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Dune habitat degradation by gulls at Barreta Island, South Portugal

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Abstract

Storm-induced erosion, sea-level rise, and human pressure are main threats to the perpetuation of barrier islands worldwide. However, the conservation of key habitat within these systems can also be threatened by internal positive feedbacks (revolt) inducing system regime shifts. To identify, assess and monitor dune vegetation perturbation observed in the grey dunes (priority habitat 2130) of Barreta island (Ria Formosa, South Portugal), we computed an index using different remote-sensed imagery from 2008 to 2020. Available imagery datasets consisted in orthophotos, Google Earth imagery, and drone surveys whose surfaces were classified into three classes (shrubs, herbaceous vegetation, and sand, corresponding to classes 1, 2 and 3, respectively) on a GIS environment and using an unsupervised classification method. The classified maps over time allowed the definition of areas where the vegetation cover appeared perturbated as those in which the sand cover (class 3) increased above 35% (typical sand coverage observed in areas recognized as healthy or non-perturbated grey dunes). Identified perturbated areas were compared with the distribution of two gull breeding colonies and censuses as well as human infrastructures and activities present in the island. Results showed that (1) there were two main perturbated areas within the grey dunes of Barreta Island exhibiting an increase in sand cover over time, (2) the main cause of perturbation was related to the presence of the gull colonies, and (3) the extension and degree of perturbation seemed to increase parallel to an increase in the number of gull breeding pairs of both gull colonies. The applied approach helped to characterise the conservation status of the grey dunes, which appear to have experimented a regime shift, or bifurcation event, induced by the positive feedbacks stablished between gulls and vegetation, proving to be very useful for informing future managing purposes.

Keywords

barrier island, dune perturbation, vegetation cover, conservation