Modelling suitable estuarine habitats for Zostera noltii, using Ecological Niche Factor Analysis and Bathymetric LiDAR

"Predicting species distribution and habitat suitability is of considerable use in supporting the implementation of environmental legislation, protection and conservation of marine waters and ecosystembased management. As other seagrasses, Zostera noltii has declined worldwide, mainly due to human pressures, such as eutrophication and habitat loss. In the case of the Basque Country (northern Spain), the species is present only in 3 out of 12 estuaries. From the literature, it is known that at least 6 of these estuaries were formerly vegetated by this seagrass. Consequently, efforts tomonitor and restore habitats have been enhanced. Therefore, we aim: to determine the main environmental variables explaining Zostera noltii distribution, within the Basque estuaries based upon the Oka estuary; to model habitat suitability for this species, as awider applicable management-decision tool for seagrass restoration;and to assess the applicability and predicted accuracy of the model by using internal and external validation methods. For this purpose, Ecological Niche Factor Analysis (ENFA) has been used to model habitat suitability, based upon topographical variables, obtained from bathymetric Light Detection And Ranging (LiDAR); sediment characteristics variables; and hydrodynamic variables. The results obtained from the ecological factors of the ENFA indicate that the species habitat differs considerably from the mean environmental conditions over the study area; likewise, that the species is restrictive in the selection of the range of conditions within which it dwells. The main environmental variables relating to the species distribution, in order of importance, are: mean grain size; redox potential; intertidal height; sediment sorting; slope of intertidal flat; percentage of gravels; and percentage of organic matter content. The model has a high predicted accuracy. Model validation using an independent dataset in the Bidasoa estuary has shown the applicability but also the limitations in extrapolating the habitat suitability model to select suitable transplantation areas in other estuaries with similar morphological and biogeographical characteristics. ENFA-technique, applied with an accurate selection of environmental predictors, could be a promising tool for predicting seagrass habitat suitability which could assist on seagrass conservation and restoration programs worldwide"

Auteurs du document : VALLE M., BORJA Á., CHUST G., GALPARSORO I., GARMENDIA J.-M.
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