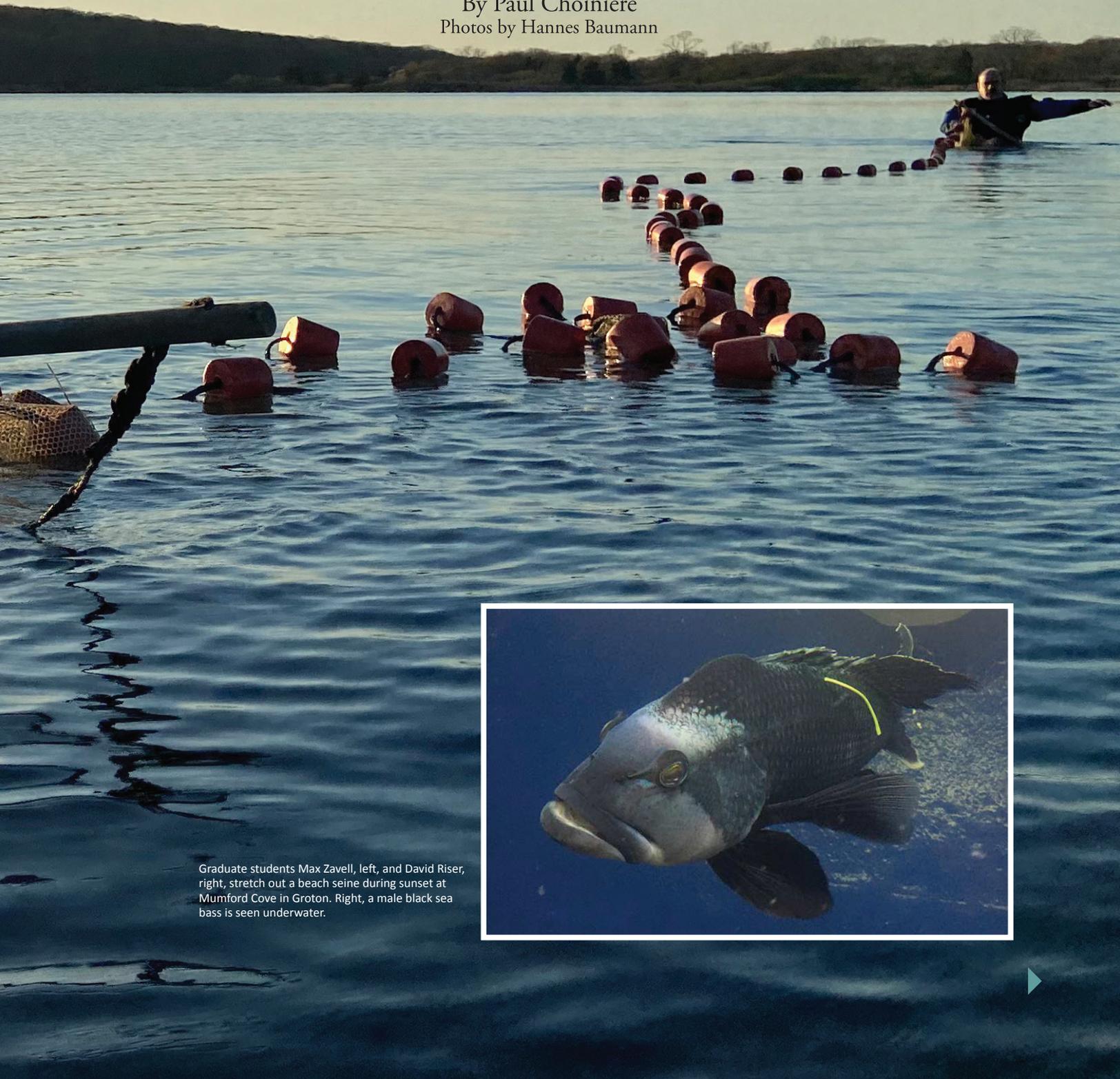




Are black sea bass becoming the 'new cod' in the Sound's warming waters?

By Paul Choiniere
Photos by Hannes Baumann



Graduate students Max Zavell, left, and David Riser, right, stretch out a beach seine during sunset at Mumford Cove in Groton. Right, a male black sea bass is seen underwater.



Black sea bass (*Centropristis striata*) are the poster fish for the unpredictability brought about by a changing climate.

Not many years ago these carnivorous bottom feeders were considered largely southern dwellers, only rare visitors to the cold Atlantic waters north of Hudson Canyon, which runs from New York/New Jersey Harbor to 400 nautical miles out to sea.

A 1953 U.S. Fish and Wildlife Service publication, “Fishes of the Gulf of Maine,” stated about the species that “it has never been found in any numbers north of the elbow of Cape Cod so far as we can learn. We have never seen it in the Massachusetts Bay region.”

Given their suitability for warmer ocean waters, there was no expectation of a move north.

The authors can be forgiven for not knowing the climate was already warming, a product of the industrial age spewing carbon into earth’s atmosphere, trapping heat like a greenhouse. And who could have predicted then that the waters off the northeastern United States would warm more rapidly than most?

In 2021, the Connecticut Department of Energy and Environmental Protection, in issuing its annual Long Island Sound Trawl Survey, noted a shocking discovery. In a single decade the black sea bass population had increased by an estimated 1,084%.

“The outburst of black sea bass has really happened after 2010.

The Long Island Sound Survey has caught more sea bass in the last five years than in all the years before combined,” said Assistant Professor Hannes Baumann.

Baumann is the founder of the Evolutionary Fish Ecology Lab at the University of Connecticut Department of Marine Sciences, located at the Avery Point Campus. He is leading research into the multiple implications that sea bass expansion has for the ecosystem of the Sound. Baumann has obtained Connecticut Sea Grant funding to undertake the first comprehensive evaluation of black sea bass diets in the Sound, the most recent of several of his projects focusing on this fish.

While warming ocean temperature is more favorable to the opportunistic sea bass, it is making the waters less hospitable to cod, summer flounder and, particularly, winter flounder. Overfishing had already depleted these stocks, all of which are now fished following strict regulations.

“The sea bass found an empty seat at the table,” Baumann said.

Working with Baumann is Max Zavell, whose doctoral research at UConn marine sciences has focused on what water temperature conditions could allow the sea bass to transition from just being summer visitors to our local coastal waters, to permanent dwellers that survive our winters, capable of spawning in winter and spring.

Such research will help sort out the implications of black sea bass expanding their turf and determining how big of a foothold they may get. Just how dominant will they become among fellow bottom feeders?



Black sea bass from Long Island Sound are swimming in large tanks at UConn’s Rankin seawater laboratory in 2020

The Maine lobster industry is also taking a wary view of the invader, which has been found with increasing frequency in lobster traps there. If juvenile lobsters become a significant part of the diet of an expanding black sea bass population, that would have troubling implications for the lobster trade.

On the positive side, black sea bass could grow into a staple for the commercial and recreational fisheries, which have seen other stocks diminish.

“It could become the new cod,” Baumann said of the fish that was once abundant in the Sound and adjacent coastal waters.

MOVING

Like the fish he is now studying, Zavell is a transplant to these environs. He didn’t take a typical route, geographically speaking, to his love of the sea. Zavell grew up in the great midwestern city of Chicago. Though nearby Lake Michigan primed his curiosity, it was the family summer trips to coastal Maine that set him on his career course.

“I found I had an innate connection to the sea, even way back then,” he said.

To friends he was known as a fish nerd.

“Ask anybody who has known me — forever — and they will say, from day one, they knew this is what I was going to do. In high school, they’d say, ‘Max is going to be a fish doctor,’” recalls Zavell.

He came east to attend the University of Rhode Island, in 2020 graduating with a Bachelor of Science degree in Marine Biology. He arrived at UConn that same year to pursue his Ph.D. Zavell is expected to be recognized this spring as a Doctor of Oceanography. In other words, a fish doctor.

Zavell’s research focused on the Mid-Atlantic black sea bass, also known as the northern stock. There is also a South Atlantic stock. These sea bass are protogynous hermaphrodites, with most starting life as females, but many transitioning to males as they mature and grow.

The fish migrate to inshore coastal areas and bays in the spring and summer, feeding on shrimp, worms, clams, crabs and small fish. Warming water temperatures account for the big increase seen in black sea bass summer migration to the Sound and other northern coastal areas. They head back offshore to warmer waters in the fall and spawning begins in winter.

Zavell wanted to observe the water temperature tolerance of these Mid-Atlantic black sea bass. If the waters warm enough, and the black sea bass adapt to those temperatures, more of them can be expected to spawn in local waters and skip the offshore trek. That could lead to further dramatic increases in population.



Graduate students David Riser, left, and Max Zavell pull the beach seine on shore in Mumford Cove.

“It’s just a matter of time, potentially, as water temperatures continue to increase, that it might be favorable for them to stay,” he said.

Utilizing facilities at the UConn marine sciences laboratories, Zavell and his assistants filled a dozen blue buckets with 700 liters of seawater pumped directly from the Sound. They populated each with eight black sea bass. Studied were fish subjected to 19 degrees Celsius (66.2 degrees Fahrenheit), considered the ideal growth temperature; 12 Celsius (53.6 Fahrenheit), the temperature typical of their northern offshore fall migration; and 6 Celsius (42.8 Fahrenheit), considered the bottom level of their tolerance.

In some tanks, Zavell also manipulated temperatures to mimic changes during migration.

As expected, the fish grew vigorously in the warmest temperatures and thrived in the 12 degrees Celsius conditions as well. More surprising was the tolerance and growth seen at 6 Celsius. Those colder conditions still left the fish depleted, making migration to warmer water still the better survival and reproduction option, he said. But not by a lot.

“These fish might have a much lower temperature threshold than we previously thought,” Zavell said.

Curious, Zavell subjected some black sea bass to winter temperatures now typical to the eastern Sound — between 3 to 4 degrees Celsius (about 37.4 degrees Fahrenheit). It was not part of the research and so not carefully analyzed or included in his doctoral dissertation. But it proved interesting.

“We did see mortality, but survival was much higher than expected,” Zavell said.

It may be that we are witnessing the development of a subunit of the Mid-Atlantic stock, said Zavell. This hardier stock would be ready for rapid population growth.



DIET

Earlier research by Baumann and fellow scientists found that the sea bass in the Sound tend to be smaller, younger and grow faster than the traditional stock. The largest of about a thousand specimens measured 57 centimeters, or about 22 inches. But the average size was 35 centimeters, about 14 inches.

South Atlantic black sea bass grow to two feet.

Baumann's next research will examine what these predators are feeding on and the implications it has for the ecosystem and for fisheries. Project researchers will analyze hundreds of sea bass through the traditional method of cutting them open and looking inside their digestive tracts, but also by using DNA technology to determine which critters have already been digested.

"As scientists there are many, many things we still don't know," Baumann said. "But we will know more when we determine what these fish are eating."

The sea bass diet could be contributing to the decline in river herring, for example, which come in from the Sound to spawn in Connecticut streams, Baumann said. And does their diet for crustaceans include many juvenile lobsters? If so, that would be bad news for the lobster industry, which has already collapsed in the Sound, but remains thriving off coastal Maine, for now.

Baumann's path to UConn traces back to East Germany. "I was 14 when the (Berlin) Wall came down," he said.

Under the communist government of East Germany, he would never have had the chance to pursue a marine biology career, Baumann said. Having scientists in that field was a low priority for a socially engineered society.

Left, a juvenile black sea bass swims in one of the experimental tanks.

Above, Max Zavell measures a live, anesthetized black sea bass juvenile to subsequently measure its growth during winter. Additional photos from the research project can be found at: <https://seagrant.uconn.edu/?p=11758>

It was a hobby he took up as a teen and still enjoys, scuba diving, that led to his interest in the field. "I wanted to identify and understand the fish I was looking at."

Baumann earned his doctorate from the University of Hamburg and came to do his post-doctoral work in the United States in 2008. He joined the UConn faculty in 2014.

For recreational and commercial fishing, the explosion in sea bass is an opportunity, Baumann said. Research on their growing abundance could lead to larger catch limits for the commercial fishery, he said, and smaller size limits for recreational fishermen and women, given the smaller size of mature fish in local waters.

"There are winners and losers when it comes to climate change," he said. "These sea bass are winners. We need to understand the implications of that and react accordingly."



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