

NMFS Involvement with Stock Enhancement as a Management Tool

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Abstract

During the last part of the 19th century and the first half of the 20th century the United States marine fishery management agency attempted to recover depleted fish stocks by propagating and releasing hatchery produced eggs and larvae. However, after over fifty years of effort, there was no evidence that this technique enhanced stocks. This was partly a result of the early approach to assessment, in which the numbers of fry produced determined success of hatchery programs rather than the number of adults that survived to enter the fishery. This early stock enhancement program was subsequently abandoned in favor of other techniques for recovering depleted fish stocks, such as restoring degraded nursery and spawning habitats and regulating fishing effort. In the 1940s and 1960s the United States Congress passed the Mitchell Act and the Anadromous Fish Act, which provided funds primarily to the U.S., with federal oversight, to culture and stock fish in an effort to rebuild depleted stocks of marine and anadromous fish. These fish stocking programs continue today. The National Marine Fisheries Service (NMFS, created in 1970) has traditionally used techniques other than stock enhancement as management tools to restore depleted stocks. However, over the past several years the U.S. Department of Commerce (DOC) and the National Oceanic and Atmospheric Administration (NOAA), the parent agency of the NMFS, have each adopted aquaculture policies that include stock enhancement. NOAA has also adopted a strategic plan to include stock enhancement.

The National Marine Fisheries Service (NMFS) and each of its predecessor agencies have been involved in aquaculture and stock enhancement for over 125 years. Marine fish culture methods developed during the second half of the nineteenth century were thought to augment and replenish natural stocks. In 1871 Spencer Fullerton Baird, leader of the newly formed U.S. Commission of Fish and Fisheries, reported to Congress the reasons for declining stocks and recommended fish culture as a solution (Baird, 1872). His ideas were accepted and a research vessel was built for the commission, followed by construction of shore-based marine fish hatcheries. Although highly efficient in producing and releasing fertilized eggs and newly hatched fry, the lack of evidence of increased harvest ended these efforts in the late 1940s. As the enhancement approach was abandoned the emphasis in post-war years shifted to “aquatic farming.” Federal laboratories, led by the Bureau of Commercial Fisheries (now National Marine Fisheries Service, NMFS), conducted pioneer research in culture techniques, first in mollusks (at the Milford, Connecticut lab), then in salmonids (at the Manchester, Washington lab) and in marine shrimp (at the Galveston, Texas lab). Although these efforts were major contributions to new industries worldwide, federal

research in aquaculture and enhancement was drastically reduced in the 1980s. The agency generally abandoned stock enhancement as a tool to rebuild depleted stocks and concentrated on other management measures that included regulating fishing effort and restoring degraded nursery and spawning habitats. With a few exceptions these are still the primary management measures in place today.

Since NMFS does not utilize stock enhancement as a management tool Congress has chosen to continue its role by budgeting in support of stock enhancement programs to be conducted by groups other than NMFS. The United States has since become a leader in fish stock enhancement. This is principally due to a century of study with pacific salmon by the federal government and the states of the Pacific Northwest. The Columbia River Basin program is authorized and funded through the 1938 Mitchell Act as amended in 1946, which was established to mitigate, in perpetuity, for habitat and salmon runs lost through the construction of hydroelectric projects. Approximately \$176 million was awarded to this program between 1970 and 1996. The 25 major hatcheries operated by this program release annually over 120 million smolts and contribute between 50-70% of all adults caught in the coastal fisheries of that region. McNair (2000) reported that 93.6% of all pink salmon caught in Prince William Sound in 1997 were from artificially propagated stocks. Of all salmon harvested in the common property resources in 1977 throughout Alaska, 22% of the coho salmon, 30% of the pink salmon, and 65% of the chum salmon originated from hatcheries. Fisheries enhancement through public, tribal, and non-profit (Alaska) propagation sites scattered along the length of the four western coastal states, contributes significantly to the domestic landings of pacific salmon, currently 285,147 metric tons valued at \$270 million (NMFS, 2001), and to a large coastal recreational fishery.

Other federal legislation and financial support passed through the NMFS budget are aimed at restoring depleted stocks. These include the Anadromous Fish Act of 1965, which provides funds to the states to rebuild depleted stocks of anadromous fishes using enhancement techniques. The striped bass populations along the mid-Atlantic coast were at low population levels in the late 1960's. However, through cooperative efforts between the Atlantic States and NMFS these stocks have recovered today to a level that supports both a commercial and recreational fishery. Other efforts have been directed at reestablishing runs of sturgeon along the nation's coasts.

NMFS also assists aquaculture-related research and development through the Northeast Fishing Industry Grants Program. NMFS awarded \$4.2 million to the program in 1994-1995 with the objective to help restore New England groundfish and shellfish stocks through hatchery programs, and to provide new business opportunities for displaced fishermen.

NMFS provides funds to the University of Southern Mississippi, which leads a consortium, dedicated to the development of marine enhancement techniques and involves Mote Marine Laboratory in Florida and the Oceanic Institute in Hawaii. Funding for that program totaled \$2.5 million for fiscal year 2001. The Oceanic Institute has been awarded \$0.5 million annually for several years to evaluate enhancement practices for several species of marine finfish.

In fiscal year 2002 Congress provided startup funds in the amount of \$1.0 million for the Science Consortium for Ocean Replenishment and Enhancement (SCORE), which is a multi-state initiative for the recovery of the nation's ocean fisheries. Its approach is to replenish diminishing marine fisheries stocks based on scientific protocols developed through a highly coordinated, national effort and focused on the demonstration of successful stock enhancement. It is believed that this fast-track strategy has the potential to be more cost-effective and timely than policy measures traditionally used to conserve and sustain ocean fishery resources.

Enhancement practices are also being applied to the conservation of fish and shellfish

populations. The marine fisheries resources of the United States reached maximum production levels two decades ago. Modern catch trends show a high incidence of fish stocks that are either fully exploited, over exploited, depleted, or recovering. Some fishery managers believe that enhancement is an effective solution for replenishment and recovery and may be the only option for some species listed under the Endangered Species Act. Perhaps the most successful project has been the federal fisheries scientists' rescue and rehabilitation of the Redfish Lake sockeye salmon from the verge of extinction. Another may be the cooperative project by the United States and Mexico to save the Kemp's Ridley sea turtle.

In the last several years DOC/NOAA, parent organizations of NMFS, have both adopted policies on aquaculture that include stock enhancement as a fishery management tool.

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