

# Climate change may affect fish size and fisheries

Scientists at the Plymouth Marine Laboratory (PML) suggest that the proportion of large fish in the North Sea may decrease by as much as 60 per cent in some areas, as climate change unfolds.

These researchers have also concluded that the effects of warmer waters and ocean acidification may mean proposed fisheries management targets based on fish size could be unachievable if the effects of environmental change on fish size are not considered.

Using state-of-the-art modelling and comparison with real-life surveys, the researchers demonstrated they can simulate how fish size is changing in our marine environment, under the pressures of fishing and environmental factors.

This form of modelling, combining important indicators and environmental change, can help with sustainable exploitation of fished stocks by helping policy makers consider how wild populations are impacted by changing, warmer and more acidic oceans into the future.

Indicators based on fish size are widely used in the study and management of wild populations exploited by commercial fishing. The Large Fish Indicator (LFI) is one such example, determining the biomass of fish above a certain size in a community, and used to inform policy and guide the fishing industry.

While widely used, however, these types of indicators have not previously been used alongside predictions of future conditions in line with expected climate change. Fish size closely reflects the environment, and a warming world will change the conditions in which fish live.

It has been suggested that rising water temperatures in the North Sea, for example, are driving down fish size in key species. By modelling North Sea fish populations alongside predicted climate change scenarios for LFI, scientists have shown how climate change may affect fish communities, and what it may mean for fisheries.

"In the UK and European waters, as in many other regions of the world, fish populations are responding very clearly to warmer ocean conditions, exhibiting smaller individual sizes alongside other more complex evolutionary processes," points out lead author Dr. Ana Queiros, of PML's Marine Ecology and Biodiversity group.

The scientists explain that they have shown that climate modelling has evolved so much that it is possible to simulate how these changes are happening, adding that policy targets regulating the fishing industry already take into account strict scientific advice at present, but this advice rarely takes into account how climate is and will continue to impact wild populations.

"Models, such as the ones we produced, can be used to explore how environmental impacts on fish size can be taken into account within policy target setting into the future. Without this consideration, these targets may be unachievable and place undue pressure on livelihoods depending on fishing," Dr. Queiros points out.

According to co-author Dr. Christopher Lynam, of the Centre for Environment, Fisheries and Aquaculture Science, the study was an important step towards the development of long term management goals. Climate change is important to consider over multi-decadal time scales and by taking account the likely impacts on ecosystems, it is possible to better understand the consequences of man's activities and the suitability of management plans.

"Follow-up work could help further understand how these pressures interact and impact on ecosystems, and improve our assessments of marine biodiversity," Lynam stresses.

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