UNIVERSITY OF TECHNOLOGY, SYDNEY

MANGROVE ALGAE IN THE ASSESSMENT OF ESTUARINE POLLUTION

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CERTIFICATE

I certify that the work in this thesis has not been previously submitted for a degree, nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

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TABLE OF CONTENTS

LIST OF TABLES

APPENDICES

LIST OF FIGURES

LIST OF PHOTOGRAPHS

ABSTRACT

Estuaries are highly degraded ecosystems throughout the world. The primary aim of this study was to investigate the biology and ecology, and the effects of contaminants on mangrove-associated micro and macroalgae, and assess their suitability in the biological assessment of estuaries.

Ecological surveys over two seasonal cycles, in four estuaries in New South Wales, Australia, the Cooks, Parramatta, Hawkesbury and Clyde Rivers, were used to examine the diversity, distribution and abundance of mangrove micro- and macroalgae, their seasonal and spatial variability and the role of sediment and water metal contaminants and nutrients in their distribution and abundance. Species that appeared to be impacted by contaminants were selected for toxicity testing in the laboratory to examine their sensitivity to the common pollutant metal, copper.

Thirty genera of microalgae and eight species of macroalgae were identified in this study. Microalgal diversity and abundance were significantly higher in summer, but no seasonal variation in the macroalgae was demonstrated. Intertidal variation in macroalgal distribution and abundance was evident, with each species growing optimally in different intertidal zones, possibly as a consequence of competition amongst the algae, and desiccation tolerance or intolerance. Variation in macroalgal distribution along the vertical length of pneumatophores was also evident for several species.

Both the micro- and macroalgal diversity differed between the contaminated Cooks and Parramatta Rivers, and the less contaminated Hawkesbury and Clyde Rivers, indicating that contamination was potentially impacting species survival. Distribution of the macroalgae *Catenella nipae*, was negatively correlated with contaminant concentrations indicating its potential as a bioindicator species. *Caloglossa leprieurii* distribution was higher in the more contaminated estuaries, suggesting that it may be a useful biomonitor species.

In laboratory toxicity tests using net photosynthesis as an endpoint, *C. nipae* was sensitive to copper at Australian and New Zealand Water Quality Guideline concentrations, further confirming its potential use as a bioindicators. In growth inhibition tests, microalgal species from the less contaminated Hawkesbury and Clyde Rivers were sensitive to copper at guideline values, indicating that these algae were potentially useful toxicity test species.

In both the micro- and macroalgal toxicity tests, similar species originating from the different estuaries displayed copper EC50 values that appeared to reflect the contaminant concentrations of their site of origin. Thus, adaptation and/or acclimation to contamination by the mangrove algae appeared to be operating.

This study has contributed to a better understanding of the seasonal and spatial factors affecting mangrove-associated algae in south-east Australia, on which there has been previous little research. This study has also identified organisms that could be potentially used in the monitoring and assessment of estuarine contamination, including bioindicator species, a biomonitor and several sensitive laboratory toxicity test species.