World Academy of Science, Engineering and Technology
International Journal of Marine and Environmental Sciences
Vol:17, No:05, 2023

The Effects of Human Activities on Plant Diversity in Tropical Wetlands of Lake Tana (Ethiopia)

Authors : Abrehet Kahsay Mehari

Abstract : Aquatic plants provide the physical structure of wetlands and increase their habitat complexity and heterogeneity, and as such, have a profound influence on other biotas. In this study, we investigated how human disturbance activities influenced the species richness and community composition of aquatic plants in the wetlands of Lake Tana, Ethiopia. Twelve wetlands were selected: four lacustrine, four river mouths, and four riverine papyrus swamps. Data on aquatic plants, environmental variables, and human activities were collected during the dry and wet seasons of 2018. A linear mixed effect model and a distance-based Redundancy Analysis (db-RDA) were used to relate aquatic plant species richness and community composition, respectively, to human activities and environmental variables. A total of 113 aquatic plant species, belonging to 38 families, were identified across all wetlands during the dry and wet seasons. Emergent species had the maximum area covered at 73.45 % and attained the highest relative abundance, followed by amphibious and other forms. The mean taxonomic richness of aquatic plants was significantly lower in wetlands with high overall human disturbance scores compared to wetlands with low overall human disturbance scores. Moreover, taxonomic richness showed a negative correlation with livestock grazing, tree plantation, and sand mining. The community composition also varied across wetlands with varying levels of human disturbance and was primarily driven by turnover (i.e., replacement of species) rather than nestedness resultant(i.e., loss of species). Distance-based redundancy analysis revealed that livestock grazing, tree plantation, sand mining, waste dumping, and crop cultivation were significant predictors of variation in aquatic plant communities' composition in the wetlands. Linear mixed effect models and distance-based redundancy analysis also revealed that water depth, turbidity, conductivity, pH, sediment depth, and temperature were important drivers of variations in aquatic plant species richness and community composition. Papyrus swamps had the highest species richness and supported different plant communities. Conservation efforts should therefore focus on these habitats and measures should be taken to restore the highly disturbed and species poor wetlands near the river mouths.

Keywords : species richness, community composition, aquatic plants, wetlands, Lake Tana, human disturbance activities