

The Impact of Riparian Alien Plant Removal on Aquatic Invertebrate Communities in the Upper Reaches of Luvuvhu River Catchment, Limpopo Province

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Abstract : Alien invasive plants (IAP's) have considerable negative impacts on freshwater habitats and South Africa has implemented an innovative Work for Water (WfW) programme for the systematic removal of these plants aimed at, amongst other objectives, restoring biodiversity and ecosystem services in these threatened habitats. These restoration processes are expensive and have to be evidence-based. In this study in-stream macroinvertebrate and adult Odonata assemblages were used as indicators of restoration success by quantifying the response of biodiversity metrics for these two groups to the removal of IAP's in a strategic water resource of South Africa that is extensively invaded by invasive alien plants (IAP's). The study consisted of a replicated design that included 45 sampling units, viz. 15 invaded, 15 uninvaded and 15 cleared sites stratified across the upper reaches of six sub-catchments of the Luvuvhu river catchment, Limpopo Province. Cleared sites were only considered if they received at least two WfW treatments in the last 3 years. The Benthic macroinvertebrate and adult Odonate assemblages in each of these sampling were surveyed from between November and March, 2013/2014 and 2014/2015 respectively. Generalized Linear Models (GLM) with a log link function and Poisson error distribution were done for metrics (invaded, cleared, and uninvaded) whose residuals were not normally distributed or had unequal variance and for abundance. RDA was done for EPTO genera (Ephemeroptera, Plecoptera, Trichoptera and Odonata) and adult Odonata species abundance. GLM was done to for the abundance of Genera and Odonates that had the association with the RDA environmental factors. Sixty four benthic macroinvertebrate families, 57 EPTO genera, and 45 adult Odonata species were recorded across all 45 sampling units. There was no significant difference between the SASS5 total score, ASPT, and family richness of the three invasion classes. Although clearing only had a weak positive effect on the adult Odonate species richness it had a positive impact on DBI scores. These differences were mainly the result of significantly larger DBI scores in the cleared sites as compared to the invaded sites. Results suggest that water quality is positively impacted by repeated clearing pointing to the importance of follow up procedures after initial clearing. Adult Odonate diversity as measured by richness, endemism, threat and distribution respond positively to all forms of the clearing. The clearing had a significant impact on Odonate assemblage structure but did not affect EPTO structure. Variation partitioning showed that 21.8% of the variation in EPTO assemblage can be explained by spatial and environmental variables, 16% of the variation in Odonate structure was explained by spatial and environmental variables. The response of the diversity metrics to clearing increased in significance at finer taxonomic resolutions, particularly of adult Odonates whose metrics significantly improved with clearing and whose structure responded to both invasion and clearing. The study recommends the use of DBI for surveying river health when hydraulic biotopes are poor.

Keywords : DBI, evidence-based conservation, EPTO, macroinvertebrates

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