

6. Fish culture techniques for important anadromous and marine game fishes;
7. Behavior studies in the laboratory and in the field on the response to light, temperature, food and other factors;
8. Information on disease and parasites of anadromous and marine fishes;
9. Effects of pollution, especially pesticides, on marine game fish.

Management and Development Objectives

Management and development objectives concern the following:

1. Periodic collection of angling and resource statistics;
2. Access and facility development;
3. Estuarine acquisition;
4. Pollution control in coastal rivers, estuaries, and coastal areas;
5. Artificial rearing and stocking of selected species such as salmon, steelhead, striped bass and shad;
6. Habitat development—artificial reefs;
7. Fish passage facilities;
8. Stream clearance.

Work in progress

In 1965, the Sandy Hook laboratory initiated a major program. The R/V *Dolphin* makes monthly surveys of the continental shelf from Cape Cod to Cape Hatteras to map the seasonal distribution of eggs, larvae, and juvenile stages of game fishes and to determine the nature of dependence upon the estuarine zone by species inhabiting the continental shelf. Another major effort centers on the life history and migration of bluefish, a top angling species. In the behavior tank at Sandy Hook bluefish are observed in relation to light regime, color vision, sound perception and feeding. SCUBA divers in the Atlantic and Pacific are observing the daily movements and feeding behavior of important game fishes.

Sea surface temperatures obtained monthly along the Atlantic and Pacific coasts using infrared radiometers from U.S. Coast Guard aircraft have been useful in predicting and explaining the movement and availability to anglers of migratory game fishes.

A new project to test artificial reefs was started in 1966. Placed in the right places, these reefs attract fish and provide spectacular fishing. Test areas have been selected off the New Jersey coast where evaluations will be made of sites, materials, fish behavior, and food production.

An investigation of Atlantic sharks is being carried on at Narragansett Marine Game Fish Laboratory and includes studies on distribution, migration, systematics, and life history. More than 100 angling clubs have formally registered as cooperators on data collection and tagging for this investigation.

At the Tiburon Marine Laboratory cooperation has been established with the International Game Fish Association and Woods Hole Oceanographic Institution for tagging and recovery of marlins and sailfish along the Pacific Coast. More than 4,000 have been tagged. The purpose of this program is to determine the migration and exploitation of these prized game fish. In the 1965 tagging, 438 striped marlin and 167 sailfish were tagged. A new record was achieved in 1966, when 735 striped marlin, 283 Pacific sailfish, and 22 roosterfish were tagged. During the first quarter of 1967, 492 marlin and 136 sailfish have been tagged. A total of 30 marlin and 2 sailfish tags have been recovered through the first quarter of 1967.

A small project on marlin and sailfish is underway in the temporary facilities of the Eastern Gulf Marine Laboratory in the Gulf of Mexico, where research is providing the facts for a new and exciting fishery for billfishes. This project is pinpointing the seasonal movements and location of billfishes on the basis of ocean climate variations.

In the field of education, graduate students have been assisted in studying life histories of important marine game fishes at the University of Miami, Texas Agricultural and Mechanical College, Oregon State University, and the University of North Carolina. As many as 40 summer assistants (high school, college and graduate students) are engaged each year at Sandy Hook.

Expected benefits

Research findings will lead to improved opportunities for recreation by defining good fishing grounds, explaining and predicting fluctuations in abundance, by preventing unwise or uninformed restrictions, and by increasing abundance through scientific habitat improvement or enlargement.