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Global protein demand, marine fish production, and trade-flows in the world of 2050.

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Abstract

Marine fisheries play a central role in food and nutrition security for hundreds of million of people world-wide. Fish stocks are increasingly under pressure, not only due to climate change effects, but also due to socio-economic development, leading to increased demand for fish on global markets. Here we use IPCC's "Shared Socio-economic Pathway (SSP)" scenarios to calculate to what extent marine fisheries can meet future needs under socio-economic change, and to anticipate coming policy challenges. We developed two types of novel bio-economic models: First, a global predator-prey model where demand functions for predatory fish and prey species interact on a global scale. Additionally, regional generalized Schaefer surplus production models are established, representing the fisheries in each of the world´s large marine ecosystems (LMEs), with fisheries tele-coupled by trade flows determined on global fish markets. Management approaches with improved management effectiveness that differentiate for ecological groups, may increase the current global catch level to between 112 to 160 million tons. Under current management effectiveness, the present global catch level may be sustained into the future, but human consumption would have to shift to less valuable forage fish species. Importantly, our modeling study indicates a future distributional challenge. Some LMEs will likely not be able to provide sufficient catches for their local consumption. Fish is already the food commodity with the highest percentage traded, but this could even increase and potentially further exaggerate food insecurity in some regions, pointing to the need of provident policy measures.

Key words: food security, shared socio-economic pathways (SSPs), global bio-economic modeling, demand, global trade

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