Bluefin tuna are back around the UK and a new study explains why

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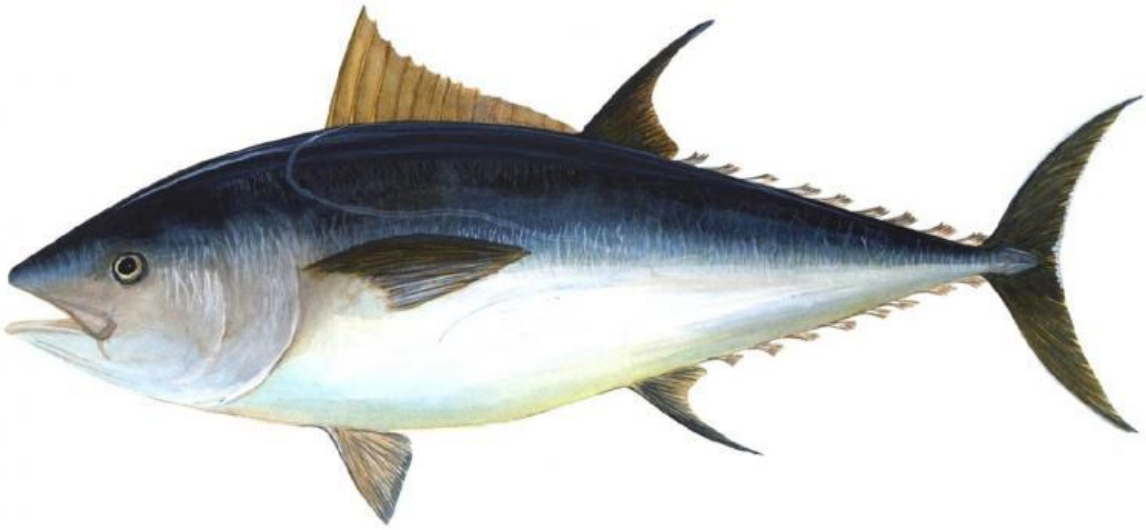

Atlantic bluefin tuna. Credit: Public Domain

Bluefin tuna are back in the sea around the U.K. after decades of absence and a new study says that warming seas can explain why. Bluefin tuna are one of the biggest, most valuable and most endangered fish in the oceans. Sportfishermen excited at the prospect of catching a fish that can grow to over 900 kg have already launched a U.K. campaign to allow recreational fishing for one of game fishing's top targets. But should we catch and exploit this endangered species or should we make U.K. waters a safe space for this species? Why has this

endangered fish suddenly returned to the U.K. after an absence of nearly 40 years? And are bluefin tuna now more abundant, or have they just changed in their distribution?

New research by Dr. Robin Faillettaz from the University of Lille (France), his French co-workers Drs Gregory Beaugrand and Eric Goberville, and Dr. Richard Kirby from the U.K. report that warmer seas can explain the reappearance of tuna around the U.K. Their research shows that the disappearance and reappearance of bluefin tuna in European waters can be explained by hydroclimatic variability due to the Atlantic Multidecadal Oscillation (AMO), a northern hemisphere climatic oscillation that increases the sea temperature in its positive phase, as it is now.

To reach their conclusion, the scientists examined the changing abundance and distribution of bluefin tuna in the Atlantic Ocean over the last 200 years. They combined two modeling approaches, focusing on the intensity of the catches over time and on the distribution of the fish's occurrence, i.e., when it was observed or caught. Their results are unequivocal: The AMO is the major driver influencing both the abundance and the distribution of the bluefin tuna.

Dr. Faillettaz says, "The ecological effects of the AMO have long been overlooked, and our results represent a breakthrough in understanding the history of bluefin tuna in the North Atlantic."

The Atlantic Multidecadal Oscillation affects complex atmospheric and oceanographic processes in the northern hemisphere, including the strength and direction of ocean currents, drought on land, and even the frequency and intensity of Atlantic hurricanes. Approximately every 60 to 120 years the AMO switches between positive and negative phases to create a basin-scale shift in the distribution of Atlantic bluefin tuna. During a warm AMO phase, such as since the mid-1990s, bluefin tuna

forage as far north as Greenland, Iceland and Norway, and almost disappear from the central and south Atlantic. During its previous warm phase, at the middle of the 20th century, the North Sea had a bluefin tuna fishery in Scarborough that rivaled the Mediterranean and the Bluefin Tunny sportfishing club. However, during a cold AMO phase, such as that between 1963-1995, bluefin tuna move south, and are more frequently found in the western, central, and even southern Atlantic, with few fish caught above 45°N.

In fact, the most striking example of the effect of the AMO on bluefin tuna is the sudden collapse of the large Nordic bluefin tuna fishery in 1963. The collapse coincides perfectly with the most rapid known switch in the AMO, which ranged from its highest to its lowest recorded value in only two years. After that, switch tuna also vacated the North Sea and the conditions remained unfavourable for bluefin tuna in the northern Atlantic until the late 1990s, when it started to reappear around the U.K.

The scientists expect that bluefin tuna will continue to migrate to the U.K. and North Sea waters every year until the AMO reverses to a cold phase. However, they also highlight that the additional effect of global warming on sea temperatures will make the future response of bluefin tuna to changes in the AMO uncertain. Further to the effect of the AMO on where and when bluefin tuna occur in the Atlantic, the study also found that this climatic oscillation influences their recruitment, i.e., how many juvenile bluefin tuna grow to become adults.

Dr. Faillettaz says, "When water temperature increases during a positive AMO, bluefin tuna move further north. However, the most positive phases of the AMO also have a detrimental effect upon recruitment in the Mediterranean Sea, which is currently the most important spawning ground, and that will affect adult abundance a few years later. If the AMO stays in a highly positive phase for several years, we may encounter more bluefin tuna in our waters but the overall population

could actually be decreasing."

Consequently, Dr. Beaugrand warns that "Global warming superimposed upon the AMO is likely to alter the now familiar patterns we have seen in bluefin tuna over the last four centuries. Increasing global temperatures may cause Atlantic bluefin tuna to persist in the Nordic region and shrink the species distribution in the Atlantic Ocean, and it may even cause the fish to disappear from the Mediterranean Sea, which is currently, the most important fishery."

Dr. Goberville also raises another important observation, saying, "Because bluefin tuna are so noticeable, they are also an indicator of current temperature-driven changes in our seas that are occurring throughout the marine food chain from the plankton to fish and seabirds."

The Atlantic bluefin tuna fishery encompasses most of the problems seen in fisheries around the world, including fleet overcapacity and political mismanagement; the species' distribution crosses exclusive economic zones and spans international, open-access waters (i.e., the entire North Atlantic, from the Mediterranean Sea to the Gulf of Mexico). Added to that, the long-term fluctuation in Atlantic bluefin tuna abundance was hitherto understood poorly, which represents a fundamental gap in this fish's sustainable management.

Dr. Kirby says, "We have shown why bluefin tuna occur when and where in the North Atlantic, and what may influence their recruitment and abundance, and this is fundamental to understanding the management of a fish that is endangered due to overfishing. Bluefin tuna have been extensively overfished during the 20th century, and the stock was close to its lowest in 1990, a fact that further indicates the recent changes in distribution are most likely environmentally driven rather than due to fisheries management and stock recovery. Before further exploiting

bluefin tuna either commercially or recreationally for sportfishing, we should consider whether it would be better to protect them by making the UK's seas a safe space for one of the ocean's most endangered top fish."

The lead author, Dr. Faillettaz, says, "Our results demonstrate that local changes in Atlantic bluefin tuna abundance can reflect large-scale shifts in a species' distribution that are unrelated to improvements or worsening of a stock's abundance. In this context we hope that our study will highlight the need to consider the environment when planning the sustainable management of all migratory fish species."

More information: Robin Faillettaz et al. Atlantic Multidecadal Oscillations drive the basin-scale distribution of Atlantic bluefin tuna, *Science Advances* (2019). DOI: 10.1126/sciadv.aar6993

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