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Modelling coralligenous habitat distribution in the Northern Adriatic Sea in a severe climate change scenario

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Climate change drives oceanographic mechanisms at the global level and affects the functioning and structure of marine ecosystems by inducing shifts in species and habitats distribution. The coralligenous outcrops of the Northern Adriatic Sea (Eastern Mediterranean basin) are listed among the habitats of priority for conservation in the Habitats Directive (92/43/EEC) and in the Marine Strategy Framework Directive (2008/56/EC) for their importance as biodiversity hotspots and ecosystem services providers and are recognized to be needy of protection also due to their vulnerability to climate change impacts. This study aims at investigating how environmental variables predicted in future climate change scenarios could affect the distribution and composition of the coralligenous benthic assemblages in the northern Adriatic Sea, to inform management and conservation strategies in the area. A cutting-edge approach was adopted through the application of two predictive models (Maxent and Random Forest) in association with oceanic circulation modeling (ROMS) to deliver the most reliable projections. The present coralligenous habitat distribution and the different habitat typologies (based on the epibenthic assemblages structure inferred from literature) were correlated with historical (consisting in temperature, salinity, velocity, light, nitrogen and phosphorus concentration) and climate change scenario RCP 8.5 (temperature, salinity, velocity) variables in order to provide estimates of possible distribution shifts. Predictive maps showing the degree of habitat suitability across the basin were provided together with a potential shift in the structure of the associated communities. Predictive models are powerful decision-support tools (DSTs) to inform conservation strategies, and in this study they are applied to support the identification of new potential areas of conservation priority in the Northern Adriatic basin, where coralligenous outcrops will be still present in the future despite climate change. We emphasize the relevance of applying DSTs to help undertake science-based actions for conservation purposes in the face of future climate change effects on marine ecosystems.