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**THE SEASONAL AND SPATIAL DYNAMICS IN
THE PHYTOMACROFAUNAL COMMUNITIES
OF LAKE HENLEY, MASTERTON.**



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of the requirements for the degree of

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By

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ABSTRACT

Spatial and seasonal dynamics of macrophyte beds in Lake Henley, a shallow artificial lake in Masterton, were examined between June 1993 and June 1994. Observed fluctuations in macrophyte biomass were linked with changes in filamentous algae associated with the weed beds. Invertebrate communities associated with submerged macrophytes were also examined at multiple sites between June 1993 and June 1994. Overall community composition was related more to seasonal influences than differences between sites within the lake. However, species richness and abundance did differ spatially. Recommendations for the ongoing management of Lake Henley, including management of the macrophyte beds and the maintenance of water quality and quantity, are made with respect to the ecological characteristics of the lake. The influence of trophic status on macrophyte invertebrate communities was also explored with a survey conducted in May 1994 of 13 other lakes in the North Island. Nutrient enriched lakes were characterised by phytomacrofaunal communities with high abundance and higher numerical dominance, whereas nutrient poor lake phytomacrofaunal communities were characterised by lower abundances but higher diversity of some taxonomic groups, particularly insects.

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INTRODUCTION

Lake Henley was built to provide the Masterton community with a recreational water body. Within a few years of completion of the lake excessive growth of introduced aquatic weeds began to place limitations on many recreational activities that the lake had been intended for, particularly boating and fishing. Concern regarding the most suitable method of weed control, together with a recognition of the need to understand the overall lake ecology in order to establish appropriate management strategies, led to the commissioning of this project.

Introduced aquatic weeds have been invading New Zealand water ways for the past century (Howard-Williams *et al* 1987) and the warm shallow waters and silty substrate of Lake Henley offer ideal conditions for the establishment of tall growing submerged plants such as *Elodea canadensis* (Michx) and *Potamogeton crispus*. These submerged aquatic plants contribute to the overall ecological functioning of such a shallow water body, but nevertheless are classified as nuisance due to their tall growth form (Johnstone 1986). Weed management in New Zealand relies on integrating mechanical, chemical and biological forms of weed control (Clayton & Wells 1989; Hughes 1976). Macrophytes are an integral part of the aquatic environment, and therefore this adds to the importance of careful assessment of the effects on the environment of macrophyte removal or control (Johnstone 1986).

To determine the most environmentally sound management approach for Lake Henley it was necessary to examine the spatial and seasonal dynamics of the macrophyte beds in relation to the physicochemical and biological characteristics of the lake. Chapter one describes the changes that occurred in the macrophyte beds between June 1993 and June 1994. It is suggested that the macrophyte beds undergo biomass fluctuations in response to seasonal changes in the filamentous algae associated with them, which are in turn influenced by the changes in nutrient concentration in the lake.

The use of invertebrate communities for biomonitoring is on the increase in New Zealand, particularly the use of invertebrate communities that inhabit stream benthos (Stark 1994). The invertebrate communities associated with the submerged aquatic plants in Lake Henley

(phytomacrofaunal communities) were considered potentially useful for similar monitoring of changes in lake water quality. In Chapter Two the seasonal and spatial dynamics of the invertebrate communities associated with the submerged macrophytes in Lake Henley are examined in this context. Comparisons are also made between *Elodea canadensis* and *Potamogeton crispus* in the lake and a neighbouring stream to examine the influence of macrophyte species on these communities.

The paucity of quantitative data on New Zealand phytomacrofaunal communities, however, and a lack of basic understanding of their response to environmental changes makes it difficult to use them in biomonitoring. In an attempt to address this a survey of the composition of invertebrate communities associated with the macrophytes in the shallow littoral zone of 14 North Island lakes was conducted. Chapter Three explores the relationship between the community of invertebrates associated with submerged aquatic plants, and the nutrient enrichment status of the lake in which they occurred.

In the final chapter of this thesis the findings on the ecology of Lake Henley are collated within a management plan designed to maximise the lake's natural biotic characteristics whilst reducing those detrimental to recreational uses of the lake. The guide-lines for lake management include managing the macrophytes through the introduction of herbivorous grass carp, *Ctenopharyngodon idella*, and monitoring water quality through assessment of filamentous algae and invertebrates, and by maintaining sufficient lake water levels in the lake.