



Menhaden study suggests overfishing may have taken place

Fisheries agency will consider new management options

By Karl Blankenship

A new review of the Atlantic menhaden stock confirms that the population continues to exist at a low level and-for the first time-suggests that overfishing has taken place in a number of recent years.

But the assessment stops short of blaming the commercial fishery for the ongoing low abundance of fish, especially juveniles, noting that there has been little correlation between the amount of menhaden harvested and reproduction.

Nonetheless, the Atlantic States Marine Fisheries Commission, the multistate agency responsible for managing the species along the East Coast, directed its technical advisers to begin exploring new management options, with an eye toward recommending changes by the end of this year.

It's the latest development in the heated controversy over the small oily fish, which pits the Bay's largest commercial fishery against recreational fishermen and environmentalists.

The industry, which catches menhaden for animal feed, Omega-3 vitamins and other products, has long insisted it has little impact on the overall population, either in the Bay or along the coast.

While menhaden processors were once common along the East Coast, the only remaining plant is operated by Omega Protein in Reedville, VA. Menhaden landings there averaged 154,980 metric tons annually between 2005 and 2008, the years examined by the assessment. Most of those fish are caught in the Chesapeake or near its mouth. (The ASMFC in 2006 established a 109,020-metric-ton annual limit on the amount of menhaden that can be caught inside the Bay.)

Menhaden are an important food source for striped bass and many other predators, and anglers say the commercial fishery leaves too few menhaden for other fishes, and even birds such as osprey, to eat. They cite figures showing that the overall size of the stock is only about a quarter of what it was three decades ago, and that the number of juvenile fish produced has been at low levels since the early 1990s.

Both sides found points in the assessment to bolster their positions.

Omega noted that the stock assessment showed that overfishing was not taking place in 2008, the most recent year reviewed, and that the overall stock was not in an overfished condition, which would have indicated the population was not sustainable.

"The findings of this stock assessment validate that Omega Protein and other menhaden fishermen have been fishing in a manner that does not negatively impact the sustainability of the menhaden fishery," Ron Lukens, senior fisheries biologist for Omega, said in a statement.

But the assessment also noted there was enough uncertainty in estimates to "raise concern about...potential overfishing in 2008." Further, it said overfishing had occurred in a number of recent years, including 1999, 2002 and 2006.

"The science is clearly saying the coastal menhaden population needs help," said Bill Goldsborough, a fisheries scientist with the Chesapeake Bay Foundation and an ASMFC commissioner.

The new assessment was the first "benchmark" stock assessment for menhaden since 2004. A benchmark assessment is a full, new analysis of stock health and is subject to peer review.

Part of the reason for different results from the previous assessment, which gave no indication of overfishing, was that the new assessment used updated methods and new information, including new information about predator-prey interactions.

Rob Latour, a fisheries professor with the Virginia Institute of Marine Science who chairs ASMFC's Menhaden Technical Committee, cautioned that the old and new assessments used different methodologies and, as a result, direct comparisons among assessments over time are difficult.

"It's not an apples to apples comparison," he said. "Each model configuration used to assess stock status is unique."

But the assessment outlined the paradox facing managers.

The goal of current menhaden management is to ensure that the adult stock is large enough to produce the minimum 13.3 trillion eggs considered necessary to maintain the population. Although that number of eggs has been produced in most years, the actual number of larval fish that survive to "recruit" into the population has remained at very low levels for nearly two decades.

In fact, the assessment report said it found "a complete absence" of any evidence showing that high egg production led to high recruitment.

"We are producing the eggs, but we are not getting the survival," and subsequently, adequate numbers of young fish coming into the fishable stock, said Doug Vaughan, a fisheries scientist with the National Oceanic and Atmospheric Administration who chaired the stock assessment panel.

If egg production is not translating into young fish, the assessment report said other factors may be more important in the production of young fish, such as predation and climate patterns affecting offshore waters where menhaden release their eggs.

Indeed, the assessment said that menhaden showed cyclical patterns of recruitment that may correspond with long-term regional climate patterns, with high levels of young in the 1950s, 1970s and 1980s, and low recruitment in the 1960s, 1990s and 2000s.

As a result, Vaughan and Latour said it's unclear that menhaden fishing was a major factor in persistent low levels of young menhaden. Over the past decade, the commercial catch has trended downward, but recruitment has not increased as a result.

Consequently, the ASMFC at its May 5 meeting directed the menhaden technical committee to explore alternate management goals for the stock.

Critics of past menhaden management hailed the action. "That's what we want to come out of this," said Ken Hinman, president of the National Coalition for Marine Conservation.

Traditionally, management goals are designed to achieve something close to a maximum sustainable fisheries yield. Critics say that fails to fully account for the ecological role of fish such as menhaden, herring or mackerel, which are important food for other species.

Hinman argued that, despite the stock assessment findings, the reduced harvest would likely result in more fish, noting that almost two-thirds of adult fish are harvested, some before they spawn and most before they are able to spawn a second time.

Even if reduced fishing did not reverse the long-running trend of low production, he said it would make more fish available to predators.

"For species like this we should be more conservative, we should leave more in the water, we should err on the side of the ecosystem," Hinman said.

That would be a big change. It pits traditional fishery management, which manages single species to maximize harvests, with emerging ecosystem concepts that place more importance on the interaction between species.

Hinman and others said that deciding the proper allocation of menhaden between the fishery and predators is a judgment call, not a scientific question.

"They are not likely to get a scientific solution to this," said Latour, whose panel is charged with making recommendations to the ASMFC. "The two management approaches are not always compatible. Which is most important may depend on whether you're a menhaden fisherman or a recreational angler."

Menhaden's role in cleaning up the Bay may be overrated

The popular image of menhaden is that of a swimming vacuum cleaner, sucking up huge amounts of algae and clearing the water as they go along.

But new research suggests their actual behavior is more like that of a broom sweeping dirt under a rug. While they remove phytoplankton from the water, they in some cases excrete enough dissolved nitrogen to fuel new algae production that may replace what they consumed.

The findings were recently reported in a paper by Virginia Institute of Marine Science researchers who studied menhaden feeding patterns to help develop ecosystem models.

During that study, they found that algae in the Bay are often too small for many menhaden to eat.

Rather than feeding like a vacuum cleaner, menhaden algae consumption "is more like running a sieve through the water," said Patrick Lynch, a Ph.D. student and lead author of the paper which appeared in the Feb. 22 issue of *Marine Ecology Progress Series*.

Menhaden swim with their mouths open so their gill rakers-comblike projections inside their mouths-can catch particles. The fish consume those particles after they close their mouths and water is expelled through their gills.

But much of the phytoplankton in the Bay is actually too small to be caught on the gill rakers, and ends up being expelled with the water. Except for the youngest fish-those less than 1 year old-menhaden instead eat a lot of larger zooplankton and detritus.

"The youngest fish, the age zeros, have the closest (gill raker) spacing which gave them the most potential for filtering smaller phytoplankton in our study," Lynch said. "As they get older, the spacing increases and they become less able to filter the smaller particles."

The study found that small menhaden did remove nitrogen from the water when phytoplankton concentrations were high. But when concentrations were low, and menhaden were consuming a greater mix of food, the fish were actually excreting more nitrogen than they were removing by eating

phytoplankton.

That nitrogen, in turn, could produce more phytoplankton, possibly worsening water quality. "It's enormously complicated," Lynch said.

Another complication, Lynch said, is that when menhaden remove zooplankton, they are consuming a small predator that would otherwise be eating smaller phytoplankton.

Others have suggested that menhaden may remove a huge percentage of the Bay's nitrogen from the water, but Lynch said those estimates did not relate menhaden to the composition of the plankton community, and did not consider what component of that community would actually be consumed by fish of different ages.

Estimates made by Lynch and his colleagues indicated that in some cases, large numbers of small menhaden might have an impact if they encountered dense algae populations, but the overall impact of menhaden on Bay nitrogen levels is probably negligible.

The study used typical species found in the York River during late spring and early summer. It's possible, Lynch said, that the outcome could be different in other places or different times of the year. "The number of species available for menhaden consumption may be in the thousands," he said.

The research was funded by the EPA Bay Program Office and the Keith Campbell Foundation for the Environment.

EPA wants to include filter feeders in TMDL equation

New cleanup plans for the Chesapeake may go beyond on-the-ground actions to rein in nutrient pollution.

The EPA wants the plans to consider whether the number of oysters and menhaden in the water are helping to meet cleanup goals.

The cleanup plans, known as a Total Maximum Daily Loads, typically set an upper limit on the "load" of pollution a body of water can receive and still meet its water quality standards.

In the case of the Bay, it will set limits on the amount of nitrogen, phosphorus and sediment. Nitrogen and phosphorus spur algae blooms, which block sunlight from reaching critical underwater plants. When the algae die, they remove oxygen from the water as they decompose. Sediment clouds the water and buries bottom habitat.

Because they feed by filtering algae and other particles out of the water, oysters and menhaden can improve water clarity, remove nutrients and improve dissolved oxygen as they eat.

EPA officials have said they want the Bay TMDL to be an innovative model, and the idea of factoring filter feeders into the plans illustrates the extent to which they want to use the TMDLs as a tool to push for Bay goals that have long proved elusive.

"We really are going into this TMDL not as a paper exercise, but as the biggest and best and most promising tool that we have to get a restored Bay," said Bob Koroncai, EPA's Bay TMDL manager.

A restored Bay means more than just less nutrients and clearer water, but also healthy populations of oysters and menhaden, which are often considered "keystone species" because of their importance to the ecosystem, Koroncai said. The EPA wants to use the TMDL as an incentive for states to boost their

populations, whether through restoration or management actions such as changing fishing regulations.

The TMDL would not require such actions. But if states could get credit for increased numbers of filter feeders, it might provide a new incentive to influence management and restoration decisions, Koroncai said.

"It is very clear to me that we ought to try to put this toolbox on the table," he said. "If we don't credit it in the TMDL, then we have less of a chance that they are even going to make that investment."

Suzanne Hall, an EPA biologist who has been working on the issue, said no other TMDL has attempted to account for changes in water quality caused by increases or decreases in filter feeder abundance, although officials working on an updated TMDL for Long Island Sound are also considering the possibility.

Right now, the Bay Program's computer models suggest today's low abundance of oysters has little impact on water quality.

"It is simply negligible," said Lewis Linker, modeling coordinator with the EPA Bay Program Office in Annapolis. "You can't even see the dissolved oxygen concentrations twitch in the (model) plots with oysters on and oysters off."

Menhaden are even more complex to model because, unlike oysters, they move and their diets change depending on their age. Efforts to date also indicate their influence is minimal.

With either species, Linker said, measurable changes in water quality require "significant changes in population."

He held out the possibility that oyster restoration efforts might help meet local water quality standards in some areas, but said that would still require sharp population increases. Oyster restoration faces major obstacles, including disease and a dramatic losses of habitat, and most experts believe restoring significant populations will take much longer than the Bay's 2025 cleanup deadline. Populations of wild oysters in the Bay have decreased over the last decade.

"It's a matter of doing the right thing, and then adding time-a lot of it," Linker said. "But this Bay has given us surprises before, and I would love to be surprised."

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