

Historical changes of the Mediterranean Sea ecosystem: modelling the role and impact of primary productivity and fisheries over time

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Summary

The Mediterranean Sea has been defined “under siege” because of intense pressures from multiple human activities; yet there is still insufficient information on the cumulative impact of these stressors on the ecosystem and its resources. This work evaluates how the historical (1950-2011) trends of various ecosystems groups/species have been impacted by changes in primary productivity (PP) combined with fishing pressure for the whole Mediterranean Sea using a food web modelling approach. Results indicate that both changes in PP and fishing pressure played an important role in driving species dynamics. Yet, PP was the strongest driver upon the Mediterranean Sea ecosystem. This highlights the importance of bottom-up processes in controlling the biological characteristics of the region. Overall, there was a reduction in abundance of important fish species (~34%, including commercial and non-commercial) and top predators (~41%), and increases of the organisms at the bottom of the food web (~23%). Ecological indicators, such as community biomass, trophic levels, catch and diversity indicators, reflect such changes and show overall ecosystem degradation over time. Since climate change and fishing pressure are expected to intensify in the Mediterranean Sea this study constitutes a baseline reference for stepping forward in assessing the future management of the basin.

Brief biography

Chiara Piroddi is marine scientist and an ecosystem modeller with more than 10 years of experience in studying marine ecosystem dynamics, structures and associated anthropogenic impacts with a special focus on marine processes and functions of the Mediterranean Sea. Her work deals with modelling 1) marine ecosystems under the impact of multiple human activities and 2) coastal and marine ecosystem services (i.e., through the use of model derived indicators). She recently obtained her PhD at the University of Barcelona (UB) under the supervision of Dr. Coll with a thesis on the use of an ecosystem modelling approach for the whole Mediterranean marine ecosystem. She worked in Canada (Fisheries Centre, University of British Columbia, Vancouver) and in Europe (Joint Research Centre, European Commission) where she respectively assessed the impact of fishing pressure on

several marine ecosystems of the world and the use of modelling tools in support of European policies like the Marine Strategy Framework Directive and the European Biodiversity Strategy. She has been participating in several research projects (e.g., FP7, Horizon 2020, IndiSeas) focused on marine biodiversity, ecological indicators, marine conservation and management.



Figure. This study models how the different groups or species in the marine ecosystem have been affected by changes in primary productivity combined with fishery pressure

References

Historical changes of the Mediterranean Sea ecosystem: modelling the role and impact of primary productivity and fisheries changes over time. Piroddi, C. M. Coll, C. Liqueste, D. Macias, K. Greer, J. Buszowski, J. Steenbeek, R. Danovaro & V. Christensen. Scientific Reports 7, 44491