

## WARMEST OCEAN EVER (from page 1)

The increase in ocean heat also affects the planet's weather systems, by raising air temperatures and supplying more moisture. Warmer air can hold more moisture. In turn, this leads to increases in the intensity of storms and heavy rains. In 2018, the world experienced a number of major tropical storms, typhoons and hurricanes, such as hurricanes Florence and Michael in the Atlantic and typhoons Jebi, Maria, Manghut and Trami in the Pacific.

Other consequences of ocean warming that are referenced in the ocean warming study include declining ocean oxygen, bleaching and death of corals, melting sea ice through bottom warming, and the increase in marine heat waves. In addition to ocean-related effects, there are other indirect effects of ocean heating, such as increased drought intensity, heatwaves, and risk of wildfire.

### Warm water impacting the fish

A good example of how warming water is impacting estuaries and the fish is Narragansett Bay, Rhode Island. It is small enough to study, yet it is very diverse. I fish this bay regularly as a charter captain and fishing guide.

The *State of Narragansett Bay and Its Watershed Report* released October 23, 2017 related that Narragansett Bay and the rivers that feed it (including the Blackstone, Taunton and Pawtuxet Rivers) are much cleaner. The discouraging news was the accelerating impact that climate change and warming water are having on salt marshes, the sea grass, fish populations, Narragansett Bay and surrounding communities. Air temperature, water temperature and sea level are rising.

**Tom Kutcher**, *Bay and Estuary Report* program speaker with the Rhode Island Natural History Survey (and a former Baykeeper for Save the Bay) said, "The salt marshes are disappearing. You might say they are drowning with climate change sea level rise."

"These salt marshes act as filters for the Bay. Water flows into them from the rivers and then into the Bay. Without them we have no filters," said Kutcher.

From the 1800s to 1970 we lost over 50 percent of Narragansett Bay salt marshes due to development and other factors. A recent analysis found we have about 3,321 acres of salt marsh left in the bay and about one-third of it in the Warren, Palmer and Barrington Rivers. Recent observations and future projections suggest that a large percentage of existing marshes will be lost with accelerating sea level rise affecting the fish and wildlife of Narragansett Bay.

### Cold water fish moving out, warm water fish moving in

A variety of factors, such as fishing pressure, weather patterns, water quality, pollution, loss of habitat, and disease, can cause changes in the abundance and mix of fish species living in estuaries.

Fishermen have known for a while that the composition of fish in Narragansett Bay has changed. You might say there will be some fish species that win by thriving in a new warmer bay and others that may lose, meaning they will leave Narragansett Bay for a more comfortable environment.

Warming of coastal waters and the bay has been documented here over the last 60 years and is projected to continue into the future. The *Bay and Watershed Report* said, "Since the 1980s, warmer-water species such as scup and black sea bass have displaced the resident species such as winter flounder and red hake, partly due to increasing temperatures. The survival rate of American lobster may also be reduced. As time goes by, the fish community in Narragansett Bay is expected

to increasingly resemble that of a more southerly, mid-Atlantic estuary with associated shifts in species."

If fish populations are changing due to climate change and warming water, then our fishing laws, most importantly the Magnuson-Stevens Act (MSA), need to be updated to reflect these changes too. Our fishing laws are based on historical fishing and survey data (what fish were caught and where) and what was true in the past may not necessarily be true today or tomorrow due to warming water and fish movement.

In Rhode Island, more cobia (an exotic warm water fish) have been caught than ever before, and as noted above, enhanced populations of summer flounder, scup and black sea bass have moved into southern New England. We also have seen a decline in cold water fish like cod, winter

flounder and American lobster.

In a climate change article, Ted Morton of The Pew Charitable Trusts said, "Fish managers often develop fishing rules expecting that the same species will be found in roughly the same place every year. Setting catch limits for fishing requires some assumptions—and until recently, one of them has been that the vast ocean, while subject to cycles, is basically stable over time. But new information challenges that notion, as scientists and some policymakers have grown increasingly aware of long-term shifts in the ocean environment."

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**Tom Sadler, deputy director of the Marine Fish Conservation Network, with a 20" black sea bass he caught off Newport. Black sea bass are plentiful in the northeast in part due to climate change.**