder in the middle Atlantic.

In Navy-supported studies, the systematics, migrations, and abundance of sharks in middle Atlantic waters are being investigated. This program is integrated with the international shark-tagging program of the American Institute of Biological Sciences. Between May and September 1964, more than 500 sharks, representing 11 species, were tagged or examined. Evidence of the interest in sharks and shark tagging is reflected in the increasing number of sportsmen who wish to cooperate in our program, and by the fact that a list of the 25 top publications sold by the Government last year includes John Casey's "Angler's Guide to Sharks of the Northeastern United States."

Starting in 1961 and a continuing, permanent part of our program is the natural history of important game fishes. Part of this is carried by the laboratories, as for example, those studies concerned with bluefish, summer flounder, marlin and sharks. Others are handled by promising graduate students at coastal universities. Under the latter program we have supported research on red snapper, red drum, starry flounders, and several species of Pacific coast surfperches.

Earlier I mentioned my conviction that our most serious problem is the protection of critical habitat in estuaries. Unfortunately, we are constantly on the defensive to prove the importance of estuaries to fish, shellfish, and wildlife. It is the role of research to provide confirming evidence of this importance.

While we are very much concerned with this subject in the marine game fish research program, we are troubled by the problem of making an effective contribution. Many agencies are involved in some aspect of estuarine research--the universities, the coastal States, and our sister Bureau of Commercial Fisheries. There is far more than all of us can do. No longer can we afford the luxury of compartmentalized research. It seems to me, therefore, that there is a need for national coordination of research on estuaries. The Bureau of Sport Fisheries and Wildlife is prepared to give estuarine research high priority, but we hope to do so within the framework of a cooperative and comprehensive program that holds promise of getting the answers before it is too late.

So far, I have attempted to outline for you the challenge to the conservation of marine sport fishing resources posed by increasing demands and shrinking habitats. Practical problems are occasionally solved by freak discoveries, but the history of science has shown

repeatedly that advancements are most rapid when a proper background of information and theory is available. I have tried to show that in comparison to waterfowl management where information needs are quite similar, we are 50 years behind.

In the national program we are attempting to meet some of these needs. After a discouragingly slow start, we feel for the first time this year that we will soon have the physical capability to undertake our part of the load.

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