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Object-Based Image Analysis on acoustic remote sensing data to support restoration actions on a *Posidonia oceanica* meadow offshore Civitavecchia (Eastern Tyrrhenian margin, Mediterranean sea)

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Posidonia oceanica, seagrass endemic of the Mediterranean Sea, builds extensive meadows considered a form of Mediterranean bioconstruction that sustain a number of ecosystem services. However, these meadows are declining, prompting the need for restoration efforts.

The RENOVATE project, is implementing an integrated methodology for the restoration of Mediterranean marine ecosystems harmed by human activity in elected areas located on the northern Latium coastal area (Italy).

Our study focuses on creating detailed habitat maps of *Posidonia oceanica* meadow at fine scale (1:10.000) to aid restoration efforts. We performed geospatial and geomorphometric analyses on the available datasets, namely multibeam bathymetry and side scan sonar backscatter data. Additionally, we developed a semi-

automated approach using Object-Based Image Analysis (OBIA) techniques to detect suitable sites for restoration. The OBIA rulesets, were developed using the eCognition® 10.2 software integrating the original dataset with terrain variables derived from geomorphometric analyses, to classify seafloor units (i.e.: *Posidonia oceanica* meadow, dead matte of *Posidonia oceanica*; sediment).

Our adaptable methodology (especially the associated ruleset implemented in eCognition) gave prominence to the inclusion of geomorphic processes for restoration site selection, considering factors such as seagrass patchiness and morphology. This research offers an innovative perspective in the implementation of restoration actions for *Posidonia oceanica* meadows, with likely implications for conservation efforts in wider ecosystems.

Keywords: *Posidonia oceanica*, Habitat mapping, Object-based image analysis (OBIA), Geomorphometry, Ecosystem restoration