HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest in toxicology, environmental/forensic sciences, or analytical chemistry.

Accumulation and sublethal effects of juvenile hormone mimics (JHMs) in honeybees

This highly topical project is part of a larger study looking at the effects of some of the newer pesticides on honeybees and their relationship to the global issues with colony collapse disorder. The project aims to develop analytical methods to assess low levels of JHMs in bees by developing new high performance liquid chromatography and pre-concentration methods to separate pesticides from natural hormones for a range of pesticides. The developed methods will be validated via LC-MS; As well the metabolites of the pesticides tested will be determined to enable screening tools to be developed for in field experiments. In addition, US EPA assays for determining dermal delivery of pesticides will be assessed; specifically the application of JHMs using different solvents (acetone (10%), methanol, DMSO and DMF) will be assessed to quantify absorption of JHMs against the US EPA dermal uptake protocols. This project is supported by a stipend of $5,000 for a high calibre student.

In this project, you will:

- Develop and apply new analytical methods using state of the art instrumentation.
- Work at the University of Western Sydney on JHM metabolites using state of the art metabolomic protocols.
- Evaluate current protocols for pesticide safety.

Supervisors:

- Assistant Prof Simon Foster, University of Canberra

Contact: Simon Foster
Email: simon.foster@canberra.edu.au
Phone: (02) 6201 2540

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in chemistry and analytical chemistry.

Iodine concentration and speciation in food products

Iodine is an essential element and required chemical for human health. The human body cannot store iodine and therefore requires a constant supply. Iodine deficiency is the most common source of preventable mental retardation (cretinism) in children. Iodine occurs in the environment mainly as dissolved iodide in seawater, although it is also found in some minerals and soils. Kelp, a type of brown seaweed, often contains high concentrations of iodine. Organic iodine compounds are produced by marine life forms, the most notable being iodomethane (commonly called methyl iodide). There is little current information on the concentration and speciation of iodine in seaweeds and seawater/sea salt – our main source of iodine. This project will provide valuable information for establishing good sources of iodine.

In this project, you will:

- Work in the Ecochemistry Laboratory.
- Develop analytical methods for the measurement of iodine in natural samples.
- Establish the concentration and speciation of iodine in seaweeds, seaweed products and seawater.
- Investigate the concentration and speciation of iodine in seafoods.
- Spend time sampling up and down the south coast of NSW.

Supervisors:

- Assistant Prof Simon Foster, University of Canberra
- Prof Bill Maher, University of Canberra

Contact: Simon Foster
Email: simon.foster@canberra.edu.au
Phone: (02) 6201 2540

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest in environmental sciences, nutritional science or analytical chemistry.

Analysis of arsenic species in certified reference materials

Arsenic is becoming an issue in more countries and regulations are becoming stricter. Accurate measurement of arsenic in food products and water is essential to ensure the safety of consumers. All analytical techniques that measure arsenic in food products and waters should validate their analyses against certified reference materials with known concentrations of arsenic and arsenic species. There are however, few certified reference materials that have been analysed for arsenic species. This project would determine the concentration and speciation of arsenic in a wide range of CRMs from plant, animals and food stuffs. In this project you would gain a valuable training in the use of both HPLC and ICP-MS both skills that are widely used. You would also have an excellent grounding in chemical speciation analysis a skill that is highly regarded.

In this project, you will:

- Use advanced analytical methods and state of the art instrumentation for the measurement of arsenic species in biological tissues.
- Develop in house reference materials to ensure accurate speciation analysis.

Supervisors:

- Prof Bill Maher, University of Canberra
- Ass istant Prof Simon Foster, University of Canberra

Contact: Simon Foster
Email: simon.foster@canberra.edu.au
Phone: (02) 6201 2540

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

These projects would suit a student with interest and knowledge in semi-arid ecology, specifically vegetation, fire, birds, and/or park management.

3 projects are available to: work with park managers to investigate the ecological consequences of management in semi-arid landscapes

1. Assessing the interaction of prescribed fire management on vegetation and bird communities at Yathong and Nombinnie Nature Reserve (NR).

   Aim: To determine if there are any long-term ecological implications which have arisen from the current prescribed (control) burning regime being implemented at Yathong and Nombinnie NRs in terms of changes to vegetation and bird communities

2. Weed invasion dynamics in a semi-arid conservation area

   Aim: To determine the current weed status (i.e. weed flora) and invasion rates across the semi-arid protected area of Yathong, Nombinnie and Round hill NRs.

3. Vegetation response following rabbit warren ripping

   Aim: To determine what affect the management activity of ripping rabbit warrens has on soil seed banks in semi-arid vegetation.

In these projects, you will:

- Investigate the effects of protected areas management – which will involve working with the local ranger.
- Learn about ecological processes in semi-arid Australia and the constraints of management
- Develop your skills in plant and/or bird ecology, field work, and spatial and data analysis.

Supervisor and contact: **Dr Paul Downey**
Assistant Professor in Plant Ecology
Email: paul.downey@canberra.edu.au
Phone: (02) 6201 2169
Room: 3C29

These projects would suit a student with interest and knowledge in plant ecology, specifically plant invasions/weeds.

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

3 projects are available to: work on alien plant invasions

Alien plants pose on the greatest threats to biodiversity, yet our understanding of their impacts and invasion patterns is poorly understood.

1. Are co-occurring weeds more likely to invade the same native plant communities?

Using existing datasets investigate the weed-native composition of plant communities to determine the invisibility pattern (i.e. if groups of weeds invade similar habitats).

2. Do weeds invade similar habitat types?

Using existing datasets investigate the habitat preferences of weeds to develop predictive capabilities related to invasion patterns.

3. Assess the invasion rates of pines (Pinus radiata) following the Canberra fires.

The Canberra fires burnt large areas of pine plantations and surrounding landscapes containing many pine wildings. Today many of these burnt areas contain large numbers of pine wildings. The impact of this invasion on the biodiversity present is unknown. This project aims to investigate pine invasion rates as well as their impacts.

In these projects, you will:

- Investigate the effects of weeds or alien plants on native plant species
- Develop your skills in plant ecology, field work, and spatial and data analysis.

Supervisor and contact: **Dr Paul Downey**
Assistant Professor in Plant Ecology
Email: paul.downey@canberra.edu.au
Phone: (02) 6201 2169
Room: 3C29

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in plant ecology.

host-mistletoe interactions

Mistletoes are hemi-parasitic plants. They parasitise a wide array of host species, yet their interactions with these hosts is poorly known.

Assess the role of mimicry in host-mistletoe combinations.

It has long been hypothesised that mistletoes mimic their host trees. It has also long been hypothesised that mistletoes are host specific. This project will look at whether mimicry or crypsis exists in mistletoe host-combinations as well as host-specificity (i.e. that mistletoes only have a select number of host trees).

Flowers of the mistletoe *Amyema quandang*, which is growing on mulga, near Yathong Nature Reserve, NSW.

In these projects, you will:

- Investigate the effects of parasitic plants on their host plants
- Develop your skills in plant ecology and data analysis.

Supervisor and contact: **Dr Paul Downey**
Assistant Professor in Plant Ecology
Email: paul.downey@canberra.edu.au
Phone: (02) 6201 2169 Room: 3C29

HONOURS PROJECT IN APPLIED SCIENCE

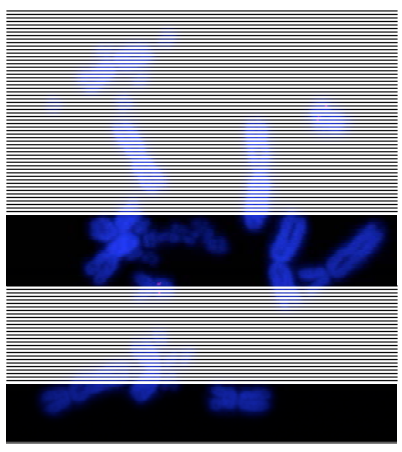
UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest in molecular genetics, cytogenetics, comparative genomics and bioinformatics

COMPARATIVE GENOMICS OF AUSTRALIAN DRAGON LIZARDS

Comparative genomics is a powerful method for understanding genome organization, evolution and functional annotation of genomes across distant lineages. In particular, comparative genome analysis by physical mapping of DNA markers on chromosomes between related species provides information on chromosome rearrangements and therefore genome organization, evolution and speciation. Australian dragon lizards are a dynamic group of reptiles, represented by ~70 species and have evolved within the last ~24-40 million years since their divergence from Asian relatives. Such rapid radiation of Australian dragon lizards within this short evolutionary time scale presents them as an excellent model group for the study of the dynamics of genomic rearrangements and organization leading to speciation. This research project will be lead by Dr Tariq Ezaz, a world leading molecular cytogeneticist. Several projects.

In this project, you will:



- Work at the state-of-the-art molecular cytogenetic laboratory in the Institute for Applied Ecology
- Map genes to Australian dragon lizard chromosomes using fluorescent in situ hybridization and BAC (Bacterial Artificial Chromosomes) clones
- Learn bioinformatics through the analysis of sequence data derived from chromosome anchored BAC clones
- Construct a comparative genomic map between two species of Australian dragon lizards representing two genera and based on your mapping and sequencing data

Supervisors:

- Assistant Professor Tariq Ezaz
- Professor Arthur Georges
- Professor Stephen Sarre

Contact: Tariq Ezaz; Email: Tariq.Ezaz@canberra.edu.au; Phone: (02) 6201 2297

HONOURS PROJECT IN APPLIED SCIENCE

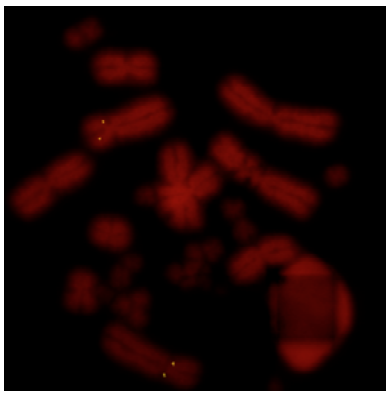
UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest in molecular genetics, cytogenetics, comparative genomics and bioinformatics

DEVELOPMENT OF A GENE DENSE CYTOGENETIC MAP IN AUSTRALIAN DRAGON LIZARD *Pogona vitticeps* FOR COMPARATIVE GENOME ANALYSIS

Reptiles occupy a key evolutionary position in the vertebrate phylogeny sharing common ancestors with birds and mammals. The characterization of the genome at cytogenetic levels and subsequent comparisons with distantly related groups can provide powerful insights into genome organization and evolution. Australian dragon lizard *Pogona vitticeps* is emerging as a model species in comparative genomic studies, not only because of its amenability to captive breeding, but also the availability of genomic resources, such as a genomic library. Constructing a gene dense chromosome map from a model reptile species is therefore critical in understanding the dynamics of genome evolution in amniotic vertebrates. This study will generate fundamental information on genome rearrangements leading to speciation in amniotic vertebrates. This research project will be lead by Dr Tariq Ezaz, a world leading molecular cytogeneticist. Continuing project.

In this project, you will:



- Work in the state-of-the-art molecular cytogenetics laboratory at the Institute for Applied Ecology
- Map genes on to the chromosomes of Australian dragon lizard *Pogona vitticeps* using fluorescent in situ hybridization and BAC (Bacterial Artificial Chromosomes) clones
- Obtain end sequences from BAC clones
- Apply bioinformatics to analyse BAC end sequences
- Construct a comparative genomic map of vertebrates based on your mapping and sequence data

Supervisors:

- Assistant Professor Tariq Ezaz
- Professor Arthur Georges
- Professor Stephen Sarre

Contact: Tariq Ezaz; Email: Tariq.Ezaz@canberra.edu.au; Phone: (02) 6201 2297

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

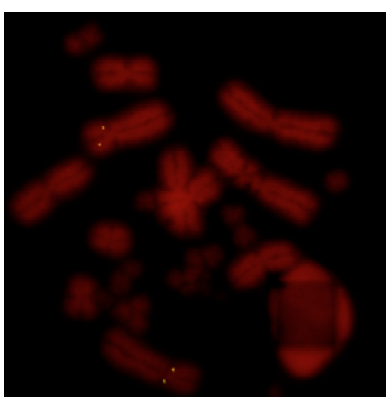
This project would suit a student with interest in molecular genetics, cytogenetics, comparative genomics and bioinformatics

GENOME EVOLUTION IN REPTILES

Reptiles occupy a key evolutionary position in the vertebrate phylogeny sharing common ancestors with birds and mammals. The characterization of the genome at cytogenetic levels and subsequent comparisons with distantly related groups can provide powerful insights into genome organization and evolution. Constructing comparative cytogenetic map in representative reptile species is therefore critical in understanding the dynamics of genome evolution in amniotic vertebrates. This study will generate fundamental information on genome rearrangements leading to speciation in amniotic vertebrates. This research project will be lead by Dr Tariq Ezaz, a world leading molecular cytogeneticist. Continuing project.

In this project, you will:

- Work in the state-of-the-art molecular cytogenetics laboratory at the Institute for Applied Ecology
- Map genes on to the chromosomes of representative reptilian species using fluorescent *in situ* hybridization and BAC (Bacterial Artificial Chromosomes) clones
- Construct a comparative genomic map of vertebrates based on your mapping and sequence data



Supervisors:

- Assistant Professor Tariq Ezaz
- Professor Arthur Georges
- Professor Stephen Sarre

Contact: Tariq Ezaz; Email: Tariq.Ezaz@canberra.edu.au; Phone: (02) 6201 2297

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest in behaviour and reproduction

Life history and behavioural traits of invasion by *Gambusia holbrooki*

Expansion of species into new habitats may select for individuals with life histories (e.g. clutch size, offspring growth rate) or behaviours (e.g. aggression, boldness) that differ from individuals in established populations. For invading species, or for species at the edge of their habitat range, do individuals exhibit "faster" life histories or more aggressive and bold behaviour? In this study, the student will examine traits of the invasive fish *Gambusia holbrooki* across several populations that vary from established, core populations in Canberra to populations at the edges of distribution within Canberra. Traits to be measured may include reproductive output, offspring growth, intraspecific aggression, risk sensitivity to predators. The work will involve some collection from the field and major study of captive animals in the lab. If "established" and "invading" populations cannot be found, comparison of different habitats could be performed (e.g. lake vs. stream, open vs. vegetated habitat).

In this project, you will:

- Collect fish from the field
- Maintain lab population
- Compare reproduction and behaviour among wild populations

Supervisors:

- Dr Lisa Schwanz, University of Canberra
- Dr Tariq Ezaz, University of Canberra

Contact: Lisa Schwanz
Email: Lisa.Schwanz@canberra.edu.au
Phone: (02) 6201 2083

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in climate change and Earth Science.

Reconstructing Australian paleotemperatures since the last ice age

Most of the evidence used to reconstruct Australian paleoclimate cannot distinguish between changes in temperature or rainfall. This project will use newly drilled boreholes, and a new thermal conductivity scanning technique, to gain a direct measure of paleotemperature changes across Australia since the last ice age. This information will improve our understanding of the response of Australian landscapes to past climate change, and improve the accuracy of future climate projections in Australia.

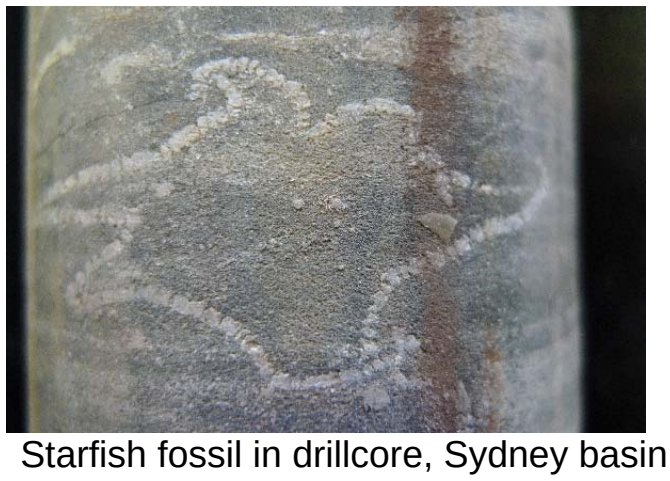
In this project, you will:

- Select a region of interest around Australia
- Measure petrological properties of samples from boreholes, and produce numerical models of former climate histories at those sites
- Be involved in research that will benefit the management of people and the environment in that area
- Learn about groundwater flow, sedimentary basins, the geothermal industry application

Supervisors:

- Duanne White
- Bernd Gruber
- Sandra McLaren (Uni Melb)

Contact: Duanne White
Email: Duanne White @canberra.edu.au
Phone: (02) 6201 2083



Starfish fossil in drillcore, Sydney basin

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in climate change and Earth Science.

Direct measurements of heat production in Antarctica

Heat production from the rocks in the crust of Antarctica controls the rate of water production and the temperature of the ice at the base at the base of the Antarctic ice sheet. This is important, as these parameters exert a strong control over ice flow, and a lack of knowledge of these areas has created large uncertainties in numerical models of the East Antarctic Ice Sheet. This in turn reduces the accuracy of any future projections of the contribution of the ice sheet to global sea level rise during the next few centuries.

In this project, you will:

- Measure the concentration of heat producing elements (U, Th, K) and other geophysical properties of samples of Antarctic rocks and sediment that were deposited at the margin of the ice sheet
- Explore geophysical datasets to determine where these rocks may have been derived from.
- Collaborate with researchers in Geoscience Australia
- Learn about bedrock geochemistry, ice flow, the geothermal industry application

Supervisors:

- Duanne White
- Chris Carson at Geoscience Australia
- Other staff as appropriate

Contact: Duanne White
Email: Duanne White @canberra.edu.au
Phone: (02) 6201 2083

Sediments melting out of the East Antarctic Ice Sheet, Rauer Group.

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in the regolith and climate change

Soil development in East Antarctica

The formation of soils in ice-free areas of Antarctica is very slow due to the limited biological disturbance, and the extremely cold and dry conditions that retard chemical weathering. However, many areas have been ice free for many million years, and over such time periods soil formation does occur. This has implications for many fields, such as the use of these features as a chronometer in determing landscape history, geological controls on the diversity of soil microbes, and the ramifications of human disturbance in what are sometimes heavily trodden ice-free areas in the region.

In this project, you will:

- Investigate the rate of weathering from sediment samples of known age in a range of ice-free environments in the Prince Charles Mountains, East Antarcitca using geochemistry and X-ray diffraction.
- Learn about soil development, geochemical analysis techniques and management of fragile eco and geosystems.

Supervisors:

- Duanne White
- Other staff as appropriate

Contact: Duanne White
Email: Duanne White @canberra.edu.au
Phone: (02) 6201 2083

Weathering of a felsic gneiss boulder, Prince Charles Mountains, Antarctica

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

Environmental Impacts of Geothermal Exploration

This project would suit a student with interest and knowledge in the regolith and chemistry

Geothermal exploration and development of geothermal power systems has the potential to provide low or no emissions baseload power in a wide variety of areas in Australia. However, there is potential for the development of the industry to adversely affect the environment in other ways, such as contamination of ground or surface waters with heavy metals. This is a little understood area that has the potential to offset some of the 'green' credentials of the industry if poorly managed. This project would be the first phase in identifying and quantifying those impacts, with the aim of developing techniques or technologies to reduce potential problems before large and essentially irreversible investments are made in infrastructure.

In this project, you have opportunity to:

- Investigate potential sources of environmental impact in the geothermal exploration and development cycle
- Evaluate the magnitude of these impacts on water quality
- Learn about groundwater geochemistry, geochemical analysis techniques and the geothermal industry

Supervisors:

- Duanne White
- Other staff as appropriate

Contact: Duanne White
Email: Duanne White @canberra.edu.au
Phone: (02) 6201 2083

Early-phase geothermal exploration drill rig, Gippsland, Victoria

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in the regolith and chemistry

Heavy Metal phases in Australian landfills

Metal discharges from landfills to ground and surface waters are an important component of their environmental impact. Knowledge of the physical and chemical form that these metals exist in is limited, but is a key factor in understanding the rate of transport offsite. It is also important for the successful treatment of landfill material using chemical immobilisation techniques that aim to bind the metals into insoluble and non-bioreactive forms that present less harm to the environment.

In this project, you will:

- Use analytical techniques to characterise the nature of heavy metal phases in landfills
- Determine whether the chemical form is affected by factors such as climate or landfill age
- Learn about groundwater geochemistry, geochemical analysis techniques and the recycling industry

Supervisors:

- Duanne White
- Other staff as appropriate

Contact: Duanne White
Email: Duanne White @canberra.edu.au
Phone: (02) 6201 2083

Erla Hafsteinsdottir investigating heavy metal phases from Antarctica at the Australian Synchrotron, Melbourne

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

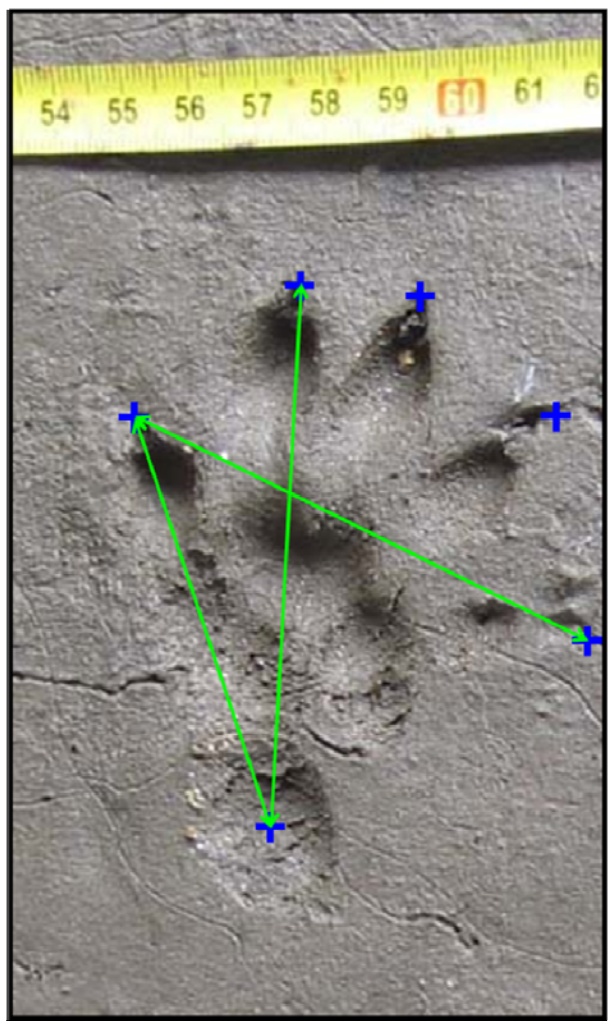
This project would suit a student with interest in statistical analysis of ecological data

Identifying animal tracks using foot prints

A still unresolved problem in ecology is the efficient identification of cryptic animals in the field. The aim of this projects is to use tracks/photos of foot prints to identify animal species by discriminant function analysis. The method was invented e.g. for mountain lions (Felis concolor, Smallwood and Fitzhugh 2004) and recently also to discriminate between footprints of the Eurasian otter and minks (Harrington et al. 2008). The idea is to develop and apply the method to Australian mammal species. Based on a collection of footprints we explore the suitability of the method.

In this project, you will:

- Digitize an existing collection of foot prints
- Analyse the data and evaluate the potential of the method to identify species
- If time allows find additional foot prints of other species and analyse them



Supervisor:

- Dr Bernd Gruber, University of Canberra

Contact: Bernd Gruber
Email: Bernd.Gruber@canberra.edu.au
Phone: (02) 6206 3804

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest in behaviour and conservation

Effects of incubation temperature on behaviour of hatchling dragon lizards

Wild dragon lizards develop within nests that experience daily and seasonal fluctuations in nest temperatures. In many species, incubation temperature is known to affect the sex (male vs. female) of the individual lizard. However, little is known about how temperature and fluctuations in temperature influence other traits of hatchling lizards, such as behaviour, physiology, morphology. For example, does exposure to fluctuating temperatures during the egg stage influence hatchling thermoregulatory behaviour, running ability or aggression? The answers to these questions directly inform how climate change will impact individuals and populations. In this study, the student will conduct research to examine the effects of lab incubation regimes on hatchling traits. Traits to be measured will depend on the student's interests and may include growth, temperature preferences, intraspecific interactions, risk sensitivity to predators, and physiology. The work will involve collection of adult lizards (water dragons, *Physignathus lesueurii*, and jacky dragons, *Amphibolurus muricatus*) from the field and extensive study of captive animals in the lab.

In this project, you will:

- Collect lizards from the field
- Incubate eggs and maintain hatchling colony
- Measure and analyse behaviour, morphology and physiology of hatchlings

Supervisors:

- Dr Lisa Schwanz, University of Canberra
- Dr Tariq Ezaz, University of Canberra
- Dr. Arthur Georges, University of Canberra

Contact: Lisa Schwanz
Email: Lisa.Schwanz@canberra.edu.au
Phone: (02) 6206 3943

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

ECOCHEMISTRY

Contact: Bill Maher 62012531 bill.maher@canberra.edu.au

Research Interests:

- The cycling of nutrients, trace metals and metalloids in marine and freshwater ecosystems in order to understand the *fate* and *effects* of chemical contaminants
- Understanding the biological factors (growth, age, gender, sexual maturity, and seasonal food supply) that control the uptake and retention of contaminants in aquatic organisms
- Understanding the effects contaminants have on the health of aquatic organisms and
- communities such as subcellular damage by metals and metalloids and endocrine disruption by pesticides
- Understanding the strategies aquatic organisms use to store and detoxify contaminants such as metal incorporation into proteins and the elucidation of the chemical forms of elements
- Understanding the reactivity of carbon in aquatic systems and the roles carbon plays in the nutrition of animals and the cycling of nutrients.

Prospective honors projects: Our policy is to match honors student's interests with the above research interests. We would be happy to explore topics with interested students.

Examples of Previous Honors projects:

- Barwick, M. Investigating the origins and bio-magnification of trace metals Se, Cd, Mn, As and Pb within food webs of fish communities in Lake Macquarie, NSW
- Burt, A. Trace metal accumulation in transplanted *Anadara trapezia* and their physiological response along a contaminant gradient in Lake Macquarie
- Duncan E. Arsenic uptake and metabolism by marine phytoplankton
- Dann, R. Hydrogeochemistry and biogeochemistry in Stephens Creek Catchment Broken Hills
- Gay, D. Spatial and temporal variation of trace metals in *Bembicium nanum*
- Kuo, W. The effects of sediment selenium on the recolonisation of benthic macrofauna in Lake Macquarie NSW – a manipulative experiment.
- Mikac, K. A health assessment of five coastal lagoons using benthic in fauna and environmental variables
- Podreka, S. Effects of DDE on embryonic development, hatching success and sex differentiation in marine turtle *Chelonia mydas.*

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in molecular and/or population genetics

DNA DETECTION OF TASMANIAN WILDLIFE

DNA analysis of scat (faecal) DNA is an important tool currently used at UC to detect and monitor introduced foxes. As part of the Tasmanian fox eradication program, predator scats have been collected from across Tasmania. These scats provide a unique and powerful resource because each one of them contains, not just the DNA of the scat producer, but also the DNA of those species that were consumed in the time leading up to defecation. Identifying the species present in individual scats will provide critical information about the species consumed by each predator. Such information is useful for management of both feral and native species. We have an opportunity for a student to be involved in the development of new methods to detect native wildlife species from trace DNA samples. This research project will be led by Prof Stephen Sarre and Dr Anna MacDonald.

In this project, you will:

- Work in the state-of-the-art Wildlife Genetics and laboratory in the Institute for Applied Ecology
- Extract DNA from samples from native and introduced species
- Contribute to the development of DNA-based tests that detect prey species of particular management interest
- Use PCR and DNA sequencing approaches to screen scat samples collected in Tasmania for the presence or absence of these target species

Supervisors:

- Professor Stephen Sarre

Contact:
Stephen Sarre; Email: stephen.sarre@canberra.edu.au;
Phone: (02) 6201 5657

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in molecular and/or population genetics

POPULATION GENETICS OF FERAL ANIMALS

Population genetics analyses using microsatellite or other DNA markers can provide a powerful tool for examining dispersal among wildlife populations. In particular, such analyses can allow us to determine which features of the landscape present barriers to dispersal and which promote dispersal. We have collected substantial numbers of tissue samples and DNA markers from a number of invasive species including cats, foxes, and pigs. We will make these samples available to a student seeking to develop their skills in wildlife genetics. In one of these projects, we will use population genetic analyses to determine the dispersal patterns of descendants of pigs left on Kangaroo Island in 1803 by French Explorer, Nicholas Baudin. This research project will be led by Prof Stephen Sarre and Dr Anna MacDonald.

In this project, you will:

- Work in the state-of-the-art Wildlife Genetics laboratory in the Institute for Applied Ecology
- Potentially collect tissues from road kills and other sources
- Extract DNA and genotype feral species at a number of microsatellite DNA loci
- Analyse your data in relation to key geographical features of the collection sites

Supervisors:

- Professor Stephen Sarre

Contact:

Stephen Sarre; Email: stephen.sarre@canberra.edu.au; Phone: (02) 6201 5657

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in freshwater ecology and water management.

Sediment and deicing salt effects on rivers in the Kosciuszko National Park

Salt mixed with sand is used in the ski resorts during winter to keep roads safe for resort visitors. Inevitably the salt and sand wash off into the local streams of the national park and can be damaging to aquatic biota. Resort managers need better information to decide how best to apply salt to keep drivers safe and to protect the rivers

In this project, you will:

- Get to work in the Kosciuszko National Park during winter
- Learn how salt and sediments affect stream biota
- Be involved in research that informs the management of salt and sand application in the KNP
- Learn applied freshwater ecology techniques and their application

Supervisors:

- Sue Nichols
- Trefor Reynoldson
- Other freshwater ecology staff as appropriate

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Phone: (02) 6201 5408

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in freshwater ecology and/or chemistry and water management.

Changing water level regimes in urban lakes and ponds

Constructed urban lakes provide important water quality and flood management services to urban areas. They are also highly valued by local communities for the recreational, aesthetic and conservation function they provide in an otherwise biologically impoverished environment. The values associated with urban lakes are intrinsically linked to their ecological functioning which is, in part, driven by the hydrological regimes they experience. A current proposal to diversify the urban water supply for Canberra is to harvest water from urban lakes and ponds to water public open space. This will fundamentally changing the frequency, duration and timing of the inundation experienced by the lakes edges.

In this project, you will:

- Be able to select from several areas that may interest you that are relevant to the ecological functioning of Canberra's urban lakes and ponds. These could include the influence of water level regimes on emergent vegetation population; the response of lake sediments to wetting and drying; the change in breeding sites for mosquitoes during lake drawdown and many others
- Be involved in research that informs the management of our urban water environment in the ACT

Supervisors:

- Fiona Dyer
- Other freshwater ecology staff as appropriate

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Email: Fiona.Dyer@canberra.edu.au
Phone: (02) 6201 2452

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in freshwater ecology and/or water quality and water management.

Climate change, water quality and ecological responses

The potential impact of climate change on water quantity has received attention locally and internationally, yet relatively little is known about the effects of climate change on water quality and ecological responses. Historical water quality data sets can give information about the gradual water quality changes that result from climate shifts and also assess the effects of extreme events such as fire and drought.

In this project, you will:

- Learn about the climate change predictions for south-east Australia and how they are likely to affect rivers
- Test the possible water quality responses to climate change
- Be able to focus on the ecological responses to climate change and water quality that may interest you. These could include the response of introduced fish species to changes in stream temperatures, the persistence of algal blooms in response to changed nutrient and temperature conditions; the response of periphyton to changes in nutrient and temperature conditions and many more.
- Consider how the use and management of freshwater may need to accommodate climate change

Supervisors:

- Fiona Dyer
- Evan Harrison
- Trefor Reynoldson
- Other freshwater ecology staff as appropriate

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Phone: (02) 6201 2452

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in river restoration, stream ecology and/or water management.

Ginninderra Creek Catchment Research

Ginninderra Creek is of major importance in both a local and regional context. It carries approximately one quarter of the urban water runoff from Canberra directly into the Murrumbidgee River system and then the Murray. The Ginninderra Catchment Group Inc (GCG), an umbrella group of community volunteers working the catchment of Ginninderra Creek, is focussed on advancing the health of the Ginninderra catchment through effective engagement and on-ground action. The GCG is offering the opportunity for students to conduct research in the Ginninderra Creek associated with some of the on-ground activities they are implementing.

** A competitive honours scholarship may be offered for a student to work in this area **

In this project, you will:

- Be able to select from several areas that may interest you that are relevant to the ecological processes occurring in the Ginninderra Creek Catchment. These could include the ecological and/or water quality consequences of willow removal and riparian restoration activities; stream recovery processes immediately following restoration activities;
- Work closely with staff from a local catchment group.
- Be involved in research that informs the management of our urban water environment in the ACT

Supervisors:

- Fiona Dyer
- Other applied ecology staff as appropriate

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HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in river restoration, stream ecology and/or water management.

Lachlan CMA Research

The Lachlan catchment is located in central western New South Wales and covers and area of approximately 84,700 km2. The Lachlan CMA provides advice, information, strategic planning and practical assistance to landholders in the catchment. The CMA are identifying a number of research priorities that will inform the management of their natural resources and are seeking honours students to work with them on these research priorities.

** An honours scholarship will be offered on a competitive basis for a student to work in this area **

In this project, you will:

- Be able to select from several areas that may interest you that are relevant to the ecological processes occurring in the Lachlan catchment
- Work closely with staff from a catchment management agency
- Make a contribution by conducting research that informs the management of our natural resources

Supervisors:

- Applied ecology staff as appropriate
- Lachlan CMA staff

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HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in stream ecology, restoration activities and/or water management.

Fine sediment and macroinvertebrate communities in the Lower Cotter Catchment

Fine sediment in aquatic systems has the potential to reduce the diversity and abundance of aquatic macroinvertebrates. Monitoring of turbidity in the streams of the Lower Cotter Catchment has been undertaken since 2005 providing information about the fine sediment loads related to post-fire recovery, human land use and erosion management activities. Macroinvertebrate data were collected between 2005 and 2007 and provides has the potential to provide information about the biological response to fine sediment loads. Little is known about the current macroinvertebrate populations in the Lower Cotter Catchment and how they have responded to restoration activities over the past 5 years.

In this project, you will:

- Collect data on macroinvertebrate communities in streams of the Lower Cotter Catchment
- Develop relationships between fine sediment and macroinvertebrate populations within the streams of the Lower Cotter Catchment using a combination of historical data sets and current field data.
- Be involved in research that informs the management of our urban water environment in the ACT

Supervisors:

- Evan Harrison
- Trefor Reynoldson
- Fiona Dyer
- Other applied ecology staff as appropriate

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HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in stream ecology and/or water management.

Understanding barriers to fish passage

The regulation of rivers and extraction of water for human consumption often leads to a fragmentation of physical habitats. Management focus is often directed at man made barriers, yet most rivers comprise sections that are natural barriers to the movement of fish, particularly under low flow conditions. Barriers to movement can result in genetic and demographic isolation, prevent access to spawning habitats and potentially compromise long term population persistence. Understanding the nature of the natural barriers and the flow conditions under which they persist can help target management effort.

** A competitive honours scholarship may be offered for a student to work in this area **

In this project, you will:

- Be able to select from several areas that may interest you that are relevant to understanding natural barriers to fish movement in either the Cotter River or Upper Murrumbidgee River systems. These could include understanding the hydraulic characteristics of natural barriers through details hydraulic measurements, understanding the flow conditions that result in natural barriers occurring, or mapping potential habitat fragmentation patterns.
- Be involved in research that informs the management of our water resources

Supervisors:

- Mark Lintermans/Ben Broadhurst
- Fiona Dyer
- Other applied ecology staff as appropriate

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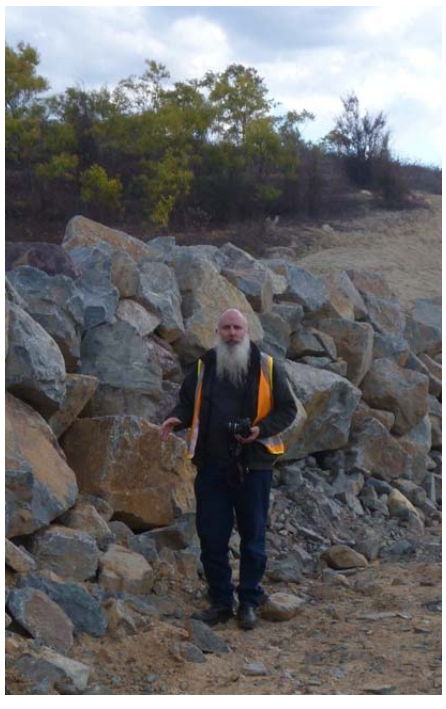

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in erosion processes, water management and cultural heritage.

Shoreline environments of Lake Victoria

Lake Victoria is a naturally occurring shallow freshwater lake adjacent the River Murray near the NSW-SA border. The Lake has important associations for Aboriginal people and is the site of numerous burials. The Murray-Darling Basin Authority (MDBA) uses Lake Victoria as an off-river storage system, as part of the River Murray System. The MDBA has been involved in an ongoing monitoring program at Lake Victoria that was implemented to assess and minimise the effect that lake regulation is having on cultural heritage that is abundant around the lake shore. As such, more than 10 years of data, including vegetation monitoring, shoreline change, inundation metrics, ground water and (limited) Cultural Heritage data has been collected.

In this project, you will:

- Work with the MDBA to define a project that will interest you that is relevant to the behaviour of the shoreline of Lake Victoria. This could involve the response of vegetation to lake regulation; the change in the shoreline over time; the relationship between groundwater and lake regulation; or many others.
- Work with work with a government partner on an important mid river storage in the Murray Darling Basin, and an important area for the local Indigenous community
- Learn applied freshwater ecology techniques and their application

Supervisors:

- Fiona Dyer
- Trefor Reynoldson
- Other freshwater ecology/cultural heritage staff as appropriate

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HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in freshwater ecology (particularly fish ecology) and water management.

Eastern Gambusia as a sentinel species for Endocrine Disrupting Chemicals

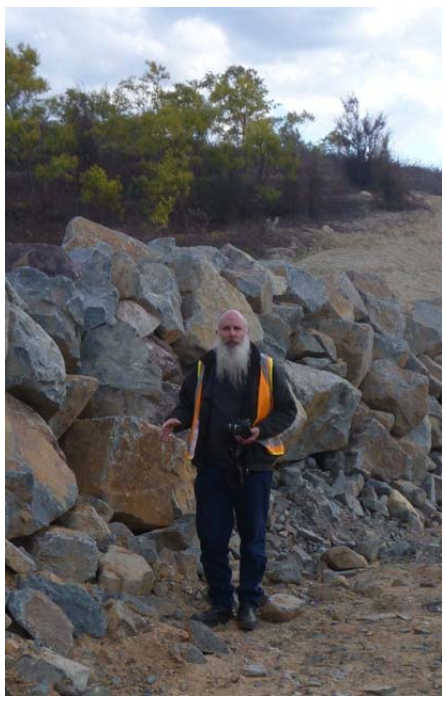
Endocrine Disrupting Chemicals (EDC's) or environmental oestrogens are causing concern worldwide for aquatic biota. EDC's have been linked to the feminisation of fish and frogs, and a common source of EDC's is sewage works. This project will examine whether Gambusia are a suitable indicator species for EDCs originating from the Lower Molonglo Water Quality Control Centre.

In this project you will:

- Students will be involved in collecting fish from a range of test and reference sites and characterising morphological abnormalites in the gonopodium of male gambusia
- Be involved in research which informs management of waste impacts on fish species
- Learn applied freshwater ecology techniques

Supervisors:

- Mark Lintermans/Ben Broadhurst
- •Other applied ecology staff as appropriate



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HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in freshwater ecology (particularly fish ecology) and water management.

The role of dams in influencing genetic structure of a sedentary fish species in an upland river

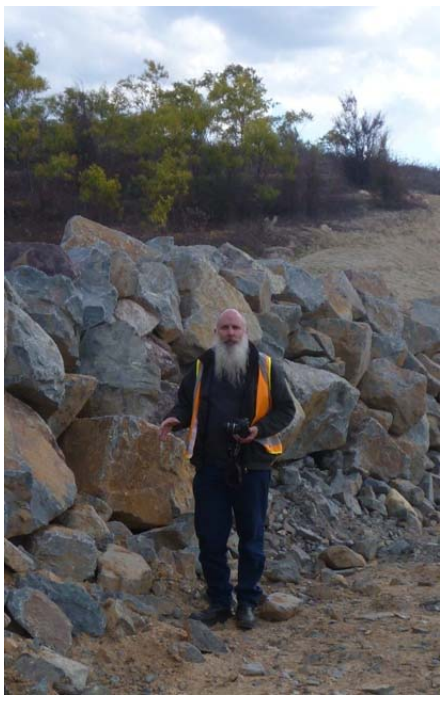
Impassable barriers to fish movement affect fish populations in a variety of ways, one of which is altering genetic structure between sub-populations. The Cotter River the only ACT catchment with a strong hold population of the locally threatened Two-spined blackfish. This species is abundant throughout the Cotter River upstream of Cotter Reservoir. Two dams and two road crossings along the Cotter River upstream of the Cotter Reservoir provide barriers to upstream movement of fish, though it is likely that some downstream dispersal occurs.

In this project you will:

- Determine the genetic diversity of sub-populations of Two-spined blackfish in the Cotter River.
- Be involved in research which informs management of how barriers influence fish populations
- Learn applied freshwater ecology and laboratory techniques

Supervisors:

- Mark Lintermans
- Tariq Ezaz
- Ben Broadhurst



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HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in freshwater ecology (particularly fish ecology) and water management.

Trophic mapping of Cotter Reservoir

The enlargement of Cotter Reservoir provides some interesting challenges to resource managers. Of particular concern for Cotter Reservoir is the population of the endangered Macquarie perch. The management of water levels in the enlarged reservoir is likely to affect food resources of Macquarie perch and other alien fish species present which may compete or prey upon Macquarie perch.

In this project you will:

- Conduct research into food webs, including both field-based and laboratory-based components.
- Be involved in research which informs management of reservoir water levels with respect to the influence on food resources for fish
- Learn applied freshwater ecology and laboratory techniques

Supervisors:

- Mark Lintermans
- Ben Broadhurst

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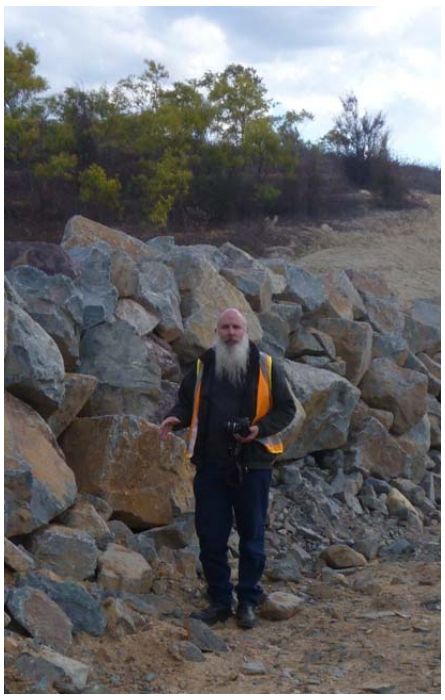

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in freshwater ecology (particularly fish ecology) and water management.

Suitability of streams in Namadgi National Park for the re-introduction of Macquarie perch

The Cotter River is home to the only self-sustaining population of the endangered Macquarie perch in the ACT. Currently, Cotter Reservoir, the species stronghold in the ACT, is being enlarged to satisfy Canberra's increasing water demands. Historically, the enlargement of reservoirs has resulted in a boom in fish stocks. If this occurs, it is feasible that some Macquarie perch stock could be translocated to streams where they once occurred (to spread the risk of extinction in the ACT).

In this project you will:

- Produce a feasibility study of the suitability of streams in Namadgi National Park for the re-introduction of Macquarie perch
- Be involved in research which informs management of options for securing the long term future of an endangered fish species
- Learn applied freshwater ecology and laboratory techniques

Supervisors:

- Mark Lintermans
- Ben Broadhurst

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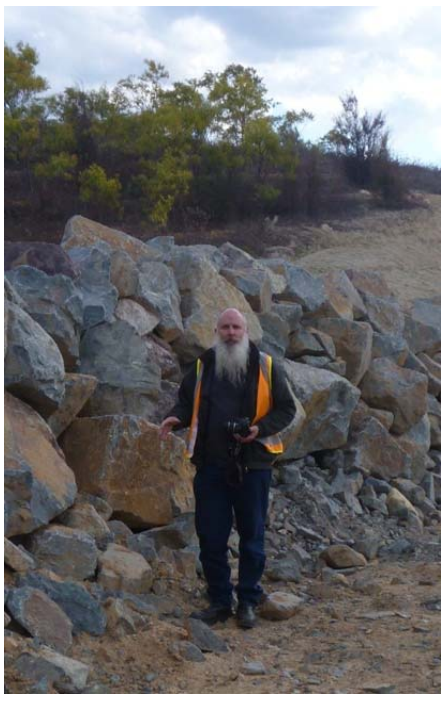

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in freshwater ecology (particularly fish ecology) and water management.

Cormorant foraging behaviour around newly inundated artificial habitat

The enlargement of Cotter Reservoir is likely to impact the resident endangered Macquarie perch. One likely effect is to reduce the amount of emergent macrophyte habitat the species uses to avoid predation. To combat this, large-scale roll out of constructed rock reef habitat has been employed, to help mitigate predation of Macquarie perch by cormorants. One possible downfall of having concentrated high-quality habitat is it may attract increased attention of predators.

In this project you will:

- Determine whether cormorants selectively forage around constructed habitats.
- Be involved in research which informs management of predator prey interactions
- Learn applied freshwater ecology techniques

Supervisors:

- Mark Lintermans
- Ben Broadhurst

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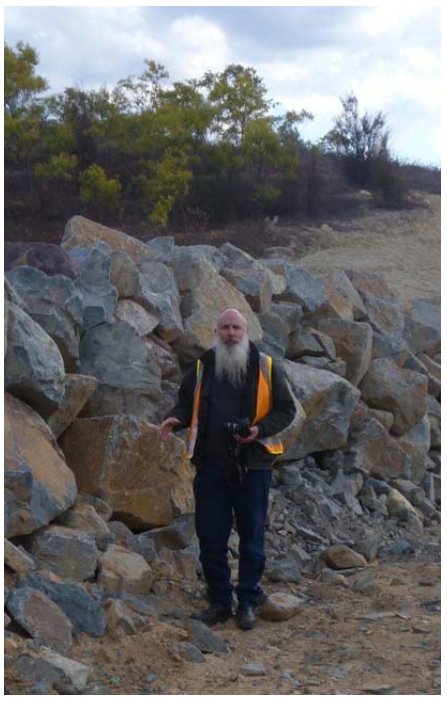

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in freshwater ecology (particularly fish ecology) and water management.

Determination of spawning time of Macquarie perch in the upper Murrumbidgee River

Environmental flows are being released from Tantangara Reservoir specifically to improve reproduction in Macquarie perch. However, the time of spawning is unknown for the upper Murrumbidgee, and so timing of environmental flows may not be optimal. This project will determine the age of Macquarie perch collected by sites along the upper Murrumbidgee River. Information gained about this critical life history feature will be used for better management of the upper Murrumbidgee River population of this endangered fish species.

In this project you will:

- Determine spawning and recruitment behaviour of an endangered fish species.
- Be involved in research which informs management of endangered species
- Learn applied freshwater ecology techniques

Supervisors:

- Mark Lintermans
- Ben Broadhurst

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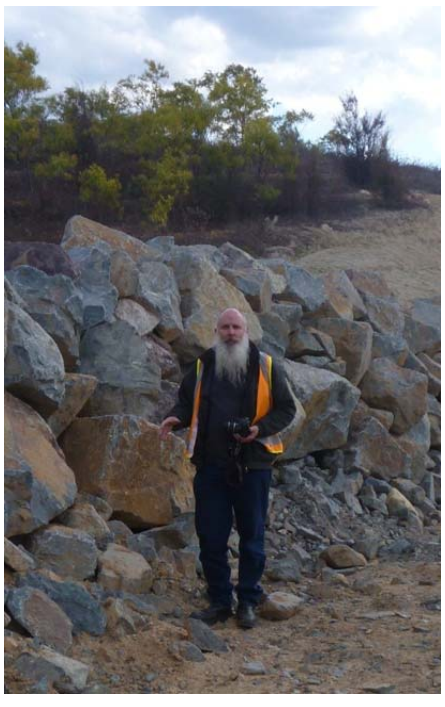

HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in freshwater ecology and water management.

The Cotter River is a major source of water for Canberra. The river is regulated by three dams: Cotter Dam, Bendora Dam and Corin Dam and is subject to the ACT Environmental Flow Guidelines. Many years of biological assessment of environmental flow has produced an extensive hydro-ecological dataset. The approach taken in this project will involve data mining of existing long-term datasets and analysis to better understand the flow-ecology relationships. Development of ecological response models will help predict the ecological outcome of managed river flows.

** A competitive honours scholarship may be offered for a student to work in this area **

In this project, you will:

- Contribute to the understanding the flow and ecological responses that will inform the setting of environmental flows and improve river health. Be able to select from several areas that may interest you that are relevant to the ecological functioning of the Cotter River. These could include developing flow-ecological response models, investigating the effects of changes in food sources for invertebrates and fish, or researching the effects of different flow regimes on the algae, invertebrates and fish – and others.
- Use historical data to examine ecological minimal flow requirements and impacts of high flow events for various biological components
- Be involved in research that informs the management of environmental flows in the ACT
- Learn applied freshwater ecology techniques and their application

Supervisors:

- Sue Nichols
- Trefor Reynoldson
- Other freshwater ecology staff as appropriate

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HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

This project would suit a student with interest and knowledge in evidence-based decision-making for environmental management.

Evidence-based decision making to improve environmental management outcomes

Environmental science currently lags behind medical research in the systematic assessment of evidence to improve management outcomes through increased confidence in causal inferences. Furthermore, evidence-based decision making is an Australian Government policy that has little in the way of any formal mechanisms to enable it. This project could facilitate the uptake of evidence-based evaluation in environmental management, and make better use of the extensive published research. Evidence-based practice (using causal criteria analysis) has great potential to improve the way we manage the environment, where management decisions are routinely based on expert opinions.

In this project, you will:

- Research the applicability of a 'causal criteria' approach to various fields of ecology (depending on your area of interest) through the application of case studies.
- Ensure the robustness and transferability of this new method to various areas of environmental science.
- Contribute to the development of an ecological ontology and provide valuable research to ensure applicability of an ecological ontology.
- Learn more about the innovative 'causal criteria' approach to environmental assessment.

Supervisors:

- Sue Nichols
- Other Institute for Applied Ecology staff as appropriate

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HONOURS PROJECT IN APPLIED SCIENCE

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

Using simulated data to establish effects thresholds

Setting decision criteria in environmental assessment with macro-invertebrates is typically done using a 95% level or a similar analogous value based on the old standard of p 0.05. However, such decision criteria do not take into account the much greater natural variability of ecological systems, and thus the power required to detect such a change or in fact the implications of failing to detect a difference if it exists (Type 2 error). Conversely, setting such a simple decision level does not consider the implications of identifying a difference when it does not exist (Type 1 error). With actual data there is no real way of knowing with absolute certainty if an invertebrate sample is different to reference or control. However with simulated data the degree of change is known with absolute certainty. Therefore, by creating artificially disturbed (SIMPACT) data sets it is possible to examine the sensitivity of various analytical methods.

In this project, you will:

- Examine methods for simulating effects data using historic data sets
- Identify two or three environmental stressors of your choice
- Create artificial date sets with known degrees of change
- Use univariate and multivariate approaches to determine effects levels

Supervisors:

- Trefor Reynoldson
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