Our challenges for full marine food web modelling and future projections

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One of the most important marine ecosystem services is provision of food, the rate of which is has increased over recent decades. Global food fish supply increased at a average annual rate of 3.2 % over the last 50 years, outpacing the world population growth. However, the Earth is facing global change impacts and it is an urgent task to assess marine ecosystem responses to future global climate change. To assess marine ecosystem responses to climate forcing, it is essential to understand mechanistic linkages from physics to phytoplankton to zooplankton to fish. Recent improvements in ocean model spatial resolution and data assimilation techniques have enabled us to conduct realistic simulations to test marine ecosystem responses to climate forcing. However, for projections of future states, typical climate model resolution is a half to one degree in latitude/longitude for the ocean model component, which makes it difficult to represent many ocean structures and phenomena important to marine ecosystems (e.g. upwelling, western boundary currents, eddies). Coastal areas are some of the most productive and biodiverse regions, and are dominated by mesoscale phenomena, which cannot be properly resolved by these climate models. Full life-cycle migratory fish models have also been developed using high-resolution circulation models. However, knowledge gaps in physical, biogeochemical and biological processes and especially in trophic linkages are preventing improvement of full food web modelling of marine ecosystems. This presentation will 1) compare the ecosystem structures of two high biological production areas: the Benguela Current system and the western North Pacific, and 2) discuss our challenges for full food web modelling and future projections.

Keywords: ecosystem model, fish growth-migration model, climate change

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