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Climate change threatens food security of many countries dependent on fish

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Summary: Analyses by an international team from the UK and Canada and led by scientists reveal that climate change is the most pervasive threat to the supply of essential micronutrients from marine fish catches, and threatens the supply of vital micronutrients from fisheries in 40 per cent of countries.

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FULL STORY

Millions of people in countries around the world could face an increased risk of malnutrition as climate change threatens their local fisheries.

New projections examining more than 800 fish species in more than 157 countries have revealed how two major, and growing, pressures -- climate change and over-fishing -- could impact the availability of vital micronutrients from our oceans.

As well as omega-3 fatty acids, fish are an important source of iron, zinc, calcium, and vitamin A. A lack of these vital micronutrients is linked to conditions such as maternal mortality, stunted growth, and pre-eclampsia.

Analyses by an international team from the UK and Canada and led by scientists from Lancaster University reveal that climate change is the most pervasive threat to the supply of essential micronutrients from marine fish catches, and threatens the supply of vital micronutrients from fisheries in 40 per cent of countries. Fisheries micronutrient supplies were found to be less vulnerable to overfishing.

Countries among those whose fisheries micronutrient sources are at risk from climate change tend to be tropical nations and include East Asian and Pacific countries such as Malaysia, Cambodia, Indonesia, and Timor Leste, as well as Sub-Saharan African countries such as Mozambique and Sierra Leone.

This vulnerability to climate change for these nations' fisheries is particularly acute given dietary deficiencies in calcium, iron, zinc, and vitamin A are particularly prevalent in the tropics. And these tropical countries are also less resilient to disruptions of their fisheries by climate change because they strongly rely on fisheries to support their national economies and their population's diets and have limited societal capacity to adapt.

The study, which is outlined in the paper 'Micronutrient supply from global marine fisheries under climate change and overfishing', is published today by *Current Biology*.

Previous studies, most notably research into the micronutrient content of fish, which was led by Professor Christina Hicks and published by *Nature*, showed that fish are unequal when it comes to their nutritional content. A range of factors, such as diet, sea water temperature and energetic expenditure influence the amount of micronutrients that fish contain. Tropical fish tend to be richer in micronutrients than cold water species.

When it comes to resilience to climate change and fishing, again not all fish are equal. Earlier studies by Professor William Cheung and colleagues have shown large fish species that have a small range tend to be more vulnerable to climate change. While species that take longer to reach maturity and grow slower, are more vulnerable to fishing -- because it takes longer for their stocks to replenish.

Their findings show only a weak link between the micronutrient density of an individual fish species' and its vulnerability to climate change or overfishing.

However, when the scientists looked at countries' overall fisheries catches then their findings revealed a clear impact from climate change on the overall availability of micronutrients for around 40 per cent of nations -- threatening the food security of millions of people living in these countries.

A key reason for why climate change is such a threat comes down to the species of fish that the countries are targeting as part of their catches.

Some tropical nations' fishers are targeting micronutrient-dense species that have an increased vulnerability to climate change, such as Indian and short mackerels (*Rastrelliger kanagurta* and *Rastrelliger brachysoma*), bonga and hilsa shads (*Ethmalosa fimbriata* and *Tenualosa ilisha*) and dolphinfish (*Coryphaena hippurus*).

However, there is a silver-lining to the study's findings which offers some hope for the future. Some countries may be able to adapt their fisheries to switch from vulnerable species and instead target alternative micronutrient-rich species that are also resilient to both climate change and overfishing, but which are currently under-represented within catches.

Dr Eva Maire, of Lancaster University and Lead author of the study, said: "As climate change and over-fishing are significant and growing pressures on global fish stocks, it is essential for the dietary requirements of millions of people to know the extent that these pressures will have on the availability of micronutrients in our seas in the future.

"We have shown that climate change is the most pervasive threat to the supply of vital micronutrients for many countries around the world, and in particular in the tropics.

This study draws on the 'FishNutrients' model, a recently released finfish nutrient composition database.

"These data open up a whole new area of research and are crucial to address global food security challenges" said co-author Aaron MacNeil, Associate Professor in the Ocean Frontier Institute at Dalhousie University. "Our research highlights that efforts to improve food security and to tackle malnutrition there is a need to integrate fisheries, climate and food policies to secure these micronutrients for existing and future generations."

Professor William Cheung, co-author from the University of British Columbia, said: "As well as highlighting the growing threat of climate change to the food security of millions of people, our study also offers hope for the future. Armed with nutritional information about different fish species, many countries have the capacity to adapt their fisheries policies to target different more resilient fish species. By doing this then these nations can ensure a more reliable supply of micronutrients for their people."

This research was funded by the European Research Council, the Royal Society, the Leverhulme Trust and NSERC Canada.

Story Source:

Materials provided by **Lancaster University**. *Note: Content may be edited for style and length.*

Journal Reference:

1. Eva Maire, Nicholas A.J. Graham, M. Aaron MacNeil, Vicky W.Y. Lam, James P.W. Robinson, William W.L. Cheung, Christina C. Hicks. **Micronutrient supply from global marine fisheries under climate change and overfishing**. *Current Biology*, 2021 DOI: 10.1016/j.cub.2021.06.067
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