

Combined effects of global climate change and regional ecosystem drivers on an exploited marine food web - DTU Orbit (12/08/2016)

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Changes in climate, in combination with intensive exploitation of marine resources, have caused large-scale reorganizations in many of the world's marine ecosystems during the past decades. The Baltic Sea in Northern Europe is one of the systems most affected. In addition to being exposed to persistent eutrophication, intensive fishing, and one of the world's fastest rates of warming in the last two decades of the 20th century, accelerated climate change including atmospheric warming and changes in precipitation is projected for this region during the 21st century. Here, we used a new multimodel approach to project how the interaction of climate, nutrient loads, and cod fishing may affect the future of the open Central Baltic Sea food web. Regionally downscaled global climate scenarios were, in combination with three nutrient load scenarios, used to drive an ensemble of three regional biogeochemical models (BGMs). An Ecopath with Ecosim food web model was then forced with the BGM results from different nutrient-climate scenarios in combination with two different cod fishing scenarios. The results showed that regional management is likely to play a major role in determining the future of the Baltic Sea ecosystem. By the end of the 21st century, for example, the combination of intensive cod fishing and high nutrient loads projected a strongly eutrophicated and sprat-dominated ecosystem, whereas low cod fishing in combination with low nutrient loads resulted in a cod-dominated ecosystem with eutrophication levels close to present. Also, nonlinearities were observed in the sensitivity of different trophic groups to nutrient loads or fishing depending on the combination of the two. Finally, many climate variables and species biomasses were projected to levels unseen in the past. Hence, the risk for ecological surprises needs to be addressed, particularly when the results are discussed in the ecosystem-based management context

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Authors: Niiranen, S. (Ekstern), Yletyinen, J. (Ekstern), Tomczak, M. (Ekstern), Blenckner, T. (Ekstern), Hjerne, O. (Ekstern), MacKenzie, B. (Intern), Müller-Karulis, B. (Ekstern), Neumann, T. (Ekstern), Meier, H. (Ekstern)

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