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IMPORTANCE OF VULNERABLE MARINE ECOSYSTEMS (VMEs) AND ESSENTIAL FISH HABITATS (EFHs) IN THE CENTRAL MEDITERRANEAN SEA

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Abstract

Vulnerable marine ecosystems (VMEs) are dee-sea biodiversity and ecological functioning hotspots. The term VMEs is based on the presence of unique and diversified benthic assemblages that consist of rare or endemic species that are physically fragile and sensitive to threats from human activities. VMEs component species frequently exhibit ecological traits such as late age of maturity, slow growth rate, uniqueness, low recruitment, high longevity and slow recovery ability after mechanical impact, which make them more vulnerable to human activities (e.g. fishing activities). These benthic species are able to increase habitat heterogeneity by providing more associated fauna in the surrounding areas, serving as feeding, breeding, nursery and refuge areas for a wide range of fish and invertebrate species. For these reasons, they have also been recognized as Essential Fish Habitats (EFHs). Despite the ecological importance of VMEs, and the use of new technologies for the exploration of deep-sea environments the information about their distribution and ecological role still remains scarce. Through the combination of non-invasive acoustic and visual methods such as Multibeam Echosounder (MBES) and Remotely Operated Vehicles (ROVs), this thesis aims to study the ecological role of VMEs in terms of associated fauna in neighbouring areas, and the preferences of the habitats, using two different multivariate approaches (Redundancy Analysis and Multiple Co-inertia Analysis) and in addition, to study their actual and potential distribution through Habitat Suitability Models (HSMs) using Maximum Entropy (MaxEnt) modelling. This approach allowed us to link presence data and environmental and anthropogenic predictors that characterised the study area, in order to obtain predictive distribution maps, determining the contribution of each predictor. The thesis includes case-studies both in the Ionian Sea and the Strait of Sicily. These results enhance our knowledge on the spatial distribution of the main VMEs observed during ROV expeditions, emphasizing the importance of environmental and anthropogenic parameters in determining their distribution and/or presence, as well as providing useful information on the important ecological role of these marine ecosystems, conferring them the definition of Essential Fish Habitats (EFHs).