

# The Crest

Current Issues in  
Coastal Ocean and  
Estuarine Science

## Menhaden Researchers Pay Big Attention to a Small Fish

An interdisciplinary group of VIMS researchers is busy studying Atlantic menhaden, small schooling fish that play a big role in Chesapeake Bay ecology. The group's research will help inform the debate that is currently swirling around this fish, its commercial harvest, and the recreational fisheries that target menhaden predators such as striped bass.

Researchers at VIMS and other institutions are working to determine the abundance of menhaden in the Bay, to quantify the role that menhaden play in filtering water and sustaining predators, and to better understand the process by which young menhaden are "recruited" into the adult population.

Dr. Rob Latour, who leads the project to estimate the Bay's menhaden population, says that research at VIMS will "help provide the data needed to manage Chesapeake Bay menhaden stocks in a sustainable manner."

VIMS Dean and Director John Wells notes that the menhaden projects "are a good example of the key role that VIMS plays in fulfilling its state mandate of providing unbiased scientific advice on sometimes contentious resource issues."

To date, reliable data on the potential effects of commercial fishing on the Bay's menhaden population have been lacking. The Atlantic States Marine Fisheries Commission (ASMFC), the

regulatory body charged with managing East Coast menhaden stocks, noted in an October 2005 addendum that "Sufficient scientific data are not available to satisfactorily address the potential for localized depletion in the Bay..."

The 2005 ASMFC addendum also instituted a harvest cap on the commercial menhaden fishery in Chesapeake Bay at the average landings from 1999-2004. The cap will extend from 2006 to 2010.

The status of the harvest cap is currently unresolved. Virginia's Attorney General ruled in January 2006 that the ASMFC had exceeded its regulatory authority when adopting the cap. Subsequently, during the 2006 legislative

session, the Virginia General Assembly killed or withdrew four bills to implement the cap.

If Virginia takes no other action to implement the cap before the July 1 deadline, the ASMFC Menhaden Management Board will rule on Virginia's possible non-compliance at its August meeting.

Atlantic menhaden (*Brevoortia tyrannus*), which inhabit near-shore waters along the Atlantic seaboard from Nova Scotia to Florida, support one of the most commercially important fisheries on the Atlantic Coast, providing fish meal, fish oil, and bait for other

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## Sea Grant Renews Collaborative Effort to Manage Cownose Rays

A multi-agency effort to restore native oysters to a Chesapeake Bay tributary suffered a setback on May 18th when cownose rays ate more than 90 percent of the 775,000 oysters that researchers had planted in the Piankankank River between early April and mid-May.

This and other similar episodes during the last few years have encouraged a collaborative team of marine scientists, resource managers, watermen, and seafood-industry representatives to renew their efforts to develop effective methods for sustainably managing cownose rays in Chesapeake Bay.

The current effort, spearheaded by Bob Fisher, a Commercial Fisheries Specialist in the Virginia Sea Grant College Program at VIMS, builds on previous attempts to manage rays in Chesapeake Bay and other estuaries along the Atlantic seaboard and Gulf Coast. Those efforts stretch back to the early 1970s.

Fisher is more hopeful this time around, believing that a unique junc-

ture of events—a renewed emphasis on restoration with disease-resistant oysters, more venturesome chefs, and new technologies that provide easier penetration of international seafood markets—will provide the impetus, funding, and political will needed to effectively manage cownose rays.

"Timing is everything," says Fisher.

The ray team, which held a two-day workshop in Yorktown in early June to catalyze future efforts, is considering a wide variety of possible management measures to help reduce the rays' predation on oysters and other commercially valuable shellfish.



Well-known Virginia Chef John Maxwell prepared a ray dish that was eagerly consumed by workshop participants, confirming the consistently favorable impressions of ray meat revealed in previous taste tests. He says that rays could be the "next big thing" in culinary circles.

Workshop participants discussed two main approaches: reducing ray numbers by developing a commercial or recreational fishery for the species, and excluding rays from shellfish beds by fences, cages, or chemical repellents.

Fisher and others stressed throughout the workshop that any measures to fish the rays would have to proceed in a sustainable manner. Rays, like their cousins the sharks, grow slowly and have very low reproductive rates. They are thus particularly susceptible to fishing pressure.

"The best available data suggest that cownose rays mature in five to seven years and only produce one pup per year," says VIMS shark expert Dr. Dean Grubbs. "This makes them inherently susceptible to over-fishing, and presents special challenges in managing a sustainable fishery."

People have been interacting with cownose rays since long before Captain John Smith's infamous encounter near the mouth of the Rappahannock River in 1608 (he was stung by a ray while trying to spear it with his sword, nearly died from the injury, then recovered to eat the ray for dinner). Archeologists have

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fisheries. Most of the catch is made by purse seine for the reduction fishery (in which menhaden are “reduced” to fish meal and oil).

Following industry consolidation and closure of most state waters to the reduction fishery in the 1980s and early 1990s, more than half of the total menhaden harvest has shifted to Chesapeake Bay (the remaining harvest, of the closely related Gulf menhaden *Brevoortia patronus*, takes place largely in the Gulf of Mexico).

The concentrated harvest in Chesapeake Bay has raised concern among recreational anglers and conservation groups, who fear that it will disrupt the menhaden’s ecological role as a forage fish and filter feeder in Bay waters.

Atlantic menhaden are a favorite food of striped bass, bluefish, sea trout, tunas, sharks, and sea birds. They also consume large quantities of plankton, thus helping to maintain water clarity.

Although the ASMFC’s most recent stock assessment indicates that the coast-wide menhaden stock is not over-fished, anecdotal evidence suggests that menhaden abundance in the Bay has declined since the 1980s. A related concern is that low recruitment of juvenile menhaden may decrease the species’ ability to serve as a major food source for other fish.

In 2004, the ASMFC’s Atlantic Menhaden Technical Committee realized that it could not address these concerns in the absence of reliable data. The

Committee thus identified four research goals: to determine menhaden abundance in the Bay; estimate the removal of menhaden by predators; quantify the exchange of menhaden between Bay and coastal systems; and quantify the recruitment of menhaden larvae to the Bay.

Latour, along with colleagues at VIMS, the Maryland Dept. of Natural Resources, the U.S. Fish and Wildlife Service, and NOAA’s Environmental Technology Laboratory, are focusing on the first goal, by testing the feasibility of using LIDAR and sonar as fishery-independent tools for assessing the size of the Chesapeake Bay menhaden stock.

LIDAR (for Light Detection and Ranging) and SONAR (for Sound Navigation and Ranging) are technologies that use the strength of reflected pulses of light or sound to distinguish among materials with differing compositions or surface properties, such as water and fish tissue.



*Juvenile menhaden. Photo by Chris Crippen.*

The goal of Latour’s two-year study is to determine whether use of an airplane-mounted LIDAR unit, a boat-mounted sonar unit, or some combination of these two technologies can detect and quantify menhaden schools, thereby providing a rapid, reliable, and relatively inexpensive means for estimating menhaden populations in the Chesapeake.

Traditional fishery surveys (in which scientists tow a net behind a research vessel for a standardized time period along numerous randomly chosen transects) are prohibitively expensive for this purpose, and are also poorly suited for counting menhaden and other fish that travel in discrete schools and instinctively flee oncoming sampling nets.

“Because both LIDAR and sonar techniques can survey a large area quickly, we expect a significant cost savings as compared to a large-scale survey using traditional fishing gear,” writes Latour. “Calibration of both techniques during the first year and comparisons between both techniques and the fishery during the second year will facilitate full-scale implementation of future menhaden surveys.”

VIMS researcher Dr. Mark Brush is leading a related three-year project that will use a state-of-the-art computer model to quantify the role of menhaden as prey items and filter feeders in the Bay.

Brush’s team will couple the bay-wide assessment of the menhaden stock with a laboratory study of menhaden diet and feeding behavior. They will use these results to model the “bioenergetics” of menhaden on both the individual and population level, and then couple the bioenergetics model to two different food-web models both separately and in combination.

“Our modeling will help us predict how different populations of menhaden might affect Bay water quality, and how different nutrient-reduction and fishery-management scenarios might impact the menhaden population and its potential to improve water quality,” says Brush. “Our results will thus provide the basis for weighing potential management options.”

A third menhaden project at VIMS, led by Dr. Mary Fabrizio, is designed to quantify the recruitment of young menhaden into the adult population. The study builds on the long-term records of VIMS’ juvenile seine survey, which has monitored juvenile fish abundance for many species, including Atlantic menhaden and striped bass, since 1980.

The survey shows that the abundance of juvenile Atlantic menhaden has declined since the early years of the survey. An index of abundance value for 2006 was 0.79, compared with the survey’s greatest index value, 9.01, which occurred in 1982.

For more details on menhaden research at VIMS, visit [www.vims.edu/menhaden](http://www.vims.edu/menhaden)