The Most Important Fish in the Sea

You've never heard of them, but your life may depend on them

By H. Bruce Franklin

FIRST YOU SEE THE BIRDS—gulls, terns, cormorants, and ospreys wheeling overhead, then swooping down into a wide expanse of water dimpled as though by large raindrops. Silvery flashes and splashes erupt from thousands of small herringlike fish called menhaden. More birds arrive, and the air rings with shrill cries. The birds alert nearby anglers that a massive school of menhaden is under attack by bluefish.

The razor-toothed blues tear at the menhaden like piranhas in a killing frenzy, gorging themselves, some killing even when they are too full to eat, some vomiting so they can kill and eat again. Beneath the blues, weakfish begin to circle, snaring the detritus of the carnage. Farther below, giant striped bass gobble chunks that get by the weakfish. From time to time a bass muscles its way up through the blues to take in whole menhaden. On the seafloor, scavenging crabs feast on leftovers.

The school of menhaden survives and swims on, its losses dwarfed in plenitude. But a greater danger than bluefish lurks nearby. The birds have attracted a spotter-plane pilot who works for Omega Protein, a $100 million fishing corporation devoted entirely to catching menhaden. As the pilot approaches, he sees the school as a neatly defined silver-purple mass the size of a football field and perhaps 100 feet deep. He radios to a nearby 170-foot-long factory ship, whose crew maneuvers close enough to launch two 40-foot-long boats. The pilot directs the boats' crews as they deploy a purse seine, a gigantic net. Before long, the two boats have trapped the entire school. As the fish strike the net, they thrash frantically, making a wall of white froth that marks the net's circumference. The factory ship pulls alongside, pumps the fish into its refrigerated hold, and heads off to unload them at an Omega plant in Virginia.

Not one of these fish is destined for a supermarket, canning factory, or restaurant. Menhaden are oily and foul and packed with tiny bones. No one eats them. Yet they are the most important fish caught along the Atlantic and Gulf coasts, exceeding the tonnage of all other species combined. These kibble of the sea fetch only about 10 cents a pound at the dock, but they can be ground up, dried, and formed into another kind of kibble for land animals, a high-protein feed for chickens, pigs, and cattle. Pop some barbecued wings into your mouth, and at least part of what you're eating was once menhaden.

Humans eat menhaden in other forms too. Menhaden are a key dietary component for a wide variety of fish, including bass, mackerel, cod, bonito, swordfish, bluefish, and tuna. The 19th-century ichthyologist G. Brown Goode exaggerated only slightly when declaring that people who dine on Atlantic saltwater fish are eating "nothing but menhaden."

And that is one problem with the intensive fishing of menhaden, which has escalated in recent decades. This vital biolink in a food chain that extends from tiny plankton to the dinner tables of many Americans appears to be threatened. The population of menhaden has been so depleted in estuaries and bays up and down the Eastern Seaboard that even marine biologists who look kindly on commercial fishing are alarmed. "Menhaden are an incredibly important link for the entire Atlantic coast," says Jim Uphoff, the stock assessment coordinator for the Fisheries Service of the Maryland Department of Natural Resources. "And you have a crashing menhaden population with the potential to cause a major ecosystem problem." Menhaden have an even more important role that extends beyond the food chain: They are filter feeders that consume phytoplankton, thus controlling the growth of algae in coastal waters. As the population of menhaden declines, algal blooms have proliferated, transforming some inshore waters into dead zones.

To grasp how ubiquitous menhaden once were, you can read the journals of explorer John Smith. In 1607, he sailed across the Chesapeake Bay through a mass of menhaden he described as "lying so thick with their heads above the water, as for want of nets (our barge driving amongst them) we attempted to catch them with a frying pan." Colossal schools of menhaden, often more than a mile in diameter, were once common along the entire Atlantic and Gulf coasts of the United States. Since World War II, however, fishermen using spotter planes and purse seines appear to have dramatically decreased both the population and the range of menhaden.

Bryan Taplin, an environmental scientist in the Atlantic Ecology Division of the Environmental Protection Agency (EPA), has witnessed the destruction of all the large schools of menhaden by purse seiners in Rhode Island's Narragansett Bay. During the last two decades he has also studied changes in the diet of striped bass in the bay by analyzing the carbon isotope signature of their scales. What he has discovered is a steady shift away from fat-rich menhaden to invertebrates that provide considerably lower nutritional value. That has been accompanied by a loss of muscle and a decrease in the weight-to-length ratio of striped bass. The bass that remain in Narragansett Bay, says Taplin, are "long skinny stripers" that have been forced to shift their diet because "the menhaden population has crashed to an all-time low."

"You have to scratch your head and wonder—since we set quotas for bluefin and tuna—why we don't set quotas for this crucial part of the oceanic food chain," says Taplin. "Not to regulate a fishery that's so important is to ask for trouble. I wonder whether we are about to see something go wrong unlike anything we have ever seen."

Signs of what could go wrong are already obvious in the Chesapeake Bay, the tidal estuary that once produced more seafood per acre than any body of water on Earth. "There's nothing in Chesapeake Bay that can take the place of menhaden," says Uphoff of the Maryland Fisheries Service. "Menhaden are king."

Jim Price is a fifth-generation Chesapeake Bay fisherman. For 10 years he captained a charter boat specializing in light-tackle fishing for striped bass, also called rockfish by bay anglers. One day in the fall of 1997, Price caught a rockfish so diseased he still becomes upset when he talks about it. "I'd never seen anything like that in my entire life," he says, wringing his powerful, deeply tanned hands. "It was covered with red sores. It was so sickening it really took something out of me."

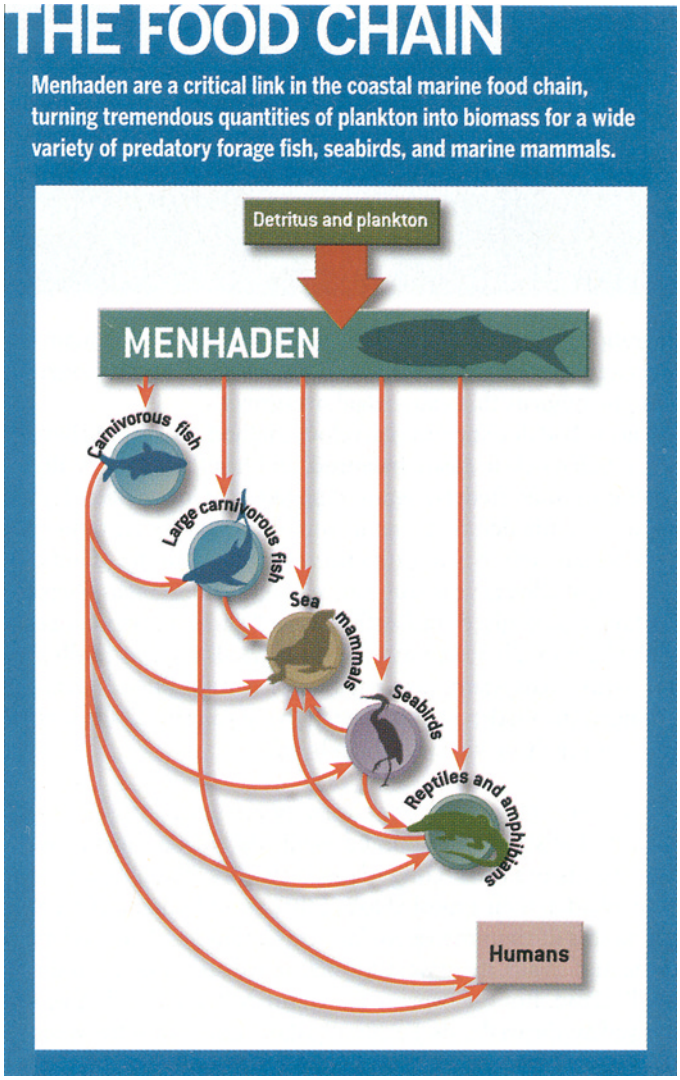
Price deposited several sick rockfish at the Cooperative Oxford Laboratory in nearby Oxford, Maryland, and then began his own independent study. When he cut some open, he was shocked. "I've been looking in the stomachs of rockfish for 40 years," he says, "but I couldn't believe what I saw—nothing, absolutely nothing. Not only was there no food, but there was no fat. Everything was shrunk up and small."

An Oxford lab pathologist speculated that the fish might have been "decoupled from their source of food," but Price was incredulous. "I thought to myself, with all the food here in the Chesapeake, that's a stupid idea. Then I got to thinking. In years past, at that time of year I would find their stomachs full of menhaden, sometimes a half-dozen whole fish."

Price hypothesized that malnutrition, caused by the decline in the menhaden population, made the rockfish vulnerable to disease. Since then, his hypothesis has been confirmed by research. Half the rockfish in the Chesapeake are diseased, with either bacterial infections or lesions associated with *Pfiesteria*, a toxic form of phytoplankton known as the cell from hell. But that is only one symptom of the depletion of menhaden.

Dense schools of menhaden swimming with their mouths open slurp up enormous quantities of plankton and detritus like gargantuan vacuum cleaners. In the Chesapeake and other coastal waterways, the filtering clarifies water by purging suspended particles that cause turbidity, allowing sunlight to penetrate to greater depths. That encourages the growth of plants that release dissolved oxygen as they photosynthesize. The plants also harbor fish and shellfish.

Far more important, the menhaden's filter feeding limits the spread of devastating algal blooms. Runoff from many sources—farms, detergent-laden wastewater, overfertilized golf courses, and suburban lawns—floods nitrogen and phosphorus into coastal waters. Nitrogen and phosphorus in turn stimulate the growth of algal blooms that block sunlight and kill fish. The blooms eventually sink in thick carpets to the sea bottom, where they suck dissolved oxygen from the water and leave dead zones. Menhaden, by consuming nutrient-rich phytoplankton and then either swimming out to sea in seasonal migrations or being consumed by fish, birds, and marine mam-



GRAPHIC BY MATT ZANG

mals, remove a significant percentage of the excess nitrogen and phosphorus that cause algal overgrowth.

Nature had developed a marvelous method for keeping bays and estuaries clear, clean, balanced, and healthy: Oysters, the other great filter feeders, removed plankton in lower water layers, and menhaden removed it from upper layers. As oysters have been driven to near extinction along parts of the Atlantic coast, menhaden have become increasingly important as filters.

Marine biologist Sara Gottlieb says: "Think of menhaden as the liver of a bay. Just as your body needs its liver to filter out toxins, ecosystems also need those natural filters." Overfishing of menhaden is "just like removing your liver," she says, and "you can't survive without a liver."

During the late 19th century, several dozen sailing vessels and a handful of steamships hunted menhaden in Gardiners Bay, near the eastern tip of Long Island, New York. The abundance of menhaden then appealed to another set of hunters: ospreys that nested in an immense rookery on Gardiners Island. As late as the mid-1940s, there were still 300 active osprey nests on the small island. But the ospreys fell victim to the DDT that was sprayed on the wetlands. Eventually, the number of active nests plummeted to 26. After DDT was banned, biologist Paul Spitzer observed a gradual resurgence of the osprey. However, in recent years he has watched the number of ospreys on Gardiners Island dwindle again. From 1995 to 2001, he says, "there has been an absolute steep decline from 71 active nests to 36."

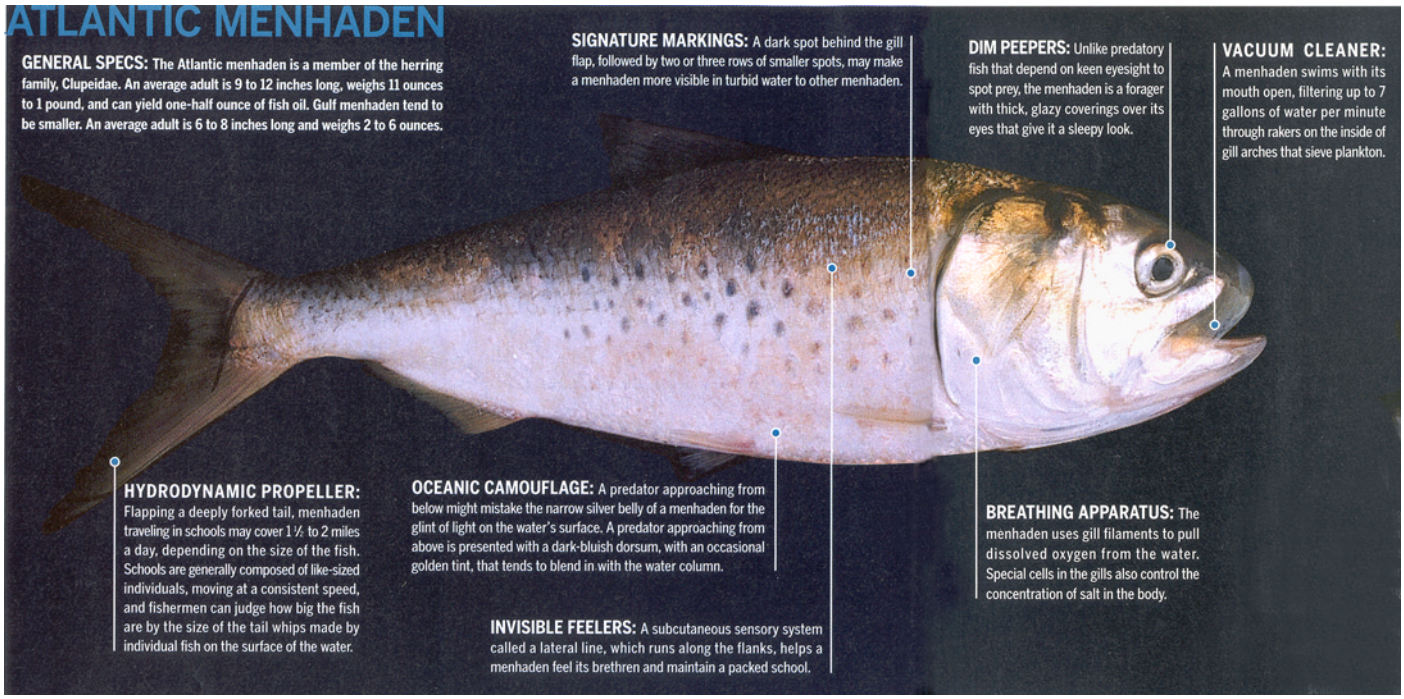
Although no longer weakened by toxins, ospreys now have little to eat. "Migratory menhaden schools formerly arrived in May, in time to feed nestlings," Spitzer says. In recent years, menhaden have disappeared, and the survival rate of osprey chicks has fallen to one chick for every two nests, a rate comparable to the worst years of DDT use. "The collapse of the menhaden means the endgame for Gardiners Island ospreys," he says. Spitzer sees the same pattern of decline in other famous osprey colonies, including those at Plum Island, Massachusetts; Cape Henlopen, Delaware; Smith Point, New York; and Sandy Hook and Cape May in New Jersey.

The menhaden crash may also contribute to the decline of the loons that make an autumn migration stopover in the Chesapeake each year. Spitzer keeps statistical counts of flocks passing through a roughly 60-square-mile prime habitat on the Chesapeake's Choptank River, near where Jim Price found diseased striped bass. Between 1989 and 1999, Spitzer's loon count dropped steadily from 750 to 1,000 per three-hour observation period to 75 to 200. The typical flock fell from 100 to 500 birds to between 15 and 40. Menhaden are "the absolute keystone species for the health of the entire Atlantic ecosystem," says Spitzer.

Hall Watters, now 76 and retired, looks back ruefully on the role he and other spotter pilots played in the demise of the menhaden. "We are what destroyed the fishery, because the menhaden had no place to hide," he says. "If you took the airplanes away from the fleet, the fish would come back."

Watters was the first menhaden spotter pilot, hired in 1946 by Brunswick Navigation of Southport, North Carolina. He had been a fighter pilot during World War II and says he was "the only pilot around who knew what menhaden looked like." Brunswick had just converted three oceangoing minesweepers and two submarine chasers to menhaden fishing ships and was eager to extend the range and efficiency of its operations. Menhaden usually spawn far out at sea, and the larvae must be carried by currents to the inshore waterways where they mature. Guided by Watters, Brunswick's rugged vessels soon began to net schools as far out as 50 miles, some with so many egg-filled females, he says, that the nets "would be all slimy from the roe."

Watters remembers that in the early postwar years, menhaden filled the seas. In 1947, he spotted one school



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about 15 miles off Cape Hatteras so large that from an altitude of 10,000 feet, it looked like an island. Although 100 boats circled the school, many fish escaped. "Back then we only fished the big schools. We used to stop when the schools broke up into small pods." But things had changed dramatically by the time he quit in 1980: "We caught everything we saw. The companies wanted to catch everything but the wiggle."

The exact size of the Atlantic menhaden population in 2001 is impossible to measure, but industry statistics show a dramatic decline in catches over the years since 1946. The average annual tonnage from 1996 to 1999 was only 40 percent of the average annual tonnage caught between 1955 and 1961. Last year the catch was the second lowest in 60 years. Moreover, these numbers may not reflect the full scope of the decline because the catch is not necessarily proportional to the population. "The stock gets smaller but still tends to school," says Jim Uphoff of the Maryland Fisheries Service. "The fishery gets more efficient at finding the schools. Thus they take a larger fraction of the population as the stock is going down."

The large oceanic schools of menhaden are often too scarce to chase profitably, so the fishing industry has moved into estuaries and bays, particularly the Chesapeake. Maryland has banned purse seining in its portion of the Chesapeake. Virginia has not. Omega Protein, headquartered in Houston and the largest U.S. menhaden fishing firm, has almost unlimited access to state waters, including the mouth and southern half of the Chesapeake. By 1999, 60 percent of the entire Atlantic menhaden catch came from the Virginia waters of the Chesapeake.

These days Omega Protein enjoys a near monopoly fishing for menhaden. As the fish population declined and operational costs increased, many companies went bankrupt or were bought out by bigger, more industrialized corporations. Omega Protein's parent was Zapata, a Houston-based corporation cofounded by former president George Bush in 1953. Omega Protein went independent in 1998, after completing the consolidation of the menhaden industry by taking over its large Atlantic competitor, American Protein of Virginia, and its Gulf competitor, Gulf Protein of Louisiana.

Omega Protein mothballed 13 of its 53 ships last year and grounded 12 of its 45 spotter planes as the menhaden continued to disappear. Fewer than a dozen of the company's ships fish out of Virginia, but 30 ships fish the Gulf of Mexico.

The Gulf seems to be headed for the same problems that are obvious in the Chesapeake, but on a larger scale. Fed by chemical runoff, algal blooms have spread, causing ever-enlarging, oxygen-depleted dead zones. And jellyfish are proliferating, both a native species and a gigantic Pacific species. Researchers believe the swollen jellyfish population could have a devastating effect on Gulf fishing because they attack the eggs and larvae of many species. Monty Graham, senior marine scientist at the Dauphin Island Sea Lab in Alabama, says overfishing, "including aggressive menhaden fishing," seems to have allowed the jellyfish—"an opportunistic planktivore"—to fill the ecological void. He says the proliferation of both species of jellyfish indicates "something gone wrong with the ecology."

Barney White, corporate vice president of Omega Protein and chairman of the National Fish Meal and Oil Association, the industry's trade association, categorically

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denies that menhaden are being overfished or that there is any ecological problem whatsoever caused by their decline. He says the controversy "is largely without basis" and is based on "lies" disseminated by recreational fishermen in general and Jim Price in particular. "It becomes an issue of politics rather than science—that people have a problem with commercial fishing in general," White says. "We have big boats closer to shore, so we're easy to see, and that makes us a convenient political target."

White attributes the absence of adult fish in New England and eastern Long Island waters to cyclic factors. "Well-meaning people who don't know marine biology have been mistaking short-term occurrences for long-term trends," he says. "In fact, the reports I have show that more fish seem to be moving into the area." Moreover, White says, "the total biomass is sufficient to sustain the industry."

Watters disagrees. More than a half century after he first took to the air as a spotter pilot, he fumes that "the industry destroyed their own fishery, and they're still at it." What galls him the most is that an increasing proportion of the catch consists of "zeros"—menhaden less than a year old. He advocates banning menhaden fishing close to shore, especially in estuaries, where the young menhaden mature. He also argues that if Omega Protein "enlarged the mesh size, they wouldn't be wiping out the zero class."

Nearly 98 percent of the menhaden catch is converted into fish meal, proteins, and oils and then used as fertilizer and animal feed and in cosmetics.

White acknowledges the industry is facing a problem of "recruitment"—menhaden are not living through their first year. But he insists that the 1 ¾-inch mesh now used allows

the very smallest juveniles to slip through. The real problem, he says, is "an overpopulation of striped bass. We think the striped bass are eating all the juveniles."

Omega Protein's financial reports indicate that the fortunes of the company rise and fall with "the supply and demand for competing products, particularly soybean meal for its fish meal products and vegetable oils and fats for its fish oil products." The fishing industry's journal, *National Fisherman*, says: "On the industrial side of the fishery, where menhaden is processed into feed for poultry and pigs, the demand for fish is depressed by a surplus of soy, which serves the same purpose." In other words, all the ground-up menhaden could be replaced by ground-up soybeans.

Since market forces are unlikely to curtail the menhaden fishery, governments may have to take action. Price thinks the fishing season for menhaden should be closed each December 1, "because after that is when the age zeros migrate down the coast." No matter what is done, most researchers agree the menhaden must be viewed not as a specific problem about a single species of disappearing fish but as a much larger ecological threat.

Bill Matuszeski, former executive director of the National Marine Fisheries Service and former director of the EPA's Chesapeake Bay program, says: "We need to start managing menhaden for their role in the overall ecological system. If this problem isn't taken care of, the EPA will have to get into the decision making." Matuszeski believes estuaries like the Chesapeake Bay should be put off limits to menhaden fishing immediately. "That would be inconvenient for the industry, but it would be inconvenient for the species to be extinct."