

**Y**ou might be surprised to learn that the most abundant fish species in the Chesapeake Bay and its tidal rivers is *not* the Atlantic menhaden—though they are very important too, and we'll get to them shortly. No, the top honor actually goes to the bay anchovy (*Anchoa mitchelli*), also known as a glass minnow or “rain bait.” No doubt you've seen them—nearly transparent 2- to 3-inch fish, schools of which

## Little Fish That Big Fish Eat

***They may be tiny and nearly invisible, but tiny fish like bay anchovies and silversides are critical links in the food chain.***

By John Page Williams

dimple the surface of the water like raindrops (hence nickname number two). This little fish has a long lower jaw under a bullet-shaped nose. That jaw swings down to reveal a surprisingly large mouth—which is telling. It's actually a ferocious mini-predator, feeding ravenously

on zooplankton, especially tiny crustaceans called copepods.

Anglers who make the annual fall trek to Harkers Island, North Carolina, for false albacore are quite familiar with these anchovies. They tie flies to imitate them: small, slender and translucent, with big eyes and a little bit of flash down the sides. Another lure that imitates them well up and down the Bay, especially in the fall when the population peaks, is a short, sparse, small feather jig with a 1/8-ounce head cast on a 1/0 hook. The obvious color scheme is a white head tied with four to six 2-inch white and yellow neck hackle tips. Another that works very well, even though it looks nothing like an bay anchovy, is a chartreuse green head with fluorescent yellow feathers.



Why so short, with so few feathers? Look closely at a bay anchovy and you'll understand. It pays to study the prey that our favorite fish favor; talk with Harkers Island veterans and they'll tell you how picky false albacore can be about the length of their flies. Matching the hatch still counts, though the gaudy green-yellow color scheme can help to attract the fishes' attention in cloudy water.

### »»» Forage Fish Play Key Roles in the Chesapeake

A quick lesson on the Chesapeake's food web: The energy that drives the system comes first from the sun, though it has to be converted to carbohydrates, proteins, fats and oils. And doing most of that work are phytoplankton, microscopic single-cell plants that drift in the water column); underwater grasses, like eelgrass and wild celery; marsh plants, like wild rice and saltmarsh cordgrass; and tree leaves that fall or wash into the waters.

The next stage is tiny animals that “graze” on the live plant material, or those that munch on it when it is decaying. Many of the tiny grazing animals are crustaceans of a group called copepods, one species of which may be the Bay's most abundant animal species. Another, much larger grazer is native American oyster, which feeds by filtering Bay water through its gills, catching certain kinds of algae there, and transferring them to its mouth. Meanwhile, the dead-plant munchers include a dozen or more species of marine worms, a dozen or more species of mud crabs and small crustaceans like grass shrimp.

Remember, though, that the plants come in a vast array of sizes, shapes and flavors. Like us, the grazers have developed strong food preferences, dictated by the structures of their mouths, their capturing abilities, and their digestive capabilities. There are enough variations in this step to keep a legion of biologists busy for their entire careers, but the bottom line is that these grazers and munchers form a hugely important link at the base of the Chesapeake's food web.

So what is the next step? How does the solar energy make it from these grazers and munchers to predator fish? In the case of grass shrimp, the answer is obvious to anyone who has ever fished with them as bait. In the Bay, they have about as many “friends” as soft



VIMS Juvenile Trawl Survey

crabs. Oysters aren't normally considered fish food, but there are some big "crunchers" in the Bay, especially tautogs, sheepshead and cownose rays, that are perfectly capable of eating algae-fueled oysters. It's the copepod, however, that leads us to the bay anchovy—as well as the Atlantic silverside (the second most abundant fish species) and menhaden (yes, the third).

Roughly speaking, it takes five thousand pounds of phytoplankton to make five hundred pounds of copepods, which gives you fifty pounds of bay anchovies, which gives you one five-pound Spanish mackerel, bluefish or rockfish. Fortunately, phytoplankton come by the billions per gallon of Bay water.

There's a balance to be struck, though. Too heavy a bloom of algae can cause serious problems, especially by causing the dead zones of low dissolved oxygen that plague the Bay and its tributaries for the warmer half of each year. Excessively fertile water (too much nitrogen and phosphorus) is the root of the oxygen problem, but it can also cause changes to the species mix of the phytoplankton community, which in turn can wreak havoc with the diets of filter-feeding shellfish like oysters and finfish like menhaden. Both problems put significant stress on the populations of our forage fish, which of course cause problems with their predators. Bay scientists, for example, think that the low stock of menhaden (currently estimated at 8 percent of what it might be if they weren't harvested, is causing nutritional stress and weakness in young rockfish in the Chesapeake, which leaves them open to infections from fungi, mycobacteria and other diseases.

Menhaden have high commercial value for bait and industrial uses, so scientists have studied their migratory behavior and popula-

tion size extensively. The Atlantic States Marine Fisheries Commission (ASMFC) and its member states (Maine to Florida) have coordinated management plans for them. (That process is going through a watershed change over the next six months; for more on that, see the *Tackle Box*, page 46, and the feature article "Food Fight" in last month's issue, for more information).

Up till now, though, the primary goal of menhaden management has been to maximize the harvest for bait and industry, but research into the Chesapeake ecosystem has led ASMFC to begin considering their ecological roles as essential links between plankton and predators—both fish and birds like ospreys and loons. The new management regime will firmly factor in that role.

As the commission does so, its member states are also beginning to pay increased attention to the ecological roles of other forage species like bay anchovies and silversides, even though there is no market for them. Thus both the Virginia Institute of Marine Science's Fisheries Department (VIMS) and the Maryland Department of Natural Resources Fisheries Service (DNR) include them in their annual seine surveys (see the *Tackle Box* for web links). The survey numbers for anchovies in Maryland have been low for the last 20 years, possibly because of the low oxygen conditions that still plague the Bay in summer. The anchovy numbers have improved in the last couple of years, however, in both Maryland and Virginia.

The same pattern holds true in both states for silversides, which look similar but are generally a little longer than anchovies, with pronounced silver stripes and green backs. They are more common close to shore, and their mouths are smaller, located

ABOVE: *A tiny bay anchovy.*  
OPPOSITE PAGE: *Joe Bruce's bay anchovy fly.*

at the tips of their snouts. These little fish eat a greater variety of food than bay anchovies do, including some algae, small zooplankton and tiny orms. Take a good look at an Atlantic silverside, either in your own seine net or in a photograph, and you'll recognize immediately why a three-inch green-over-silver-over-white Lefty's Deceiver fly or X-Rap lure can be so effective here in the Chesapeake.

One more group of little fish deserves our respect and affection: the killifishes (sometimes called bullfish minnows), including the mummichog, the striped killifish and the banded killifish. They are members of a large family of nearshore minnows with members on other coasts. Bay anglers use them widely for bait, e.g., the "flounder sandwich," which combines a bull minnow with a strip of cut squid. But we should appreciate them for other reasons too. They are exceptionally hardy, tolerating wide ranges of temperature, salinity and oxygen while eating an equally wide range of food that ranges from decaying scraps of marsh grass to tiny worms and crustaceans. They too serve as major links in the Chesapeake's food web. 📌

### Tackle Box

- To review the VIMS surveys of these fish, visit [www.vims.edu/research/departments/fisheries/programs/juvenile\\_surveys/data\\_products/indices/index.php](http://www.vims.edu/research/departments/fisheries/programs/juvenile_surveys/data_products/indices/index.php).
- To review the DNR surveys of these fish, visit <http://dnr.maryland.gov/fisheries/juvindex/index.asp#Indices>
- To follow the process of menhaden management for the rest of 2012 and 2013, visit the Atlantic States Marine Fisheries Commission web site, [www.asmf.org](http://www.asmf.org).
- To look at a range of flies that imitate these forage fish and study how to design and tie your own, a good place to start is Joe Bruce Custom Flies, [www.joebruce.net](http://www.joebruce.net).