School of Life and Environmental Sciences

HDR Projects 2020

If you are looking for a rigorous graduate training under the supervision of world-renowned researchers, and want to make a substantial contribution to expanding knowledge and finding solutions to real-world problems, the School of Life and Environmental Sciences at Deakin University offers fully-funded PhDs available over three years.

Generous scholarships for outstanding candidates covering tuition fees and a stipend of up to $28,092 annually (tax exempt) - unless stated otherwise in the project briefs – are available for suitably qualified individuals. PhDs are available in the following disciplines:

- Chemistry
- Environmental Management and Sustainability
- Marine Science
- Freshwater Biology
- Fisheries Science
- Environmental Science
- Conservation Biology and Ecology

To be eligible you must:

1. be a domestic or onshore international candidate (domestic includes candidates with Australian Citizenship, Australian Permanent Residency or New Zealand Citizenship)
2. meet Deakin's PhD entry and English Language requirements
3. enrol full time and hold an Honours degree (First Class) or an equivalent standard Masters degree with a substantial research component

For more information please visit Deakin Research – Higher Degrees by Research

To express interest, review the project list, email the respective supervisor and provide the following:

- your CV including details of two referees
- a copy of your academic transcripts
- grading scales
- a one-page cover letter that outlines your research skills, experience and why this PhD opportunity interests you.

Please refer to the entry pathways to higher degrees by research for further information.

Program Title #1: ARC Training Centre for Green Chemistry in Manufacturing – multiple scholarships available

Contact Name and Email:

Professor Colin Barrow, colin.barrow@deakin.edu.au

Program Description:

The ARC Training Centre for Green Chemistry and Manufacturing is an interdisciplinary research and training environment centred on green and sustainable chemistry. The Centre has research nodes at Deakin University, Monash University, Flinders University and Curtin University and will work with industry, government authorities and key industry bodies to develop new green and sustainable chemical technologies for use in manufacturing across three research themes:

- **Advanced Sustainable Manufacturing** | Green chemistry metrics will be applied to explore opportunities to develop production processes that are safer for manufacturers, users and the environment. Existing research and application studies in the development of continuous flow manufacturing processes will be extended, and there will be a focus on developing advanced materials using safe and efficient methodology.
- **Bioprocessing** | The application of enzymes to transform materials, especially biologically sourced materials, provides many benefits: processes can be safer, utilise lower energy and produce less toxic waste streams than traditional manufacturing, and they can be highly selective, reducing costs of isolating desired products. Enzymes also can be excellent and specific catalysts providing high product yields, minimising required reaction volumes and reagents, and when immobilised can be re-used. Research will improve enzyme selectivity, activity and immobilisation methods to enable efficient and effective use of enzymes in biomass processing and for reaction catalysis.
- **Products from Renewable Biomass** | Waste biomass is a significant burden on a number of industries, particularly food and forestry, and represents a missed opportunity to develop new products. Australia has a vast amount of waste biomass and under-utilised materials from marine, agricultural and food sources. To decrease our environmental input and improve the economic utilisation of natural resources, valuable products including fine chemicals, nutritional ingredients, cosmetic ingredients and industrially useful polymers can be recovered from renewable biomass.

Program Features:

The ARC Training Centre for Green Chemistry and Manufacturing will produce industry-ready PhD-qualified chemists, chemical engineers and material engineers. Successful applicants will enjoy the benefits of training and joint supervision from experts across four universities, and mentoring from industry partners. Each project will focus on an industry identified problem. Further information on chief investigators (academic leaders) is available at https://tcgcm.com.au/team/chief-investigators.

- Four ARC PhD scholarships and two Deakin University PhD scholarships are available (each PhD has a designated university partner and the PhD degree will be awarded by that institution).
- PhD researchers will be supervised by academics with mentoring from an industry partner.
- All PhD researchers in the Centre will undertake an advanced training plan covering numerous sustainability topics in preparation for working in industry.
- PhD researchers will undertake a minimum of 12 months industry experience.
- The scholarship includes:
    - a full tuition fee sponsorship provided by the relevant university for the course duration (maximum of 42 months) which includes 57 months Overseas Student Health Cover; and
    - a living allowance (stipend) of $34,013 AUD per annum full-time rate (tax-free) provided by the relevant university for three years with the possibility of an extension.

Applicant Requirements

Applicants will be considered provided they meet the Admission Criteria (https://www.deakin.edu.au/research/become-a-research-student/research-degree-entry-pathways) and the English language proficiency requirements (https://www.deakin.edu.au/research/become-a-research-student/how-to-apply-research-degrees)

Applications

To submit an expression of interest please visit https://tcgcm.com.au/

Closing Date

Sunday, 16 August, 2020, 11:55pm AET

Project Title #2: Relational values underpinning pro-environmental action

Supervisor Names and Emails:

A/Prof. Bill Borrie, b.borrie@deakin.edu.au
A/Prof. Kelly Miller, kelly.miller@deakin.edu.au

Project description:

There are myriad relational values recognised in nature and there is good evidence that multiple values shape motivations for pro-environmental behaviour. Values also underpin advocacy and support for environmental policies. An early consideration, for instance, argued that wildlife conservation would fail if a full and diverse set of values wasn't engaged with.

Relational values are, importantly, distinct from instrumental (economic) and intrinsic (ecocentric) values and may be more closely aligned with enduring pro-environmental action. For example, previous studies suggest that highlighting relationships between nature and people can encourage support for conservation among ecotourists. Relational environmental values are therefore defined as the importance and desirability attributed to meaningful interactions and responsibilities between humans and nature. As such, deep human-nature relations include sacred and spiritual connections, aesthetic appreciation and recognition of beauty, inspirational and emotional bond, and identity, kinship and belonging.

Project Aim:

To develop methods to measure a full complement of relational values and to consider their overlap or distinctness from related concepts such as connectedness to nature and place attachment with its dimensions of place identity, place dependence and nature bonding. The project will likely involve multiple social science data collection efforts, as well as a review of existing ethical approaches to environmental values. There is scope to engage with multiple industry partners including those in environmental policy, wildlife conservation, and environmental planning and management.

Project Title #3: Modelling greenhouse gas abatement opportunities and environmental/economic trade-offs and co-benefits in NSW land systems

Supervisor Name and Email:

Alfred Deakin Professor Brett Bryan, b.bryan@deakin.edu.au

Project description:
This project will explore integrated environmental-economic modelling of land use, agriculture, and carbon sequestration in New South Wales, Australia. The successful PhD candidate will be involved in assessing the impacts of carbon payment policy in achieving agricultural greenhouse gas abatement – via interventions such as carbon plantings, ecosystem restoration, soil carbon and regenerative agriculture, and other land-based mechanisms – while simultaneously improving the sustainability of land systems more broadly.

Measuring the sustainability impacts will involve assessment of trade-offs and co-benefits of greenhouse gas abatement interventions for economic returns to landholders, and effects on agri-food production, biodiversity conservation, water resources, land degradation and soil health. Expected outcomes include the spatial and temporal prioritisation of cost-effective interventions for greenhouse gas abatement and win-win opportunities for sustainability. The project will involve working with collaborators in the university sector, the private sector and the Government of New South Wales. Methods used will include spatial data modelling and analysis, Geographic Information Systems, and integrated spatiotemporal environmental and economic systems modelling.

Project aim:
To model opportunities for land-sector greenhouse gas abatement in New South Wales that identify significant benefits for landholders, governments involved in land management, and the public through increased productivity, profitability and environmental health in the context of future climate and socio-economic uncertainties.

Project Title #4: Evaluating riparian buffer zones in temperate streams

Supervisor Name and Email:
Dr Ty Matthews, ty.matthews@deakin.edu.au

Project description:
The Barwon River is the major source of drinking water for Victoria's key regional city Geelong and its immediate surrounds. It is also the region's most important and prominent river in terms of its cultural, ecological, recreational, commercial and social values. The upper reach of the (East) Barwon River faces numerous challenges that pose downstream risks to both water quality and water security. The primary issue is the infestation of invasive weed species willows and *Glyceria* that have significantly affected river hydrology. In particular, willows and *Glyceria* adversely affect water quality and yield, choking the waterways which results in restricted and/or diverted lateral flows that increase flooding of adjacent land.

This presents a water security issue for Barwon Water as it diminishes the capacity to transfer water (up to 60 ML per day) from West Barwon Reservoir to the Wurdee Boluc Inlet Channel (WBIC) via a three-kilometre section of the East Barwon River. More broadly, infestation of willows and *Glyceria* has adversely affected Corangamite Catchment Management Authority's environmental water release. If infestation of invasive plants worsens, failure of the river embankment could result in a lateral diversion of flows. This would likely render the river an unviable option for water transfer to the WBIC or environmental water release, and the impact on local landholders would be significant.

Within this context—and following extensive consultation with government agencies, landholders, and other parties—Barwon Water has established a project that will see crown frontage along the three-kilometre stretch of the East Barwon Branch transferred to a Barwon Water-led committee of management. Under the auspices of this committee, Barwon Water will undertake willows removal, streambed stabilisation, revegetation and stock exclusion—with the substantive aim of improving the

water quality and meeting its bulk-transfer entitlements, and the ancillary aim of improving overall waterway health including renaturation to promote a flourishing native ecology.

This PhD position is sponsored by industry partner Barwon Water and provides an opportunity to master research methodology techniques and strategies under the guidance of Deakin University supervisors. It is based at the university's Waurn Ponds and/or the Queenscliff Marine Station.

The successful candidate will conduct field sampling, laboratory processing and statistical analysis to assess changes in physico-chemical and water quality, microbial assemblages and other biological assemblages before and after completion of restoration works.

Project Aim:

To assess changes in physico-chemical, water quality and the ecology of the upper East Barwon River following invasive plant restoration works. This will involve a structured sampling program that monitors the restored reach, together with multiple nearby controls (i.e. non-restored reaches) at time periods before and after restoration works.

The successful candidate should have an Engineering, Science or Environmental Science degree, Honours or MSc qualifications and proven scientific writing skills. Applicants will ideally have experience in hydrological, water quality and ecological assessment. Environmental engineering experience is valuable but not essential.

This is a fully-funded three-year PhD scholarship package up to the value of $115,000 including a stipend of $30,000 per annum, a $20,000 operating allowance and $5,000 WaterRA professional development.

Additional benefits include working directly with Barwon Water and opportunities to engage with multiple stakeholders through Barwon Water, WaterRA and Deakin University networks.

To apply visit www.waterra.com.au/leadership/student-opportunties/projects-seeking-students The selection process will commence in September with a view to a Semester 1, 2021 start (subject to change).

Project Title #5: Population dynamics of shorebirds in peril

Supervisor Name and Email:

Prof. Marcel Klaassen, marcel.klaassen@deakin.edu.au

Project description:

Among all long-distance migratory birds, the approximate eight million shorebirds along the East Asian–Australasian Flyway have been hit hard by global change, with population declines up to 80 per cent. The ARC funded Discovery Project "Are pollutants and emerging diseases endangering a global migratory flyway?" investigates the role of chemical pollution on disease susceptibility and survival in these shorebirds. This inquiry will use an extensive collection of blood and virus samples obtained from a wide range of shorebird species over the past nine years during their non-breeding season in Australia, along with 40 years of banding and resighting data (more than 500,000 observations). The overarching research project is a collaboration between Deakin University, the Peter Doherty Institute for Infection and Immunity (viruses), Norwegian University of Science and Technology (pollutants), the Victorian Wader Study Group (VWSG) (banding) and the Australasian Wader Studies Group (AWSG) (banding).

Based at Deakin University's Waurn Ponds campus, this PhD project will analyse banding and resighting data provided by VWSG and AWSG, extracting annual recruitment and survival figures for a number of key species, and will link these annual variations – as well as species-specific differences in recruitment and survival – to global change processes including climate change, pollution and habitat desctruction.

Project Aim:
To provide essential data for developing mitigation strategies to help curb the demise of shorebirds, while simultaneously providing information about the effects of pollution on the role of migrants in disease spread.

The successful candidate must hold an Honours degree (first class) or an equivalent standard Masters degree with very strong computer and statistical skills, and some research experience.

This position will remain open until a suitable candidate is found.

Project Title #6: The influence of submarine headlands on upwelling and bentho-pelagic productivity in the Bonney Coast upwelling system

Supervisor Name and Email:
A/Prof. Daniel Ierodiaconou, daniel.ierodiaconou@deakin.edu.au

Project description:
The Bonney Coast encompasses shelf waters between Cape Jaffa in South Australia and Cape Otway in Victoria and hosts a strong seasonal upwelling that supports one of the most productive marine regions in Australian coastal waters. The region is of high ecological and economic importance to South Australia and Victoria. It supports large populations of Blue and Southern Right whales, Australian fur seals, pelagic sharks and southern blue-fin tuna, together with important State (southern rock lobster, giant crab, abalone) and Commonwealth (small pelagic, south east trawl, shark and scale-fish) fisheries, and a growing charter fishing industry. A deeper understanding of the physical, chemical and biological mechanisms that underpin this highly productive region, and the relevance of this area to species of ecological importance as well as commercial interest, will promote the sustainable management of its ecosystems and fisheries. Furthermore, the region is part of the largest area of temperate carbonate sedimentation on the planet and is of profound interest to earth scientists globally.

The Bridgewater region is a particularly productive area of the Bonney Coast. It is characterised by deep shelf-break canyons that likely play a significant role in shaping the hydrodynamics of the upwelling that underpins bentho-pelagic productivity in the region. Shelf topography off Cape Bridgewater is far from uniform and is dominated by one of the seven pairs of gentle submarine headlands and valleys that characterise the Otway shelf. Recent idealised modelling studies have indicated that wind driven currents in the area are characterised by a very strong near-bottom upwelling (~ 20 - 40 m/day) into valleys and on the equatorward flanks of submarine headlands. Over headlands, equally strong downwelling occurs. Sea glider observations support this scenario.

The Integrated Marine Observing System (IMOS) has recently established a hydrodynamic mooring southwest of Portland through a collaboration between Deakin University (VicIMOS) and SARDI Aquatic Sciences (SAIMOS). It consists of an upward looking ADCP, a CTD (@ ~90 m), and a thermistor string to a SeapHOx (CTD) at 40 m, and is serviced biannually (Dec/Jan, Jun/Jul). CTD profiles are collected along a cross shelf transect of five stations during each mooring servicing.

We are seeking a highly motivated, independent PhD candidate who will be based at Deakin University's Warrnambool Campus. The successful candidate will undertake fieldwork on routine mooring servicing voyages and will collect, process and analyse sediment and water samples to investigate variations in nutrient concentrations, microbes, pigments, phytoplankton, zooplankton, suspended solids and carbonates, and to document calcareous benthos at specific sites as related to upwelling and downwelling. The project is in partnership with the South Australian Research and Development Institute (SARDI) and Queen's University (Prof. Noel James) with funding support from the Glenelg Shire.

Community productivity, trophic pathways and food web dynamics will be examined using methods such as stable isotope analysis, radioisotope uptake and Fast Repetition Rate Fluorometry. Sedimentology studies will include seafloor mapping, assessments of seafloor sediment composition and geochemistry (mineralogy, trace elements, stable isotopes), with sediment age determined by radiometric dating.

Project Aim:

To investigate the influence of submarine headlands on upwelling, bentho-pelagic productivity, and sedimentology in the Bonney Coast upwelling system. This project will build on existing hydrodynamic data from the new IMOS mooring and CTD surveys through collection of complementary benthic and pelagic biogeochemical data and examination of community productivity, trophic linkages and food web dynamics. Outputs from the project will assist in the calibration and validation of hydrodynamic, biogeochemical and ecosystem models for the Bonney Coast, which will promote knowledge-based sustainable management of marine resources, and help industry to optimise harvest strategies and maximise profitability. In addition, new insights into the influence of these processes (above) on seafloor sediment composition will improve interpretation of the sedimentary rock record.

The successful candidate must hold an Honours degree (first class) or an equivalent standard Masters degree with a substantial research component. Applicants will ideally have experience in oceanography, hydrological, water quality and/or ecological assessment.

This is a fully-funded three-year PhD scholarship with an annual stipend of $28,092 plus $5,000 p/a scholarship top-up from the research partner.

Interested applicants should email the following documents to Associate Professor Daniel Ierodiaconou, daniel.ierodiaconou@deakin.edu.au:

- CV (two-page) highlighting your skills, education and relevant work experience
- Cover Letter (one-page) outlining your interest in this project and how your previous experience and technical skills suit the position.

Once the documents have been emailed, please complete the Expression of Interest form and lodge your application here: https://www.deakin.edu.au/courses/fees-scholarships/scholarships/find-a-scholarship/hdr-scholarship-the-influence-of-submarine-headlands

The deadline for applications is **1st October 2020**.

Project Title #7: Marine biosecurity and network modelling

Supervisor Name and Email:

Dr Eric A. Treml, e.treml@deakin.edu.au

Project description:

Effective biosecurity is critical to protect New Zealand's unique marine biodiversity and the enormous cultural, social and economic value derived from it. Movements of vessels, aquaculture stock and equipment, and other maritime infrastructure are principal pathways for the spread of non-indigenous marine species. Every day, hundreds of recreational, merchant, passenger, fishing and aquaculture vessels transit between New Zealand's ports, marinas, urban coastal centres, aquaculture farms, marine reserves and iconic natural and culturally significant coastal areas, creating a complex maritime transport network. Deakin University, in collaboration with Cawthron Institute – New Zealand's largest independent science organisation - is seeking a PhD candidate to augment a new five-year research program that will develop improved tools for the prevention, detection and management of marine pest incursions. Based in Nelson, Cawthron Institute has a proven national and international reputation for enterprise, innovation and

excellence in science and employs more than 27 highly qualified scientists and technical experts from more than 25 different countries. Its Biosecurity Team undertakes ecological experiments, molecular tool development, antifouling research, risk assessment modelling and social science to underpin the understanding and management of risks that marine pests and diseases pose to New Zealand and international regions.

Project Aim:

To develop an understanding of the dynamics of New Zealand's complex maritime transport network and its ability to facilitate the spread of non-indigenous species in space and time to enable regulators and industry to implement meaningful approaches to prevention and management of biosecurity risks. This PhD project will assist with the development of a maritime network model for New Zealand that can be used to simulate incursion and response scenarios to facilitate the development of optimised risk mitigation strategies.

This is a fully-funded three-year PhD scholarship (~AU$28,000 p.a. tax free) through the School of Life and Environmental Sciences. Due to the COVID-19 pandemic, selection of candidates and commencement of research will be contingent on the lifting of current restrictions on travel and workplace activities presently imposed by the New Zealand and Australian governments.

Please email your EOI to Dr Eric Treml (e.treml@deakin.edu.au) attaching a CV, names of three referees, and academic transcripts.

Expressions of Interest from potential PhD applicants close on **24th July 2020**.

Project Title #8: Resolving differences in phenotypic performance of fish using electronic tagging technologies

Supervisor Name and Email:

A/Prof. Timothy Clark, t.clark@deakin.edu.au

Project description:

In animal production, and in other contexts such as animal ecology, it would be useful to know the survival probability and future performance of juvenile individuals. In the absence of this knowledge in aquaculture, significant time and money are wasted on raising individuals that ultimately perform poorly and/or die prior to harvest. This project will shed light on this issue by making use of electronic tagging technologies to examine physiological traits of juvenile fishes.

Deakin University, in collaboration with Cawthron Institute – New Zealand's largest independent science organisation – is seeking a PhD candidate who will work alongside Associate Professor Timothy Clark at Deakin's Waurn Ponds campus and at the Queenscliff Marine Station, as well as conducting experiments with Dr Jane Symonds at Cawthron Institute in Nelson, New Zealand.

Project Aim:

To predict the performance of individual juvenile fishes as they progress through life. King salmon (*Oncorhynchus tshawytscha*) from the New Zealand aquaculture industry will be one of the focal species used in this project.

The successful candidate should have achieved an excellent grade (e.g. H1 or HD) in an Honours or MSc research program and will have experience in physiology, molecular biology, electronic tagging (e.g., heart rate, accelerometry), and/or a related discipline.

This is a fully-funded three-year HDR scholarship (~AU$28,000 p.a. tax free) through the School of Life and Environmental Sciences. To apply, please complete the Expression of Interest (download from https://www.dropbox.com/sh/j762khsax2xd88z/AACfxdyvFvJbSNEI0ifol5npa?dl=0) and email this with your CV to A/Prof. Timothy Clark (t.clark@deakin.edu.au) and Dr Jane Symonds (jane.symonds@cawthron.org.nz).

The deadline for applications is **15th August 2020** but the position will remain open until a suitable candidate is found.

Project Title #9: The diversification and role of the gut microbiome in the adaptation of fish species.

Supervisor Name and Email:

Dr Andrew Oxley, andrew.oxley@deakin.edu.au

Project Description:

Comprising some 30,000 species, bony fishes (teleosts) are the largest and most diverse group of vertebrates, displaying incredible variation in their forms, physiology and behaviours, and occupying habitats ranging from tropical to Antarctic oceans, deep-sea systems to coasts, estuaries and freshwater environments. Their success, in part, is thought to have been influenced by the remarkable evolutionary flexibility within their immune systems, which plays a key role in defence against pathogens and the selection and regulation of beneficial microbes that support their overall health and fitness. Having co-evolved with the host over millions of years, these microbes arise (as symbionts) from the environment through processes of immigration and adaptation, leading to the formation of distinct communities of microbiota that encode unique features within their collective genomes – and what is now known as the 'microbiome'. Within the gut, the microbiome is considered an additional 'organ' to reflect the diverse contributions and services it provides in determining the host phenotype. From its role in the regulation of digestive and metabolic processes, to supporting intestinal development and immune homeostasis, the gut microbiome of fish is likely central to their survival and ability to adapt to different niches.

Elucidating the associations and role/s that particular gut microbes play among fish species is fundamental in informing our understanding of fish adaptation, and has the capacity to provide novel insights into how fish may respond to new stressors imposed in our rapidly changing world. For industries like aquaculture, this may include insights into how amenable the gut microbiome could be to modulation for improving health and nutrition. This knowledge would prove valuable, for instance, in determining whether sufficient evolutionary plasticity exists in the gut microbiomes between divergent fish lineages for supporting host acceptance of specific microbes that many confer a benefit to the farmed host (as probiotics) – a prospect that has shown promise for extending the dietary range (and consequently suitability of new habitats) of threatened animal species.

Project Aim:

To improve understanding of the diversification and role of the gut microbiome in the adaptation of fish species, utilising the wealth of historical specimens available within Australian museum and Government collections and metagenomic and/or amplicon sequencing-based approaches.

This is a fully-funded three-year PhD scholarship (~AU$28,000 p.a. tax free) through the School of Life and Environmental Sciences. To apply, please send your Expression of Interest and CV to Dr Andrew Oxley (andrew.oxley@deakin.edu.au).

The ideal candidate should have a demonstrable understanding and interest in host microbial ecology, and familiarity in specimen handling, molecular microbiological techniques and bioinformatics. Candidates

should also be comfortable with analysing, interpreting and integrating complex datasets. The candidate must be able to commence **before 18th December 2020** and will have three years to complete the project.

Project Title #10: Fisheries ecology of rock flathead (*Platycephalus laevigatus*) in south eastern Australia

Supervisor Names and Emails:

Dr Justin Rizzari, justin.rizzari@deakin.edu.au
Dr Adam Miller, a.miller@deakin.edu.au

Project description:

Rock flathead (*Platycephalus laevigatus*) supports an important commercial fishery in south-eastern Australia, however the stock structure of rock flathead is largely unknown. This project will use an integrated approach involving the application of acoustic tracking and chemical tracers coupled with population genomics to address key questions around fisheries stock structure and processes influencing the dynamics of rock flathead fisheries. This project will involve engagement with government and fisheries industry stakeholders.

We are seeking a PhD candidate who will work alongside Dr Justin Rizzari and Dr Adam Miller at Deakin University's Queenscliff Marine Science Centre.

Project Aim:

To develop an improved understanding of processes shaping marine biodiversity in south-eastern Australia to assist in the sustainable management of the rock flathead fishery.

The successful candidate should have achieved an excellent grade (e.g. H1 or HD) in an Honours or MSc research program, have proven skills in scientific writing, and an interest and experience in fish biology and ecology. Experience in fish tagging, boating- and diving-based field work, and/or population genetics is desired but not critical.

This is a fully-funded three-year PhD scholarship (~AU$28,000 p.a. tax free) through the School of Life and Environmental Sciences. The project is funded by the Fisheries Research and Development Corporation. To apply, please send your Expression of Interest (download from https://www.dropbox.com/sh/diga9j2gaqn6xxg/AAAw65cyjMJflMnSuhJdOqXFa?dl=0) and CV to Dr Justin Rizzari (justin.rizzari@deakin.edu.au).

This position will remain open until a suitable candidate is found.

Project Title #11: Conservation genomics of the short-finned eel (*Anguilla australis*): a focus on an ancient fishery within the UNESCO Budj Bim Cultural Landscape

Supervisor Name and Email:

Dr Adam Miller, a.miller@deakin.edu.au

Project description:

The short-finned eel (*Anguilla australis*) is native to the lakes and coastal rivers of south-eastern Australia and New Zealand. The species carries significant cultural importance, having been harvested by Indigenous people across much of its historical distribution. In south-western Victoria, where the species is known as 'kuuyang', it is a powerful cultural symbol of the local Gunditj people and is the basis of an aquaculture

industry dating back almost 7000 years. Lake Condah is globally recognised as the birthplace of modern aquaculture, where Indigenous people engineered the landscape to farm and trade eels for millennia. This has been formally recognised through a UNESCO World Heritage listing for the Budj Bim cultural landscape.

Since the early 20th century, commercial fisheries have operated across the species range including in south-western Victoria. These fisheries continue and are heavily geared towards stock enhancement, with lakes and dams stocked with elvers and small eels for subsequent harvesting. The fishery supports an export market but is strongly affected by seasonal factors, with severe drought conditions driving low production in recent years. Wild short-finned eel populations are further pressured by the aquaculture industry, which is dependent on harvesting juvenile stock for grow-out in intensive farming systems. The combined pressure of climatic factors and commercial exploitation of short-finned eels has led to reduced recruitment of juveniles and population declines, raising questions about the industry's sustainability and conservation of the species, especially in the face of environmental shifts resulting from climate change. Information on the species' biology and ecology is needed to help guide fisheries management and conservation planning.

This project will involve field and laboratory-based activities with three research components:

1. Population genomic analyses to gain insights into eel stock connectivity and spatial patterns of recruitment across the species range.
2. Use of eDNA tools to assess patterns of habitat use within catchments.
3. DNA metabarcoding to assess eel diet based on the genomic analysis of eel stomach samples.

The project provides an opportunity to develop key skills and knowledge in conservation and fisheries genomics. It will be conducted in close partnership with traditional owners, local government and industry.

This PhD position is based at Deakin University's EcoGenetics Lab at the Warrnambool campus.

Project Aim:

To address critical knowledge gaps and provide new insights into the species life history, providing resources to assess the resilience of short-finned eel fisheries to environmental change and to inform future management. The project will have a particular focus on the ancient "kuuyang" fishery within the UNESCO Budj Bim Cultural Landscape.

The successful candidate should have achieved an excellent grade (e.g. H1 or HD) in an Honours or MSc research program and proven skills in scientific writing. Applicants will ideally have an interest and experience in wildlife ecology, fish biology or ecological genetics (not essential).

This is a fully-funded three-year HDR scholarship (~AU$28,000 p.a. tax free + $5,000 p.a. scholarship top-up from the research partner) through the School of Life and Environmental Sciences.

To apply contact Dr Adam Miller (a.miller@deakin.edu.au) or visit https://www.ecogeneticslab.com/open-position.