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Patterns and potential environmental drivers of mesophotic communities of the warm temperate shelf of the Amathole Region, South Africa.

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Abstract

Foundational biodiversity research has seen a recent shift from the collection of epibenthic data using destructive methods to less destructive methods that include underwater visual surveys. South African mesophotic ecosystems are under-sampled compared to both their shallower counterparts. The Amathole offshore region is a historically unexplored region of the South African coastline. This study aimed to define and describe the benthic communities and identify the processes driving their distribution on the temperate shelf in the Amathole offshore region, using a Remotely Operated Vehicle (ROV). It also piloted the application of the Australian developed CATAMI classification to annotate images collected by ROV in South Africa. This survey combined 14 sites comprising 215 images from ROV and nine environmental variables from 30 to 100 m water depth. Multidimensional scaling and a cluster dendrogram produced nine benthic communities. Similarly, multivariate analyses (distance-based linear model and distance-based redundancy analysis and constrained binary divisive clustering analysis) of the environmental data revealed that substratum type and correlates of depth to be the main variables likely responsible for the observed biodiversity patterns. LINKTREE analysis revealed a depth break at 74 m which established the boundary between the upper and lower mesophotic zone in this region. Rhodolith bed communities were discovered in the upper mesophotic and are a welcomed novel ecosystem type for South African benthic ecologists. This zone was also characterised by communities of dense brittle star aggregations and macroalgal dominated reefs. The lower mesophotic zone was characterised sponge and gorgonians gardens. The use of morphospecies in image classification to define macrobenthic communities on an unexplored continental shelf was effective despite limited knowledge of species. This foundational biodiversity information informs marine spatial planning and spatial management efforts for the newly proclaimed Amathole Offshore Marine Protected Area and the greater Amathole offshore region.

Keywords

Temperate mesophotic ecosystems, Animal forests, Benthic invertebrates, River influenced