

Shifting fisheries management toward a multi-species approach

The job of managing our coastal marine fisheries is a difficult and complex one. Off the coast of New York the waters of the mid-Atlantic continental shelf are home to many species that are important to commercial and recreational fisheries. Bluefish, striped bass, summer flounder, Atlantic mackerel, squids, and many other species contribute millions to New York's economy. The state's marine resources provide jobs, tasty seafood, and outstanding recreational opportunities.

Loligo pealeii



With the help of previous and current New York Sea Grant funded research, the job of managing our precious marine resources is made easier and more effective.

Researchers at Stony Brook University's Marine Sciences Research Center (MSRC), with funding from Sea Grant, have been studying New York's mid-Atlantic ecosystem for many years. Their efforts have advanced the scientific understanding of the functioning of this complex ecosystem. The added knowledge is directly applicable to improving management of our coastal marine resources.

Management of marine fisheries is accomplished through the development of Fishery Management Plans (FMPs). It is a complex process that requires accurate information about the ecology and economics of the fishery. The goal of an FMP is to provide for conservation of the resource while balancing the interests of those who harvest and benefit from the resource.

The challenge is that only incomplete knowledge of the mid-Atlantic coastal shelf ecosystem is available to consider when developing FMPs. The species that are harvested interact with each other in many ways and form complex food webs, which are poorly understood and are influenced by fishing activities. Historically, management plans have taken a single species approach, with each species having its own management plan. This approach fails to take into account the competitive and predator-prey interactions that research has shown are important to the structure and function of continental shelf populations, food webs, and the carrying capacity of the ecosystem. Therefore, there is growing recognition that fisheries management needs to shift towards a multi-species ecosystem-based approach.

Research funded by New York Sea Grant responds to this need. In a new project currently underway, **Dr. Timothy Essington** of MSRC will study the role of squids in the continental shelf ecosystem. Based on what is currently known about the mid-Atlantic food web, it is clear that squids play a central role. Squids such as longfin inshore squid (*Loligo pealeii*) and

Selected Publications

northern shortfin squid (*Illex illecebrosus*) are key links in the food web because they are important as both prey (of adult fish) and predators (of juvenile fish). The research will use field and lab studies and modeling to determine in more detail the influence of squid in the mid-Atlantic food web and the effects of squid harvesting. The field studies will collect stomach contents of squid and their predators, and the lab studies will measure the bioenergetics of captive squid. The data collected will be used to develop models of squid bioenergetics and trophic interactions. Essington's research objectives include improved descriptions of predator-prey interactions between squid and their fish predators, and quantifying predatory demand of squid and fish. Without taking into account the predator prey interactions of squid and fish, single species FMPs could lead to unexpected and undesirable responses of the ecosystem to fishing. Data from Essington's research could be used to help prevent that from happening.



Previously funded Sea Grant research has also illustrated the need to manage fisheries with a multi-species approach. A pair of projects conducted by **Dr. David Conover**, of MSRC, focused on bluefish (*Pomatomus saltatrix*) predation on the continental shelf. Bluefish grow very rapidly compared to other continental shelf species. As young of the year (YOY), bluefish are larger than YOY of other species and prey heavily upon them. Bluefish predation on YOY fish can have a major impact on the recruitment of many commercially, and recreationally important species such as striped bass and billfishes. The details of bluefish life history illuminated by Conover's research improved scientific understanding of another component of the continental shelf food web. Without taking into account the interactions between bluefish and their prey, single species FMPs could fail to meet the goals of conserving the fishery and providing a sustainable resource for the future. With the help of New York Sea Grant funded research, the job of managing our marine natural resources will be a little easier.

— Lane Smith
Project Assistant



Essington and Sea Grant Scholars Michelle Staudinger and Mary Hunsicker at MSRC's Flax Pond Lab where squid research is getting underway.

The Mid-Atlantic Fishery Management Council in cooperation with the Atlantic States Marine Fisheries Commission is responsible for developing fishery management plans for the mid-Atlantic region. The FMPs are submitted to the National Marine Fisheries Service who implements them. Learn more about FMPs at: www.mafmc.org/mid-atlantic/fmp/fmp.htm

Dr. Conover's NYSG-funded research on bluefish has resulted in two dozen peer-reviewed journal publications to date as well as several doctoral dissertations and other university-based articles. Here is a sample of selected publications. Find a complete list at www.nyseagrant.org

Buckel, J.A., B.H. Letcher, and D.O. Conover. 1998. Effects of a delayed onset of piscivory on the size of age-0 Bluefish. *Transactions of the American Fisheries Society* 127(4):576-587.

Buckel, J.A., D.O. Conover, N.D. Steinberg, and K.A. McKown. 1999. Impact of age-0 bluefish (*Pomatomus saltatrix*) predation on age-0 fishes in the Hudson River estuary: evidence for density-dependent loss of juvenile striped bass (*Morone saxatilis*). *Canadian Journal of Fisheries and Aquatic Sciences* 56(2):275-287.

Buckel, J.A., M.J. Fogarty, and D.O. Conover. 1999. Foraging habits of bluefish, *Pomatomus saltatrix*, on the U.S. east coast continental shelf. *Fishery Bulletin* 97(4):758-775.

Buckel, J.A., M.J. Fogarty, and D.O. Conover. 1999. Mutual prey of fish and humans: a comparison of biomass consumed by bluefish, *Pomatomus saltatrix*, with that harvested by fisheries. *Fishery Bulletin* 97(4):776-785.

Munch, S.B., and D.O. Conover. 2000. Recruitment dynamics of bluefish (*Pomatomus saltatrix*) from Cape Hatteras to Cape Cod, 1973-1995. *ICES Journal of Marine Science* 57(2):393-402.

Scharf, F., J.A. Buckel, F. Juanes, and D.O. Conover. 1998. Predation by juvenile piscivorous bluefish (*Pomatomus saltatrix*): the influence of prey to predator size ratio and prey type on predator capture success and prey profitability. *Canadian Journal of Fisheries and Aquatic Sciences* 55:1695-1703.