

Article

Heterogeneity of Fish Taxonomic and Functional Diversity Evaluated by eDNA and Gillnet along a Mangrove–Seagrass–Coral Reef Continuum

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Simple Summary: The selection of fish community survey methods based on their efficiency and reliability is critical for ecosystem conservation, protection and management. In this study, we used environmental DNA (eDNA) metabarcoding and traditional (gillnet) fishing to assess the diversity of fishes along a mangrove–seagrass–coral reef continuum of marine habitats in Hainan, China. Higher fish taxonomic diversity was identified using eDNA; however, gillnet fishing was better at identifying fish communities from different habitats along the sampled continuum. Results from both survey methods indicate that some fish species use multiple habitats along mangrove–seagrass–coral reef continuums. Therefore, the concurrent use of eDNA and gillnet survey methods provides a more comprehensive approach to understanding the heterogeneity of fish taxonomic and functional diversity along mangrove–seagrass–coral reef continuums.

Abstract: The effective and reliable monitoring of fish communities is important for the management and protection of marine ecosystems. Environmental DNA (eDNA) metabarcoding is a relatively new method that has been widely used in recent years, while traditional sampling via fish catching (i.e., gillnets) is one of the most common and reliable fish monitoring methods used to date. We compared the taxonomic and functional diversity of fish detected within a mangrove–seagrass–coral reef continuum using both survey methods. One liter seawater and gillnet samples were collected in August 2021 from mangrove forests, seagrass meadows and coral reef habitats ($n = 3$ each) in Hainan, China. Surveys using eDNA and gillnets identified 139 genera belonging to 66 families and 58 genera belonging to 42 families, respectively. Regardless of the survey method, fish detected in mangrove, seagrass and coral reef habitats were heterogeneous in their communities; however, the shared species between habitats suggest some degree of connectivity. There were no significant differences between habitats in terms of taxonomic and functional diversity, but a higher taxonomic diversity was detected using eDNA. Both methods were able to distinguish fish assemblages between different habitats; however, gillnet surveys performed better than eDNA surveys for distinguishing mangrove from seagrass assemblages. Therefore, the concurrent use of eDNA and gillnet survey methods provides a more comprehensive approach to understanding the heterogeneity of fish taxonomic and functional diversity along mangrove–seagrass–coral reef continuums.

Keywords: environmental DNA; fish community; functional diversity; mangrove; seagrass; coral reef



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