The influence of ecosystem structure and diversity on fisheries productivity within seagrass meadows in the Western Indian Ocean.

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The degradation of habitats is a primary driver of biodiversity loss within coastal environments. Structural simplification is, in part, a causal factor in this loss and as a result terrestrial biodiversity conservation is underpinned by conserving specific habitat qualities and characteristics. In general, habitats with heterogeneous structures are better for conserving biodiversity, as faunal diversity is positively correlated with habitat heterogeneity. Similarly, preserving specific and unique biological legacies enhance habitat quality, biodiversity and ecosystem function. However different taxa respond to habitat heterogeneity over a range of spatial scales, and the aspects of habitat composition and complexity that are key for positive relationships remain unclear for coastal habitats such as seagrass. This research specifically assesses the influence of both habitat diversity and structural traits on faunal diversity (finfish) in tropical seagrass meadows in Zanzibar, Tanzania. Seagrass meadows in Zanzibar provide a suitable setting to test this hypothesis in that they are complex an comprised of a number of species (this study n=9) in varying densities. These are characteristically comprised of mixed and monospecific Halodule uninervis, Halophila ovalis, and Cymodocea rotundata areas towards the upper intertidal limits of the meadow, shifting to both mixed and monospecific H. uninervis, C. rotundata, Thalassia hemprichii and H. ovalis areas in the lower intertidal limits of the meadow. The upper subtidal areas are comprised of C. serrulata, T. hemprichii, H. ovalis and Syringodium isoetifolium, shifting to C. serrulata, T. hemprichii, H. ovalis, S. isoetifolium and Thalassodendron ciliatum before being dominated by T. ciliatum and Enhalus acoroides, growing in monospecific strands, in deeper areas. Each of these species’ mixes provide different structural characteristics and complexity. Eleven sites across a gradient in both anthropogenic impact (e.g. land use, eutrophication) and fishing pressure were used, and sampling points were non-randomly selected within and across sites to encapsulate variability in both seagrass structure and species richness. At each individual sampling point (n=55) seagrass morphometrics were recorded, along with biodiversity assessments. For each individual sampling point, 22 haphazardly placed 0.25 m² quadrats were sampled from within the seagrass meadow. Shoot density (0.0225 m²) was recorded as was total percentage cover and floral species composition. Canopy height was recorded using the mean height of three leaves in each quadrat, as was leaf width. Percentage epiphyte and algal cover were recorded using the Seagrass-Watch quadrat metrics. The relative abundance and diversity of fish assemblages were evaluated using mono-camera Baited Remote Underwater Video systems (BRUVs), Underwater Visual Census surveys (UVCs) and herbivory assessments. Understanding how habitat traits link to fisheries, while critical for fisheries management, is also important to understanding the vulnerability and resilience of both marine systems and the human communities that depend on them to change. There exists an urgent need to understand the relationship between ecosystem structure (both composition and richness) and tropical marine small-scale fisheries. This research presents an overview of this relationship using seagrass meadows in Zanzibar as a model system and potentially changes our understanding of the importance of floral diversity for faunal biodiversity.