The importance of seedling recruitment and clonal propagation for the persistence and resilience of seagrass meadows under disturbance

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Seagrasses are marine aquatic angiosperms that can form dense, productive meadows in shallow coastal waters. Seagrass meadows are maintained by the contribution of two reproductive strategies where new genetically distinct individuals are recruited as a result of sexual reproduction and once settled can reproduce clonally by horizontal rhizome extension with subsequent formation of genetically identical shoots. Increasing human-induced land use in coastal areas is one of the main threats to seagrass meadows globally causing eutrophication and sedimentation. These environmental stressors induce sudden ecosystem shifts toward new alternative stable states defined by lower seagrass richness and abundance. *Enhalus acoroides*, a large-sized tropical seagrass species, appears to be more resistant to environmental change compared to coexisting seagrass species. In this study, eight populations of *E. acoroides* in four lagoons along the South Central Coast of Vietnam were genetically analysed using 11 polymorphic microsatellite loci to determine the importance of sexual and asexual reproduction for the persistence and resilience of *E. acoroides* meadows in strongly altered marine environments. We classified land use into 6 classes based on Sentinel-2 L2A images and analysed the effect of human-induced land use at different spatial scales on population genetic indices including genotypes richness, clonal structure and genetic diversity. The proportion and size of clones were significantly higher in populations of surrounding catchments with larger areas of agriculture, urbanization and aquaculture from which we hypothesize that large, old, persistent genets contribute to the resilience of *E. acoroides* meadows under high levels of disturbance. Although lagoons were strongly differentiated and may act as barriers for seed dispersal, our study indicates that sexual reproduction and the subsequent local recruitment of seedlings remains an essential strategy for the long-term persistence of populations of *E. acoroides*.

Keywords
Seagrasses; Dispersal Ecology; Clonality; Disturbance; Resilience, Population Genetics; Microsatellite Markers