Spatial pattern in macroinvertebrate communities in headwater streams of New Zealand and a multivariate river classification system

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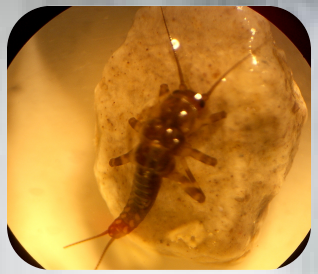

ABSTRACT

Macroinvertebrate data collected from 120 headwater streams in New Zealand were used to test the ability of the Freshwater Environments of New Zealand River Classification (FWENZ) to explain spatial variation in unimpacted stream invertebrate communities. FWENZ is a GIS based multivariate river environment classification of the sections of national river network. The classification performance of the FWENZ was examined to determine the optimum classification level which could be used for the purpose of conservation and biomonitoring of New Zealand rivers and streams. The classification performance of the FWENZ was also compared to those of two other river classification systems, the ecoregions and the River Environment Classification (REC). Results of the analysis of similarity (ANOSIM) test showed that discrimination of the study sites based on interclass differences in macroinvertebrate community composition was optimal at FWENZ 100 class level which classifies the New Zealand rivers and streams into 100 different groups. The FWENZ 100 class level distinguished the biological variation of the study sites at a finer spatial scale than the REC Geology level. Although performance of the ecoregions classification was stronger than both the river environmental classifications, the REC and the FWENZ, but it was unable to explain the variation in local assemblage structures. Multivariate analyses of the macroinvertebrate abundance data and the associated environmental variables at three different spatial scales (upstream catchment, segment, and reach) were used to identify environmental predictors of assemblage patterns. Catchment-scale measures of climatic, topographic and landcover factors were more strongly correlated with macroinvertebrate community structures than segment scale measures, whereas reach-scale measures of instream physicochemical factors and riparian characteristics had the least association with assemblage patterns. Despite the strong influences of cathment-scale factors on macroinvertebrate communities, local factors like water temperature, stream velocity, reach elevation, percent canopy cover and percent moss cover were also involved in explaining the within-region variation in assemblage patterns, which indicates the importance of considering regional as well as local factors as surrogates of stream invertebrate communities to provide a base for stream bioassessment programmes at multiple scales.

DEDICATION

To my parents

Sibangsu Bimal Chakraborty and Namita Chakraborty

who waited so long for this

And to my fiancé

Esther Emmanuelle

who was always beside me during this journey

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CONTENTS