Molecular Systematics of Selected Australian Brown Algae

Nuttanun Soisup

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School of Earth and Environmental Sciences
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Thesis Summary

This thesis focuses on the molecular systematics of four selected Australian brown algal genera (Phaeophyceae); *Acrocarpia*, *Caulocystis*, *Cystophora* (Fucales) and *Lobophora* (Dictyotales). The thesis consists of five chapters. **Chapter 1**: General introduction; **Chapter 2**: The phylogenetics, DNA barcoding and phylogeographic discrimination of *Caulocystis* and *Acrocarpia* species; **Chapter 3**: The molecular phylogenetics of *Cystophora*; **Chapter 4**: An assessment of species diversity within Australian *Lobophora* based on *rbc*L and *cox*1 DNA sequence analyses, and **Chapter 5**: General discussion.

The first chapter describes the marine floral biodiversity of Australia, the ecological importance of benthic brown algae, the development of taxonomic studies in macroalgae, and the aims and significance of this study.

The second chapter is the first molecular taxonomic study specifically targeting two endemic Australian Fucales genera, *Acrocarpia* and *Caulocystis*, based on *cox*1, *rbc*L and ITS2 DNA sequence analyses. Results from molecular and morphological data suggest that two known *Caulocystis* species are conspecific, and hence should be merged into a single taxon.

The third chapter aims to clarify taxonomic problems originating from the phenotypic plasticity of the Australian and New Zealand endemic genus *Cystophora*. Traditionally, *Cystophora* species identification has been based on morphological features alone. This study applies molecular phylogenetic analyses to reassess *Cystophora* taxonomy. Results demonstrate the competence of molecular phylogenetics for resolving species delineation problems and establishing evolutionary relationships within the genus.

The fourth chapter reports on the true levels of species richness in the brown algal genus *Lobophora* based on *rbc*L and *cox*1 DNA sequences. *Lobophora* is found all over the world, from tropical to warm temperate waters, and wherever it is found, species in this genus are common and conspicuous members of the benthic flora. In Australia there have been only four species recognized so far. However, the molecular data generated from approximately 300 new specimens collected widely around Australia suggest the existence of at least 22 species. Consequently, the species diversity within the genus has been highly underestimated, worldwide. The last chapter is a summary of the findings, including new taxonomic changes and the

significance of molecular phylogenetics in both, solving long standing phylogenetic questions and uncovering hidden brown algal species diversity in Australia.

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Nuttanun Soisup

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