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The addition of hydrodynamic variables to predictive cold water coral habitat modeling: The Bari Canyon case-study, southwestern Adriatic Sea

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Predictive habitat modeling is gaining momentum because of its usefulness to recognize potential distributional patterns of ecosystems thus facilitating their proper governance when required, as it is for instance the case of the Marine Strategy Framework Directive (MSFD). This holds particularly true for the deep-sea in front of its overwhelming areal extent on a global scale and intrinsic technological difficulties (with related costs) for its direct exploration. Cold Water Corals (CWC) is one emblematic, virtually cosmopolitan, ecosystem in the deep, that is under international attention because of its multifaceted ecological importance. CWC is currently represented in the Mediterranean basin by habitats engineered by the arborescent scleractinians Madrepora oculata and Lophelia pertusa associated with a number of other benthic invertebrates. One major CWC hotspot located on the southwestern Adriatic margin, the Bari Canyon cold water coral province, has been targeted for producing habitat suitability maps. Initially the evaluation of the theoretical distribution of CWC in this area has been based upon visual observations, mainly extracted from geo-referenced underwater ROV imagery, coupled with the eco-geographic information derived from bathymetry. This approach relies upon the compilation and comparison of presence-only models (MaxEnt and ENFA), but also presence-absence model (GLMs). However, the pivotal role played by oceanographic factors has been soon added in order to achieve more robust predictive models. In fact, the Bari Canyon CWC province is situated on the main path of the North Adriatic Dense Water cascading, and hypothesized to be sensitive to hydrological factors. Accordingly, the statistical models to assess potential habitat extent have been implemented using hydrodynamic fields provided by ROMS for ocean currents, coupled with SWAN within the COAWST modelling system to account for wave-current interactions. The integration of results is beneficial to the production of more sophisticated habitat suitability maps.