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THE IMPACT OF URBAN DEVELOPMENT AND HABITAT FRAGMENTATION ON AQUATIC INVERTEBRATE COMMUNITIES IN REMNANT WETLANDS: A CHRISTCHURCH CASE STUDY

A thesis presented in partial fulfillment of the requirements
for the degree of Master of Applied Science in
Natural Resource Management
at Massey University, Palmerston North

John Knight

2004

Abstract

The coastal plains that are now occupied by Christchurch City, in the South Island of New Zealand, were once dominated by palustrine and estuarine wetland systems. These wetlands were almost completely drained over a 100-year period in order to allow the construction of the city and to provide arable land for farming. However, remnants of the original wetlands have been preserved and are scattered throughout the present metropolitan area. Most of these are small riparian wetlands associated with Christchurch's many streams and three major river systems. In addition, there are also several large remnant wetland reserves that each cover many hectares. These remnant wetlands experience a range of environmental pressures from adjacent urban development, including stormwater discharge, landscaping, flood control, the presence of dense housing, pressure from introduced plants and insects, and more recently, wetland enhancement programmes.

This study investigated the impact of urban development and habitat fragmentation on remnant urban riparian wetlands primarily by comparing the aquatic invertebrate communities that they support, with the same communities in three unmodified 'natural' wetlands associated with lowland streams flowing through native tussock and scrubland. A range of physical parameters (water clarity, conductivity, pH, temperature) were also measured. Three wetlands of a similar type and size located in pastoral grazing areas, and three artificially constructed urban wetlands, were also assessed to provide additional points of reference.

The unmodified wetlands exhibited slightly higher species richness and abundance when compared to the remnant urban wetlands. However, this difference was not statistically significant ($p>0.05$). The unmodified wetlands showed significantly higher species richness than both the constructed and pastoral wetlands ($p<0.01$). Both of these highly modified wetland types contained large numbers of dipterans and molluscs, whereas the unmodified and remnant wetlands contained higher proportions of coleoptera and hemiptera. Significant differences were also detected between some of the pH, water clarity and temperature levels measured in the various wetland types.

The effect of wetland size was also measured by comparing the invertebrate faunas in small, medium and large remnant fragments. Although lower macroinvertebrate abundance and species richness was observed in the small fragments, no statistically significant difference was detected between the three fragment sizes ($p>0.05$). There was also no significant difference between the unmodified wetlands and the remnant fragments.

It was concluded that fragment size did not have a significant effect on the aquatic invertebrate communities in remnant urban wetlands, and adjacent urban development did not have a significant adverse impact on remnant urban wetlands when compared to natural wetland systems. Intensive pastoral grazing had a significant and quite severe effect on wetland systems, probably due to eutrophication and sediment wash-off. Artificially constructed wetlands contained significantly lower species richness than natural wetland systems. Remnant urban fragments appear to be resistant to the effects of urbanisation, and are considered to be suitable habitats for preserving native aquatic biodiversity in urban areas.

Acknowledgements

I would like to thank my supervisors, Dr Mike Joy and Dr John Holland, for their invaluable advice and support throughout this project. I would also like to thank Dave Voice (MAF scientist) for his wise advice during the project design phase, and especially thank Mark Braithwaite (MAF scientist) for his encouragement and assistance, and making available laboratory equipment without which certain aspects of this research would not have been possible.

I wish to dedicate this report to my amazing, wonderful wife Jennifer. Not only was she a very capable field assistant, she has never once complained about the many hours I have recently spent tapping on a keyboard, or peering down a microscope. She has been a constant source of love, strength and support.

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