HABITAT SUITABILITY MODELING FOR *POSIDONIA OCEANICA* L. (DELILE): A MACHINE LEARNING APPROACH

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Over recent years, the development of models predicting the spatial distribution of species has rapidly increased in Ecology, since they help both in understanding habitat requirements and predicting species potential distribution. These models, commonly called Species Distribution Models (SDMs), analyze and quantify the species-environment relationships. Recently, SDMs gained importance as a tool to assess the impact of anthropic activities on ecosystems. Their use has been especially promoted to tackle conservation issues and to define decision-making processes. Nevertheless, due to the complexity and heterogeneity of ecological systems, predicting interactions between species and environment is extremely difficult. Machine Learning (ML) techniques' ability to identify and explore non-linear and non-intuitive relationships, make them widely used in ecological modeling. In particular, ML is a set of methods, such as Random Forests (RFs), Gradient Boosted Regression Trees (GBRTs), Artificial Neural Networks (ANNs), that can automatically detect patterns in data and then use these patterns to predict biotic responses to environmental conditions.

The aim of this Ph.D. project is to develop Habitat Suitability Models (HSMs), a particular case of SDM, using ML techniques, for *Posidonia oceanica* L. (Delile) 1813, an endemic seagrass species of Mediterranean Sea. *P. oceanica* is the most widespread seagrass in the Mediterranean Sea, forming meadows which extend from the surface to 40-45 m depth. This seagrass has a crucial ecological role all over the basin. Despite its importance, *P. oceanica* is declining at alarming rate, especially due to the anthropogenic impacts, such as eutrophication and pollution. There is an urgent need to better understand the *P. oceanica* processes and trends.

The goal of this project is to explore the possibility of using modeling approach to assess the ecological status of *P. oceanica*.

Primary results showed that there is a linkage between the model predictions and the actual ecological status of the meadows. Thus, our model could be regard as a tool to assess the vulnerability of meadows of *P. oceanica* over large spatial scale, supporting conservation and monitoring actions. Although HSMs cannot replace the actual monitoring programs, their predictions can be used to define the baselines in drawing monitoring strategies.

Furthermore, in case enough field data will become available also for other species, the possibility to develop additional models based on the same techniques will be explored.