

Scientists link shifting Atlantic mackerel distribution to environmental factors, changing climate

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NOAA scientists have found that environmental factors have changed the distribution patterns of Atlantic mackerel (*Scomber scombrus*), a marine species found in waters from Cape Hatteras to Newfoundland, shifting the stock northeastward and into shallower waters. Atlantic mackerel migrate great distances on a seasonal basis to feed and spawn, and are sensitive to changes in water temperature. These findings could have significant implications for U.S. commercial and recreational mackerel fisheries that mostly occur during late winter and early spring.

In a paper published online in the American Fisheries Society journal *Marine and Coastal Fisheries: Dynamics, Management and Ecosystem Science*, researchers from NOAA's [Northeast Fisheries Science](#) Center (NEFSC) reviewed annual changes in the winter and early-spring distribution of the Atlantic [mackerel](#) stock on the northeast U.S. [continental shelf](#) using spatial and standard [statistical analyses](#) of data collected on research trawl surveys.

"Our findings suggest that both the commercial and recreational Atlantic mackerel fisheries in the United States will probably be faced with more variable resource conditions in the future in terms of the winter distribution of the stock," said study co-author Jon Hare of the Northeast Fisheries Science Center (NEFSC)'s laboratory in Narragansett, R.I. "The continental shelf is warming, increasing the area over which the stock can be distributed, while at the same time the distribution of the

stock is shifting northward."

Between 1968 and 2008, the overwintering distribution of the Northwest Atlantic stock has shifted about 250 kilometers (roughly 155 miles) to the north and about 50 kilometers (about 30 miles) to the east. The Atlantic mackerel population has also shifted from deeper off-shelf locations to shallower on-shelf areas where more area is now available within the mackerel's preferred temperature range. Atlantic mackerel prefer water above 5 degrees Celsius (41 degrees Fahrenheit).

The environmentally-driven shift in distribution patterns will probably make it more difficult to find and catch Atlantic mackerel in certain areas in the future. The authors note that the Canadian coastal commercial fishery has continued to thrive while the U.S. commercial mackerel fishery during the winter has declined in recent decades. The change in distribution pattern could also impact other species, since mackerel plays a central role in the food web of the ecosystem. Atlantic mackerel are prey for a wide variety of species; they eat mostly small crustaceans and plankton.

"Atlantic mackerel is one of many species shifting their distribution range as a result of changing oceanographic and environmental patterns," said Hare. "Those patterns include regional temperature changes from year to year and larger scale environmental forces or climate drivers such as the North Atlantic Oscillation (NAO) and the Atlantic Multidecadal Oscillation (AMO).

Recent studies have indicated a northward shift in distributions of a number of species in this region (Nye et al., 2009), and work by Hare and others in 2010 documents a shift in the distribution and increase in biomass of Atlantic croaker (*Micropogonias undulatus*) associated with warming. This latest study on Atlantic mackerel by Hare and NOAA Fisheries co-authors William Overholtz (now retired) and Charles Keith

of the NEFSC's Woods Hole Laboratory in Massachusetts indicates that the changes in distribution are related to both interannual variability in temperature and a general warming trend on the Northeast Atlantic continental Shelf.

Despite the current high abundance of the stock, the changes could make it harder for U.S. commercial vessels to locate large schools of mackerel during the winter, when the majority of landings occur, because the fish are dispersed over a larger area within their preferred temperature range. The study also has implications for an early spring recreational Atlantic mackerel fishery in the mid-Atlantic region, which has declined steadily since the 1960s. The trends in recreational landings of Atlantic mackerel are unrelated to fishery regulations or management actions as there were no size limits, bag limits or constraining quotas in effect during this period.

"If the data from the late 1960s are indicative of the southernmost limit in the overwintering population of Atlantic mackerel, the change in the northern and eastern extent of the winter distribution of the stock is relatively large," Hare said. "Although there has been considerable interannual variability in the stock's distribution from the late 1960s through the first decade of the 21st century, the Atlantic mackerel stock has progressively moved from the offshore mid-Atlantic region to the southern New England shelf, and is now on the continental shelf more often in winter and much farther north and east of their previous winter positions, moving most recently onto Georges Bank."

Provided by NOAA

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