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Spatial extent of ecosystem patch dynamics following the outbreak of a benthic grazer

Ecosystems may persist over multiple generations, or rapidly undergo shifts between structurally different configurations after biotic and physical disturbances. In kelp forest communities, increased herbivory by sea urchins can trigger state shifts, transforming kelp forests into urchin barrens that are void of macroalgae. Due to increased purple urchin populations overgrazing kelp, Monterey Bay has recently undergone a shift from long-standing kelp forests to a mosaic of urchin barren and kelp forest patches. In this study, I examined the transition dynamics of kelp forest and urchin barren states along the Monterey Peninsula following major disturbances that triggered a dramatic shift in community composition. I found that the coastline of the Monterey Peninsula is a highly spatially variable mosaic of barrens and forests. Some patches in the mosaic persist as a forest or barren over time, while others transition between alternate states. Changes in patch state were associated with shifts in sea urchin density, but were not associated with shifts in sea urchin size frequency. The forest to barren transition group was a strong predictor of changes in sea urchin density. Since ecosystems transitioning to patchy mosaic configurations can be an early warning sign for collapse, it is critical to continue investigating the dynamics of patch transitions between alternate states in order to better understand the underlying dynamics of ecosystem stability.