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CHARACTERISATION OF HAWKES BAY RIVERS BASED ON BIOTIC COMMUNITIES



A thesis presented in partial
fulfilment of the requirements
for the degree of
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ABSTRACT

Environmental data, aquatic macroinvertebrates and periphyton were sampled in 52 rivers throughout Hawkes Bay primarily between January and March, 1995. The 97 invertebrate taxa collected comprised predominantly Trichoptera (27), Ephemeroptera (17), Diptera (11) and Coleoptera (10). 49 periphyton taxa were collected which comprised of 30 diatoms, 10 Green algae and 9 Blue-Green algae. An ordination of sites by macroinvertebrate data using Detrended Correspondence Analysis (DECORANA) produced two interpretable axes. Axis 1 was correlated with measures reflecting terrain, land use and nutrient levels. Axis 2 was correlated with measures of periphyton abundance. DECORANA analysis of periphyton indicated pH had most influence over community structure, with measures of periphyton abundance, leaf litter, and water colour (absorbance at 440nm) having a secondary influence. Classification of macroinvertebrate communities using Two-Way Indicator Species Analysis (TWINSPAN) produced six groups. Sites within each group were generally found to fall into restricted areas of Hawkes Bay and these are suggested as bioregions. Each bioregion is described and could be used as a management unit by appropriate organisations. Analysis of periphyton with TWINSPAN classified sites into seven groups, but no geographical pattern was evident.

Direct analysis of environmental variables and macroinvertebrate taxa using Canonical Correspondence Analysis (CANOCO) indicated that gradient, altitude, substrate size, conductivity, SO_4 and K had most influence over macroinvertebrate communities. Two widely used biotic indices of water quality (MCI and EPT) were strongly positively correlated with several chemical variables and negatively correlated with substrate related factors so it was difficult to know if macroinvertebrates were responding to water quality or physical features. Ranking taxa by their CANOCO axis scores is suggested as a way of recalibrating taxa MCI scores for a region and assigning appropriate MCI scores to new taxa.

The bioregions generated from the TWINSpan analysis of macroinvertebrates are compared to an existing New Zealand-wide ecoregion classification and also to ecoregions developed from a cluster analysis of six climatic and geomorphological factors of the 52 sites in Hawkes Bay. Little correlation was found between the bioregions and the cluster analysis, however some similarity between bioregions and the existing ecoregion classification was found, and the bioregions are suggested as possible "subcoregions".

Environmental data and macroinvertebrates were also sampled in nine sites on each of two major Hawkes Bay rivers to look at longitudinal patterns in macroinvertebrate communities. Both rivers exhibited a zonation pattern rather than a continuum, and the zonation is related to degree of human disturbance.

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The macroinvertebrate pictures on the title pages for each chapter are copied from Winterbourn and Gregson (1989).

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apendix3.xls	Spreadsheet of macroinvertebrate and environmental data used in chapter 4.
apendix4.xls	Spreadsheet of periphyton chlorophyll <i>a</i> and ash-free dry-weight for each site.
apendix5.xls	Spreadsheet of periphyton taxonomy found at each site.

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