



Integrating biodiversity protection into different socio-economic scenarios of maritime spatial planning for the Italian seas

*Sofia Raschetti^{1,3}, Elena Gissi^{1,3}, Manuela D'Amen⁴, Germana Garofalo⁵, Stefano Menegon^{1,3}, Alessandro Mulazzani^{1,3}, Emiliano Ramieri^{1,3}, Andrea Barbanti^{1,3}, Marco Andrello²

*lead presenter: e-mail address of lead presenter

1 National Research Council, Institute of Marine Sciences, CNR-ISMAR, Venice, Italy

2 National Research Council, Institute for the study of Anthropic impacts and Sustainability in the marine environment, CNR-IAS, Rome, Italy

3 National Biodiversity Futures Center, Palermo, Italy

4 Italian Institute for Environmental Protection and Research, ISPRA, Rome, Italy

5 National Research Council, Institute for Marine Biological Resources and Biotechnology, CNR-IRBIM, Mazara del Vallo, Italy

Sustainable use of maritime spaces requires a participatory spatial planning approach that balances the needs of different stakeholders with the need to protect biodiversity. In this study, we investigated how different types of protected areas could be configured to cover 106 conservation features (including 39 vulnerable species and 67 habitats). We did this considering three socio-economic scenarios reflecting different trajectories of economic development and biodiversity protection through different spatial allocation of sea uses (fishing, tourism, mining, nature protection, etc.), which were built through expert-based consultations in three study areas (Northern Adriatic Sea, Strait of Sicily and Northern Tyrrhenian Sea). Specifically, we modelled species distribution using habitat suitability models, we defined spatial protection targets for each conservation feature using legislative references and calculated how many conservation features could reach their protection targets in each scenario. We then defined and solved systematic conservation planning problems with prioritizr to optimize the spatial configuration of protected areas considering the different spatial allocation of sea uses of the three scenarios. Our analyses show that none of the three scenarios could meet the spatial protection target for all conservation features, but also that there are many possible ways to improve each scenario by expanding the proposed set of protected areas. Through systematic conservation planning approaches, this study demonstrates that it is possible to integrate conservation objectives into maritime spatial planning to achieve a more biodiversity-positive spatial allocation of human activities.