

Alpha and beta diversity of benthic macroinvertebrates in natural and disturbed river watersheds and their environmental driver

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Knowledge about habitat transformation and disturbance of wildlife is important for concern in biodiversity conservation. The number of species coexisting in ecological communities between different levels of disturbance and how it contributes to species diversity due to symbiotic dependencies with environments is little to be known in freshwater ecosystems. We estimated alpha and beta diversity of benthic macroinvertebrates and relationships between species diversity and environmental predictor variables by sampling the diversity of local sites in Ado River (natural) and Yasu River (intermediate disturbance) watersheds, Japan, separately. The alpha diversity was consistently slightly higher in the natural system than in the intermediate disturbed system but was not equivalent in their spatial distributions. The opposite pattern was evidenced for the beta diversity assemblages. The values of species richness and abundance showed a highly linear positive correlation, except that alpha richness and abundance in Yasu River watershed consisted of the bell-shaped correlation. Significant differences on environmental variables between two watersheds were exhibited, especially high chlorophyll a concentration detected in the intermediate disturbed system. The alpha diversity were not correlated with similar environmental variables whereas water temperature and chlorophyll a concentration across sites were the two most significantly important predictor variables for beta diversity in the two river watershed systems. These results suggest that patterns of local and regional diversity in freshwater benthic macroinvertebrate communities are differently influenced by levels of disturbance, which may benefit to increasing species diversity than previously thought through generating habitat heterogeneity processes, and understanding how both alpha and beta diversity vary with disturbance and how they relate to environments is essential for protecting local to regional diversity and can directly assist conservation planning.

Keywords: Benthic macroinvertebrates, Disturbance, River watershed, Biodiversity, Environmental driver