Improving Stream Management Using DNA Barcodes and Ecological Modelling

PhD Opportunity

Are you interested in PhD research with the potential to discover new species?
Do you want to help strategically protect biodiversity and monitor the health of Melbourne's waterways?
Do you want to gain skills in fieldwork, molecular methods, spatial and ecological modelling and industry-focused research engagement and translation?

'***Improving stream management using DNA barcodes and ecological modelling***' is an exciting, University of Melbourne-Melbourne Water collaborative ARC Linkage project with direct management impact.

We seek a Phd candidate to join our multidisciplinary team to work on bringing together DNA barcoding and metabarcoding of freshwater macroinvertebrates with spatially-explicit modelling.

The project will provide macroinvertebrate species data, methods and tools for Melbourne Water to better understand and monitor freshwater biodiversity patterns across Melbourne and improve capacity to plan, prioritise and evaluate management actions for improved stream health (extended project description below).

The Phd project will involve a program of fieldwork, molecular methods (e.g. DNA barcoding, metabarcoding and DNA-based bioinformatic analyses) and spatial and ecological modelling (e.g. GIS, species distribution modelling, scenario analyses, spatial conservation prioritisation).

The project team consists of A/Prof Chris Walsh, Prof Ary Hoffmann, Dr Yung En Chee, Dr Rhys Coleman, Dr Melissa Carew and Genevieve Hehir.

The successful candidate will work across the Waterway Ecosystem Research Group (WERG) and the Pest and Environmental Adaptation Research Group (PEARG) at The University of Melbourne.

WERG specialises in understanding interactions of urban and rural landscapes and freshwater ecosystems and develops knowledge and tools to improve land, waterway and biodiversity management. And PEARG specialises in the use of genetic approaches to understand species diversity, adaptation, evolution, behavior and population structure. The project will also involve close collaboration with Melbourne Water, supported by the award-winning Melbourne Waterway Research-Practice Partnership.

A generous scholarship top-up is available for the successful candidate (Range: $7,000-$10,000 per annum for three years, depending on the scholarship type of the successful candidate)

How to apply
Note: Due to current international travel restrictions this scholarship top-up opportunity is preferentially available for

Australian domestic students or international students already in Australia or New Zealand.

1. Contact Dr Yung En Chee (yechee@unimelb.edu.au) to discuss your eligibility and interests.
2. Send us i) a one-page expression of interest outlining your academic background, training, research interests and alignment with the project, ii) academic transcript and iii) CV, including contacts for at least two referees.

This Phd opportunity will remain open until filled by a suitable candidate.

Detailed Project Description: Improving stream management using DNA barcodes and ecological modelling

Freshwater ecosystems are vital resources and provide invaluable ecosystem services to human societies yet are commonly degraded by human activities. Human-induced loss of biodiversity is a severe global problem and freshwater biodiversity is both more threatened and less studied than marine and terrestrial biota.

Freshwater macroinvertebrates contribute to many ecological processes and functions and are essential to maintaining waterway health and ecosystem services. Their diverse ecological roles across multiple trophic levels and varying sensitivity to disturbances make macroinvertebrate assemblages sensitive, informative ecological indicators for biological monitoring of freshwaters.

This monitoring function is critical for adaptive management, planning and accountability. Despite this importance, species-level knowledge of macroinvertebrates distributions, environmental habitat determinants, and responses to human activities is patchy and inadequate.

This project will address this problem by developing robust molecular (DNA) methods to enable routine species-level macroinvertebrate identification. Species data will then be combined with purpose-built, ecologically relevant environmental data for streams of the Melbourne region to enable modelling and mapping of biodiversity in freshwaters. These models in turn will support quantification of species status, systematic planning, prioritisation of management action, monitoring, evaluation and reporting.

This suite of molecular (DNA), spatial and quantitative tools will enable data-driven, comprehensive, region-wide decision support to improve the ability of Melbourne's waterway managers to manage, monitor and improve stream health.