THE UNIVERSITY OF WESTERN AUSTRALIA

Student Research Projects 2019

School of Biological Sciences

WELCOME

As biologists, we are passionate about how living organisms – plants and animals – live, work, sense the world around them, communicate, reproduce, and can be managed, conserved and restored in threatened environments, as well as how they provide clues to advance medical science and treatment. We are also committed to the communication of science to the public and external stakeholders.

Our researchers tackle grand challenges in the laboratory and at field sites across the globe, studying plants and animals in natural as well as managed environments, including below and on the ground and in the air as well as in fresh and marine waters. We use a wide range of techniques spanning scales from molecular and genetic to individuals as well as to populations and higher order ecosystems.

Ecology & Conservation

We research how animals and plants interact with other species and with their physical environment. This fundamental ecological understanding is required to conserve endangered species and protect their habitats with effective, evidence-based methods. Our research takes us to habitats from suburban backyards to deserts and the depths of the sea.

Evolutionary Biology

Our research explores evolutionary responses to selection at the phenotypic and genomic level, with the broad aim of discovering how organisms adapt to their changing environment. CEB takes a multidisciplinary approach to explore selective processes acting on the morphological and life-history traits of whole organisms and their gametes. We have particular expertise in acoustic signalling, predator-prey interactions, visual ecology, sperm competition, chemical ecology, and the genetic mapping of complex traits.

Science Communication

Science communicators bridge the gap between those researching and working in Science Technology Engineering and Maths (STEM) and the public. Science communicators work with researchers, scientists, technologists, engineers, mathematicians, medical professionals, business and industry, policy-makers and members of the public to engage different communities in discussion about important scientific issues, to enhance understanding and help us all make better decisions about our future priorities

Neuroscience and Neuroecology

Comparative neurobiology and neuroecology aims to decipher how different species perceive and process sensory input from the natural world, under different environmental conditions. Our high quality research attracts the next generation of young scientists interested in animal behaviour, sensory processing and the conservation of biodiversity.

Computational Biology

We address fundamental and applied questions in biology using methods and tools from mathematics, statistics and computer science. Using methods such as computational simulation modelling, bioinformatics and big data algorithms we investigate a range of issues including the evolution of resistance to biocides in weeds, coral and seagrass growth patterns and the maintenance of diversity in ecological communities.

Many projects are available across more than one Honours/Masters Stream/Specialisation. Students are encouraged to contact prospective supervisors directly to discuss the project and find out about additional projects not currently listed in this booklet.

Meet our Teaching and Learning Team

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Potential Postgraduate Projects 2018

School of Animal Biology

We are passionate about animals and study how they live, work, have sex and sense the world around them. We study animals in the natural and managed environments including below and on the ground and in the air as well as in fresh and marine waters. We are also passionate about the communication of science to the public and external stakeholders and work towards sustainable and ethical food supplies, help to protect threatened environments, and provide clues to advance medical sciences and treatments.

We undertake research projects not only in Australia but also globally.

The School's research expertise is far-reching and diverse, spanning five major Disciplines: Evolutionary Biology, Ecology & Conservation Biology, Livestock Science, Neuroscience, and Science Communication. As such, we place great value not only in research but also in research-led teaching and external engagement. The School focuses on an integrative approach to fundamental problems that can make a significant contribution to the solution of outstanding scientific and societal problems in the following discipline areas;

Ecology & Conservation

We research how animals interact with other species and with their physical environment. This fundamental ecological understanding is required to conserve endangered species and protect their habitats with effective, evidence-based methods. Our research takes us to habitats from suburban backyards to deserts and the depths of the sea

Evolutionary Biology

Our research explores evolutionary responses to selection at the phenotypic and genomic level, with the broad aim of discovering how organisms adapt to their changing environment. CEB takes a multidisciplinary approach to explore selective processes acting on the morphological and life-history traits of whole organisms and their gametes. We have particular expertise in acoustic signalling, predator-prey interactions, visual ecology, sperm competition, chemical ecology, and the genetic mapping of complex traits.

Science Communication

Our research explores evolutionary responses to selection at the phenotypic and genomic level, with the broad aim of discovering how organisms adapt to their changing environment. CEB takes a multidisciplinary approach to explore selective processes acting on the morphological and life-history traits of whole organisms and their gametes. We have particular expertise in acoustic signalling, predator-prey interactions, visual ecology, sperm competition, chemical ecology, and the genetic mapping of complex traits.

Neuroscience

Neurological conditions make up one third of global disease burden, yet there are few effective treatments. We aim to understand brain structure and function with the goal of promoting functional recovery in various neurological conditions including developmental brain disorders, traumatic injury and neurodegenerative diseases. Our research covers key areas including abnormal brain development; clinical trials for spinal cord injury and neurotrauma.

Neuroecology

By researching the nervous and sensory systems of animals we are discovering how animals detect light, chemicals, sound and other environmental cues, as well as finding ways to explain abnormal brain development and treat traumatic neural injury in humans. Our work extends from animal behaviour and neuroecology, via fundamental neuroscience, to clinical trials, and encompasses animals from insects and crabs, to mammals and sharks.

Students are encouraged to contact prospecitve supervisors directly to discuss the project and find out about additional projects not currently listed in this booklet.

SUPERVISORS	TOPIC	LEVEL
Prof Jacqui Batley jacqueline.batley@uwa.edu.au	Evolution of disease resistance genes Plant disease resistance genes play a critical role in providing resistance against pathogens. The largest families of resistance genes are the nucleotide binding site and leucine rich repeat genes (NBS-LRRs) and receptor like proteins (RLPs). Hundreds of these genes are present within the genome, however the evolutionary history of these genes is not fully understood. Genome wide identification of these genes within and between species allows a study of which genes are core to a species or family and which have variable roles. This project aims to identify all these genes within Brassica species and wild relative species, perform comparative analysis within and between the species and provide an understanding of the evolution of these genes	Honours Masters PhD
Prof Jacqui Batley jacqueline.batley@uwa.edu.au	Association and localization of NBS-LRR genes with disease resistance QTL Plant NBS-LRR (Nucleotide Binding Site-Leucine Rich Repeats) genes are important genetic components of the resistance defence mechanisms. The association and co-localization of NBS-LRRs and disease resistance QTL is a common feature of plant genomes. This project will review and assess the correlation between disease resistance QTL intervals and NBS-LRR resistance genes in Brassica napus. QTL intervals for resistance to clubroot, downy mildew and blackleg disease in B. napus will be identified and classified. Results will provide evidence on NBS-LRR distribution and clustering throughout the genome and determine if the clusters tend to be more linked and associated with disease resistance QTL. Further investigation of the similarity/divergence in sequence and gene content of these QTLs will help elucidate their conservation and evolution	Honours Masters PhD
Prof Jacqui Batley jacqueline.batley@uwa.edu.au	Genomics of Plant pathogen interactions Research on the interactions between plants and pathogens has become one of the most rapidly moving fields in the plant sciences, findings of which have contributed to the development of new strategies and technologies for crop protection. A good example of plant and pathogen evolution is the gene-for-gene interaction between the fungal pathogen Leptosphaeria maculans, causal agent of Blackleg disease, and Brassica crops (canola, mustard, cabbage, cauliflower, broccoli, Brussels sprouts). The newly available genome sequences for Brassica spp. and L. maculans provide the resources to study the co-evolution of this plant and pathogen. The aim of this project is to use next generation sequencing technologies to characterise the diversity and evolution of these genes in different wild and cultivated Brassica species. This will involve phenotypic analysis of the disease in a variety of cultivars and species and association genetics to link to the phenotype	Honours Masters PhD
Dr Bruno Buzatto, bruno.buzatto@uwa.edu.au A/Prof Joseph Tomkins joseph.tomkins@uwa.edu.au	Male dimorphism and sexual conflict Male dimorphism usually reflects alternative reproductive tactics among males: the large male morphs typically guard females or reproductive territories and have more elaborate weaponry; the small male morphs sneak copulations and have reduced weaponry. In the bulb mite *Rhizoglyphus echinopus* , fighters have a thick and sharp pair of legs and kill rival males, whereas scramblers search for unguarded females. We have colonies of bulb mites in the lab that have been under artificial selection on the thickness of fighter legs for several generations. The aim of this honours project will be to assess whether selection for thicker legs in fighters generated any response in females. If so, then a sexual conflict should arise and constrain the evolution of sexual dimorphism and male dimorphism, which would be a very significant finding in evolutionary biology. The work will involve manipulating mites under the microscope and measuring their legs with image software.	Honours
Dr Bruno Buzatto, bruno.buzatto@uwa.edu.au A/Prof Joseph Tomkins joseph.tomkins@uwa.edu.au	Selection for larger weapons and fight performance Male dimorphism usually reflects alternative reproductive tactics among males: the large male morphs typically guard females or reproductive territories and have more elaborate weaponry; the small male morphs sneak copulations and have reduced weaponry. In the bulb mite *Rhizoglyphus echinopus* , fighters have a thick and sharp pair of legs and kill rival males, whereas scramblers search for unguarded females. We have colonies of bulb mites in the lab that have been under artificial selection on the thickness of fighter legs for several generations. The aim of this project will be to assess whether selection for thicker legs in fighters generated coevolutionary responses in fighting performance. If so, we will have gathered the first direct evidence for the positive effect of thick legs in winning fights in mites! The work will involve setting up and observing male-male fights bewteen mites under the microscope and measuring their legs with image software.	Honours Masters

Karen Bell karen.bell@csiro.au karen.bell@uwa.edu.au	Detecting the floral fingerprint of biocultural dispersal Ancient anthropogenic influences are often not well considered in studies on biogeography and community ecology, yet ancient dispersal events may well have left a significant and detectable influence on present day community assemblages. This project will examine potential ancient human-mediated species dispersal into and around northern Australia.	Masters PhD
Karen Bell karen.bell@csiro.au karen.bell@uwa.edu.au	Tracing the introduction history of invasive plants. The movement of plant species from one place to another is a significant anthropogenic impact. Following introduction to a new location, plant species can become invasive, threatening the environment, agricultural productivity, and access to Indigenous cultural sites. Understanding the dispersal pathways that have led to the introduction of invasive species can allow for better management, as well as preventing future invasions. This project will use evolutionary genetics and phylogeography to determine geographic origin and introduction pathways for invasive plants in Australia.	Honours Masters PhD
Karen Bell karen.bell@csiro.au karen.bell@uwa.edu.au	Using DNA metabarcoding to detect plant-pollinator interactions. Pollination is an essential ecosystem service but can be difficult to directly observe. New methods using DNA metabarcoding may help to determine which plants are being visited by which pollinator. This project will use a combination of traditional field observations, microscopic analysis of pollen, and DNA metabarcoding of pollen, to detect plant-pollinator interactions.	Honours Masters PhD
Dr Cecile Dang cecile.dang@dpird.wa.gov.au Prof Jacqui Batley Jacqueline.batley@uwa.edu.au	Investigation of microorganisms associated with health issues in pearl oysters Pinctada maxima from northern Australia The pearl oyster industry is one of Australia's most valuable and iconic fisheries, creating significant economic and employment opportunities across Northern Australia. However, as with any major animal production industry, health issues are persistent obstacles inhibiting productivity. Since 2006, the pearl oyster (Pinctada maxima) farming industry in Western Australian has been hampered by health and productivity issues with no identified cause(s). This project aims to characterise active microorganisms (fungus, bacteria, virus) in moribund oysters in order to understand which ones are associated with health issues. Our laboratory has collected unique samples since June 2017 from moribund and healthy adult and spat pearl oysters, which will be used in this study. This molecular work will involve next-generation sequencing (extraction of nucleic acid, library preparation, etc.) and bioinformatics analysis. .	Honours Masters

Dr Cecile Dang cecile.dang@dpird.wa.gov.au Prof Jacqui Batley Jacqueline.batley@uwa.edu.au	Pathogenicity of Vibrio spp. in pearl oysters Pinctada maxima from northern Australia The pearl oyster industry is one of Australia's most valuable and iconic fisheries, creating significant economic and employment opportunities across Northern Australia. However, as with any major animal production industry, health issues are persistent obstacles inhibiting productivity. Since 2006, the pearl oyster (Pinctada maxima) farming industry in Western Australian has been hampered by health and productivity issues with no identified cause(s). Bacteria belonging to Vibrio alginolyticus clade have been associated with moribund oysters and can harbour plasmids, which contain virulence genes and may be responsible for the pathogenicity of the bacteria. This project proposes to characterise the virulence factors of Vibrio alginolyticus and assess which environmental factors enhance the pathogenicity. This work will involve bacteriology (culture techniques), molecular biology (qPCR and next-generation sequencing), and microscopy techniques. .	Honours Masters
Raphael Didham raphael.didham@csiro.au, raphael.didham@uwa.edu.au	How do plant-insect interactions differ between native and introduced ranges? When plant species are introduced to new environments, this disrupts its ecological interactions. Projects are available examining the insect communities associated with threatening weeds in Australia, both in their native and introduced range, including fieldwork across WA.	Masters PhD
Prof Michael Douglas michael.douglas@uwa.edu.au Dr Leah Beesley leah.beesley@uwa.edu.au Prof Matt Hipsey matt.hipsey@uwa.edu.au	Do thermal associations drive the spatial aggregation of fish in dry season pools of the Fitzroy River? Dry season waterholes in intermittent rivers are important refuges for biota, including fish. These waterholes are typically supported through the dry season by the influx of cool groundwater. Water resource development that lowers the water table and reduces the depth of refuge pools may impact the suitability of these habitats for fish. This study will map the depth and temperature of a number of pools using GPS data-logger technology. Sonar will also be used to map the location of fish during different times of the day (dawn, midday, dusk, night). Temperature-related changes in fish habitat use will be assessed by examining the extent to which fish spatial positioning is linked with temperature. This project will contribute the determining the environmental flow requirements of the Fitzroy River, and is part of National Environmental Sciences Program.	Honours Masters
A/Prof Jon Evans, jonathan.evans@uwa.edu.au	Uncovering trade-offs between pre- and postcopulatory sexual selection Males are expected to balance their investment into gaining matings (pre-copulatory sexual selection) and fertilisations (post-copulatory sexual selection) according to the resources available for investment into reproduction. However, trade-offs may only be apparent when resources limit a male's ability to invest maximally into these successive episodes of sexual selection. But where are the tipping points that determine whether such resource allocation trade-offs occur? Research opportunities at either PhD or Honours level are available to address this question, using experimental and quantitative genetic approaches in the guppy Poecilia reticulata.	Honours Masters PhD
A/Prof Jon Evans, jonathan.evans@uwa.edu.au Dr Rowan Lymbery rowan.lymbery@uwa.edu.au	Can environmental effects on sperm distort patterns of genetic variation in offspring fitness? Over the last decade or so we have come to realise that sperm can be highly sensitive to environmental variables, and that these effects can have profound influences on offspring fitness. In this project, you will have the opportunity of designing an experiment that explores these effects in the mussel M. galloprovincialis. By incorporating an experimental approach (where sperm are exposed to different environmental treatments) within a quantitative genetic breeding design (North Carolina II), you will determine how much variance in offspring fitness can be attributable to environmental effects (i.e. due to changes in the sperm environment prior to fertilization) and additive genetic effects (i.e. due to the sire's intrinsic genetic 'quality'). The results from this project could have profound implications for studies that use quantitative genetic approaches to estimate genetic variation in offspring traits without considering the possible role of sperm-moderated paternal effects.	Honours

A/Prof Jon Evans, jonathan.evans@uwa.edu.au Dr Rowan Lymbery rowan.lymbery@uwa.edu.au	Can ocean pH influence gamete signalling mechanism in broadcast spawning marine invertebrates? Mussels have proved to be superb models for understanding the role that egg chemoattractants (chemical cues realised by eggs to attract sperm) play in moderating gamete interactions. Evidence from our lab has shown that in M. galloprovincialis egg chemoattractants selectively attract sperm from genetically compatible males, a process we term 'differential sperm chemotaxis'. However, the efficacy of egg chemoattractants to effectively exert this form of 'gamete choice' may depend on the chemical environment in which sperm chemotaxis occurs. In this project, you will determine whether seawater pH (acidity) influences gamete signalling processes in mussels, and thus evaluate the extent to which predicted changes in ocean chemistry may disrupt critical processes that moderate reproduction in marine invertebrates.	Honours
Assoc/Prof Patrick Finnegan patrick.finnegan@uwa.edu.au E/Prof Hans Lambers hans.lambers@uwa.edu.au Dr Kosala Ranathunge kosala.ranathunge@uwa.edu.au	Nutrient acquisition in Hakea prostrata (Proteaceae) The Proteaceae (banksia, grevillea, etc.) are incredibly well adapted to the nutrient poor soils of Western Australia. Our model plant is Hakea prostrata (Proteaceae), a plant that grows on some of the poorest soils in the world. We are identifying the genes that control the novel up-take and transport of the essential nutrients phosphate and nitrate around Hakea prostrata and are involved in the profound nutrient use efficiency of this plant. You will conduct plant physiological experiments and make use of our in-house Hakea prostrata genome sequence and RNAseq data, which you will supplement with your own quantitative PCR results.	Honours Masters
Assoc/Prof Patrick Finnegan patrick.finnegan@uwa.edu.au E/Prof Hans Lambers hans.lambers@uwa.edu.au Dr Kosala Ranathunge kosala.ranathunge@uwa.edu.au	Leaf nutrient use efficiency – Delayed leaf greening in Proteaceae The trait of delayed leaf greening displayed by many iconic Proteaceae (banksia, grevillea, etc.) is an adaptation to maximise leaf number for plants growing on some of the most nutrient-poor soils on earth. We are identifying the genes involved in delayed greening in Hakea prostrata so that we can investigate thier usefulness in creating more fertiliser-efficient crop plants. You will investigate important physiological traits that define delayed greening by conducting plant physiological experiments in Hakea prostrata and making use of our in-house Hakea prostrata genome sequence and RNAseq data, which you will supplement with your own quantitative PCR results.	Honours Masters
Assoc/Prof Patrick Finnegan patrick.finnegan@uwa.edu.au E/Prof Hans Lambers hans.lambers@uwa.edu.au Dr Kosala Ranathunge kosala.ranathunge@uwa.edu.au	Computational bioinformatics – Understanding traits in the extremophile plant Hakea prostrata (Proteaceae) We have a large amount of genomic DNA and RNA sequencing data from Hakea prostrata, a plant that is very well adapted to the harsh, extremely nutrient poor soils of southwestern Australia. This project involves mining our datasets to improve our understanding of the genetic modules that allow this plant to prosper under these extreme conditions. We are particularly interested in nutrient acquisition and metabolism, especially of phosphorus and nitrogen, because this plant has a unique way of interacting with these nutrients that differs from all other plants studied in any detail.	Honours Masters
A/Professor Lindy Fitzgerald lindy.fitzgerald@curtin.edu.au	Limiting damage following mild traumatic brain injury Traumatic injury to the central nervous system has serious and long-term functional consequences. We have demonstrated that oxidative stress in the cells that make the myelin required for efficient functioning of the nervous system is associated with disruptions to myelin structure and chronic functional loss. Here we will use a model of repeated mild traumatic brain injury/concussion and assess the mechanisms of damage to myelin and the contribution of inflammatory cells both at the site of injury and remotely. We will assess therapeutic strategies designed to limit myelin changes, including combinations of ion channel inhibitors and anti-oxidants	Honours PhD

Dr Jan Hemmi jan.hemmi@uwa.edu.au	Heart rate monitoring of aquatic invertebrates Heart rate is well known as an indicator of physiological 'state', activity and stress in animals such as mammals, including humans. Heart rate varies similarly in invertebrates such as crabs and molluscs, providing a method to monitor the animals to determine their state of physiological stress (e.g. in response to pollutants), to optimise husbandry for welfare reasons, or to maximise growth rates in aquaculture. We have constructed a small electronic package comprising an infrared (IR) light emitting diode (LED) and IR detector that can be mounted on the shell of a mollusc or carapace of a crab and used to monitor heart rate with minimal impact on the animal. We will use this to measure the affect of physico-chemical environmental conditions such as dissolved oxygen tension, temperature, and pH on aquatic invertebrates including farmed animals such as abalone and marron. We will also investigate heart rate in the context of marine invertebrates with complex behavioural repertoires and/or that live in environmentally highly varying conditions (e.g. fiddler crabs).	Honours Masters PhD
Dr. Jan Hemmi jan.hemmi@uwa.edu.au	Comparative colour vision and spatial vision in ants Ants have some of the smallest brains in the animal kingdom, yet they show a wide range of interesting behaviours, many of them visually driven. Their small size and limited head and eye space has forced them to optimise their visual system in very distinct ways. We have recently shown that one of the Australian bull ants, a species exclusively active in the dark of the night, has trichromatic colour vision like humans. As this is the first ant that has been shown to have more than two spectral photoreceptor types, this project will compare ants from different phylogenetic branches in order to understand the evolution of colour vision and spatial vision in ants in general. This project runs in collaboration with researchers from Macquarie University and will use a range of complementary techniques (physiology, behaviour and possibly molecular biology).	Honours Masters PhD
Dr. Jan Hemmi jan.hemmi@uwa.edu.au	How fiddler crabs see the world This project aims to understand how animals, in particular fiddler crabs, see their world. Using a mix of behavioural, physiological and anatomical experiments, we seek to understand how these animals see colours, patterns and polarisation, and how these visual capabilities influence how these crabs interact with their environment, their predators and conspecifics. Experiments will be conducted using our resident UWA fiddler crab colony, housed in a 4 m^2 fully-functional artificial mudflat. You will discover how sensory information underpins animal behaviour, learn how to probe the visual capabilities of animals and, depending on your interests and abilities, learn different combinations of behavioural and physiological and possibly genetic techniques.	Honours Masters PhD
Dr. Jan Hemmi jan.hemmi@uwa.edu.au	Escape responses in fiddler crabs How do animals decide when to escape from an approaching predator? We are trying to understand the sensory information animals underlying this decision. The results will tell us how animals measure risk and how they manage to avoid being eaten while still being able to feed and find mates. Fiddler crabs are highly visual animals that live under constant threat of predation from birds. Field experiments have shown that the crabs are not able to measure a predator's distance or their direction of movement – a problem they share with many other small animals. You will bring fiddler crabs into the laboratory and their escape decisions will be tested in our artificial mudflat (at UWA) and/or on a custom made treadmill controlled conditions. Depending on your interests, you can use a combination of behavioural and physiological measurements to understand the mechanisms underlying the crab's escape behaviour.	Honours Masters PhD
Dr. Jan Hemmi jan.hemmi@uwa.edu.au	Eye movements for high resolution in fiddler crabs The compound eyes of arthropods such insects and crustaceans are well known for their low spatial resolution. By our visual standards, almost all these animals seem to have a hopelessly blurry view of the world. This low spatial resolution is due to the optical design of their eyes: in particular the relatively broad angular sensitivity of the ommatidia – the individual photoreceptor elements of the eye – and the interommatidial angle – the way in which each ommatidia's line of sight differs from that of its neighbour. If each ommatidium looks in a very different direction, it is inevitable that the whole eye's view will lack spatial detail. Unless, that is, arthropods have evolved a way to overcome this problem. In machine vision, a technique of subpixel interpolation is used to increase the resolution of an imaging system or camera. This is done by taking several images of a scene but shifting the image sensor slightly for each image. You will use macro high speed video to investigate whether fiddler crabs move their eyes in a way that would enable them to employ such sub-ommatidial interpolation.	Honours Masters PhD

Dr. Jan Hemmi jan.hemmi@uwa.edu.au	Comparative eye anatomy We have recently developed an exciting new tool to measure the visual field of animals with compound eyes, such as ants and bees. MicroCT is a technique that uses x-rays to image eyes on a very fine spatial scale. We have now developed unique new software to analyse these 3D images and reconstruct how the eyes sample the world. This has never been done before. The output will be a much improved understanding of how animals see their world and much detail they can see. The speed and accuracy of this technique will allow you to compare numerous eyes and can form the basesused for a comparative study of fiddler crab eyes, or to compare the eyes of a range of other animals groups such as ants. For a PhD project, this could involve developing a new staining technique to investigate neural connections in the intact eye, to see how neurons are	Honours Masters PhD
Dr Jan Hemmi jan.hemmi@uwa.edu.au Prof Shaun Collin shaun.collin@uwa.edu.au	Reaction of marine invertebrates to sound Sound travels well underwater and underwater sounds is increasingly recognised as a form of pollution that has impacts on a wide range of animals. Little is known, however, about the affect of sound on marine and estuarine invertebrates. This project will investigate the reaction of marine invertebrates such as crustaceans and aquatic insect larvae to sound. Experiments will include analyses of in situ natural sound recorded with hydrophones in the Swan River, observations of invertebrate behaviours in reaction to these sounds, and sound play-back experiments.	Honours Masters PhD
Dr. Jan Hemmi jan.hemmi@uwa.edu.au Dr Zahra Bagheri zahra.bagheri@uwa.edu.au Callum Donohue callum.donohue@uwa.edu.au	Risk assessment and decision making in fiddler crabs Risk assessment and decision-making is an essential process for animal survival. In natural environments, animals are constantly exposed to several threating stimuli at any one time. It is not clear how animals make escape decisions in these situations. Do animals identify the most dangerous threat and organize their escape accordingly? Or do they try to escape from all threatening stimuli at the same time? To answer these questions, this project aims to study fiddler crabs escape response to multiple simultaneous threats. The study will test the effect of different stimulus characteristics such as visibility and speed on the crabs' risk assessment and decision-making process. The results will not only improve our understanding of how animals escape predators, but may also contribute to technologies such as robotic rescue.	Honours Masters
Dr. Jan Hemmi jan.hemmi@uwa.edu.au Dr Zahra Bagheri zahra.bagheri@uwa.edu.au Anna-Lee Jessop anna-lee.jessop@uwa.edu.au	Diurnal modulation of colour vision in fiddler crabs Unlike in humans, the colour vision of fiddler crabs has been shown to involve a shift in spectral sensitivity towards longer wavelengths over the course of each day, making them more sensitive to 'red' light in the late afternoon. At night their eyes reset to have more shortwave 'blue' sensitivity once again. We assume that coloured 'screening' pigments that move within the eye are responsible for this shift, but this has never been shown. This project will use Electron Microscopy to examine the position of these screening pigments within the crabs' eyes at different times of the day and will correlate their position with physiological measurements of the crabs' spectral sensitivities. The results will show how these animals adjust their perception of colour and light sensitivity throughout each day.	Honours Masters
Dr. Jan Hemmi jan.hemmi@uwa.edu.au Dr Huon Clark huon.clark@uwa.edu.au	The importance of fiddler crab burrows Fiddler crabs have intricate mating behaviours designed to lure potential partners to mate. Some species mate in the male burrow, while others employ a tactic known as surface mating, whereby the female returns to her own burrow. In some species the males search for a partner, in others, the females do. Different species have different burrow structures and there are differences between male and female burrows in at least some species. Are burrow structures linked to mating tactics? How do mixed species populations partition the mudflat into territories and what impact does this have on sediment structure and population dynamics? By taking burrow casts of multiple species we can answer some or all of these questions.	Honours Masters

Dr. Jan Hemmi jan.hemmi@uwa.edu.au Dr Tim Langlois tim.langlois@uwa.edu.au Dr Huon Clark huon.clark@uwa.edu.au Callum Donohue callum.donohue@uwa.edu.au	Taking the pulse of crustaceans – monitoring heart rate in response to environmental changes Non-invasive measurements of physiological parameters can provide important insights into how short or long-term environmental changes impact on the health of species, populations, or individuals. The focus of this project is to test whether it is possible to use a small-scale optical heart rate monitor to understand (1) the impact of changes in environmental conditions such as temperature, water salinity and PH, or (2) stress - brought about by handling, transportation or exposure to dummy predators on the heart rate of either fiddler crabs or western rock lobsters. The outcomes of the study will help improve animal husbandry and transportation (rock lobster) or aid our understanding of how species respond behaviourally and physiologically to environmental stressors (fiddler crabs).	Honours Masters
Dr. Jan Hemmi jan.hemmi@uwa.edu.au Anna-Lee Jessop anna-lee.jessop@uwa.edu.au	The function of the lobula plate in crustaceans The lobula plate is an optic neuropil (part of the brain) found in many species of arthropods. It has been extensively studied in dipterous insects such as blowflies, where its role is to process large-field motion information used for controlling gaze (optomotor responses). Blowflies use this information to stabilize themselves when moving, especially in flight. However, the functional significance of the lobula plate in crustaceans remains unknown. This study will aim to further understand the relationship between the lobula plate and the optomotor behaviour in crustaceans, by comparing behavioural measurements of eye stabilisation and Micro-CT (x-ray) measurements of the lobula plate structure in a range of crustacean species.	Honours Masters
Tommaso Jucker tommaso.jucker@csiro.au tommaso.jucker@uwa.edu.au	Home and away: generating management solutions for plant species that are both rare natives and threatening invasives. Non-native species often exhibit the peculiar tendency of becoming dominant and invasive in their new habitat, while at the same time being rare or even threatened in their native range. Projects are available to explore what processes create this biogeographic quandary, determine what impact such invasions are having on native biodiversity and ecosystem functioning, and identify solutions for managing for both control and conservation, depending on the location.	PhD
Tommaso Jucker tommaso.jucker@csiro.au tommaso.jucker@uwa.edu.au	Taking the pulse of the Great Western Woodlands from a mile up. The Great Western Woodlands are the world's largest Mediterranean woodland ecosystem. These woodlands play a central role in regulating carbon and water fluxes across the entire region, in addition to which they are a global hotspot for biodiversity. This project will combine data from an intensively-monitored field station with state-of-the-art airborne remote sensing to develop a platform for monitoring carbon dynamics in these unique woodlands using unmanned aerial vehicles (UAVs).	Masters
Tommaso Jucker tommaso.jucker@csiro.au tommaso.jucker@uwa.edu.au	Understanding the ecology of Mesquite to manage its impacts in the Pilbara. Mesquite (Prosopis sp.) is regarded as one of Australia's most threatening invasive weeds due to its current and potential future economic and environmental impacts. This project will make use of an unparalleled dataset documenting the precise location of over a million individual Mesquite trees monitored over multiple years in the Pilbara to better understand what drives population dynamics in the region and what management interventions are most effective for controlling this threatening invasive.	Masters
Professor Gary Kendrick gary.kendrick@uwa.edu.au Dr. Elizabeth Sinclair elizabeth.sinclairi@uwa.edu.au	Seagrass adaptation and acclimation responses to extreme climatic events: genomics and gene expression Extreme climatic events are predicted to become more frequent and severe, causing rapid ecosystem change, the scale of which is likely to be greater than that caused by a gradually changing climate. This project takes an interdisciplinary approach that incorporates whole plant growth, physiology and gene expression responses to explore interactions of multiple stressors to extreme events under predicted climate change scenarios.	Honours Masters PhD

Prof Hans Lambers hans.lambers@uwa.edu.au Asst/Prof Matthias Leopold matthias.leopold@uwa.edu.au Dr Kosala Ranathunge kosala.ranathunge@uwa.edu.au Dr Hongtao Zhong hongtao.zhong@uwa.edu.au	Phytogeography of Declared Rare Flora species at Great Brixton Street Wetland or Alison Baird Reserve? The Great Brixton Street Wetland, located in the Perth metropolitan, however harbors an extraordinary high biodiversity within the Swan Coastal Plain. The long-term interactions between alluvial/colluvial inputs from Darling Range on the east and coast sand dune development from the west have given this seasonal wetland area a unique combination of geography and hydrology. These significantly contribute to the existence of such biodiversity, and provide a fortunate ecological niche for many rare flora species. Some species only restricted to certain areas, but why? The potential Honours or Masters project are aimed to answer this. Field and glasshouse experiments will be conducted to investigate the distribution of selected rare flora species in relation to soil and water resources.	Honours Masters
Dr Rowan Lymbery, rowan.lymbery@uwa.edu.au A/Prof Jonathan Evans jonathan.evans@uwa.edu.au	What are the molecular mechanisms of gamete interactions and gamete signalling? The funciton of sperm cells appears deceptively simple: to successfully fuse with an egg. As such, sperm have long been considered DNA-delivery machines with fixed phenotypes. However, there is growing evidence that the post-ejaculatory environment can result in striking changes to sperm phenotypes. For example, evidence from our lab has revealed that sperm of broadcast spawners differentially modify their swimming behaviour when they detect chemical cues from eggs of different females. Nevertheless, the question of how these phenotypic adjustments occur remains unresolved. A variety of projects in our lab aim to uncover the molecular and genetic mechanisms that underlie the responses of sperm to environmental signals. These projects would be well-suited to students with some molecular laboratory experience.	Honours Masters PhD
Emily Polla emily.polla@dbca.wa.gov.au Associate Professor Shane Maloney shane.maloney@uwa.edu.au	The Enigma of the Echidna – copulatory behaviour, mate selection and activity levels Perth Zoo has a successful short-beaked echidna breeding program, with 10 individuals hatched over the last 10 years, yet the copulatory behaviour of the echidna remains largely unknown. Echidnas have some interesting mate selection behaviours and while echidna 'trains' have been documented in the wild, little is known about how echidnas select mates when given access to multiple potential partners in a zoo environment. Using CCTV footage and accelerometers (provided by Perth Zoo) this project aims to uncover the secrets of echidna mate selection and copulatory behaviour. Activity levels of echidnas will also be recorded during breeding and non-breeding periods to determine if breeding behaviour influences echidna activity, as well as further examining echidna activity in zoo environments. This project will be available as an honours project through the School of Anatomy, Physiology and Human Biology at the University of Western Australia in 2018, co-supervised by Associate Professor Shane Maloney (UWA) and Research Assistant Emily Polla (Perth Zoo).	Honours
Prof Jessica Meeuwig jessica.meeuwig@uwa.edu.au	Changes in scale of coral bleaching in the British Indian Ocean Territory. The 2016 El Nino swept the world's oceans causing unprecedented rates of coral bleaching globally. Reports in October 2016 suggest that 80% of corals in the northern Great Barrier Reef are dead as a result of this warming event. Some evidence suggests that corals recover from bleaching faster when in fully protected marine protected areas (MPA). As part of a fish survey using baited remote underwater video systems (BRUVS) we have habitat data from the British Indian Ocean Territory MPA pre and post the 2016 bleaching event. This project would examine (1) whether BRUVS be used to detect bleaching and (2) the chance in incidence rate of bleaching pre event and at two points post bleaching.	Honours
Professor Jessica Meeuwig jessica.meeuwig@uwa.edu.au	Detecting coral bleaching from baited remote underwater visual imagery Assessment of coral bleaching largely relies on either aerial surveys of *in situ* underwater visual census. Our large data set of baited remote underwater video systems (BRUVS) provides an opportunity to score the scale of bleaching globally and also through time at key locations. This project involves developing a new technique for quantifying bleaching based on BRUVS and analysing spatial and temporal patterns.	Masters
Professor Jessica Meeuwig jessica.meeuwig@uwa.edu.au	Environmental DNA in pelagic environments This project would develop a protocol for obtaining eDNA samples in Western Australiafor pelagic species, that would include contributing to a global library of bar codes for pelagic species.	Masters PhD

Prof Jessica Meeuwig jessica.meeuwig@uwa.edu.au Prof Christine Erbe (Curtin)	Cross-shelf patterns in fish biodiversity at Bremer Basin. The Bremer Basin has been identified as a "hotspot" of diversity, supporting an iconic aggregation of orcas. The degree to which this area also is a hotspot for area is a fish hotspot is however unknown. Towed video imagery has been collected at numerous locations in the area and this project will focus on (1) assessing the information generated by towed video an d (2) interpreting this in terms of regional diversity.	Honours
Dr Jane Prince jane.prince@uwa.edu.au	Karajini Inter-Tidal Reef Project A unique opportunity to engage with the indigenous custodians of the shore between Roebuck Bay and 80 mile beach. This project is not the typical honours project, incorporating aspects of citizen science and science communication. Its main objectives are: 1. Initiate activities to gain baseline biodiversity data on karajarri sea country – initially intertidal reefs (but also interested in mangroves, seagrass and intertidal creek systems). 2. Build capacity of rangers and community members to undertake these activities 3. Establish an ongoing monitoring program that can detect changes due to natural and anthropogenic events. 4. Compare biodiversity as well as management practices at other locations in the West Kimberley	Masters Honours
Dr Jane Prince jane.prince@uwa.edu.au	Cygnet Bay 1. Survival of oyster spat following settlement This project aims to understand the survival of oyster spat in the weeks following settlement and how this is influenced by the surrounding conditions, including the presence of its own and other species. 2. Structure of the biofouling community on pearl oyster panels The objective of this project is to understand the nature of the biofouling assemblage to investigate if there is any possible use for this by-product of the industry. Both projects will require a long stay at the Cygnet Bay Research station, interactions with traditional owners and volunteer interns.	Honours Masters
Dr Jane Prince jane.prince@uwa.edu.au	The recruitment and survival of periwinkles on intertidal shores around Cape Leeuwin Anecdotal evidence suggests numbers of periwinkles and other high shore macroinvertebrates have decreased in areas outside a fenced-off section of shore, relative to numbers inside. Whether this is due to differences in recruitment, post-settlement mortality or some anthropogenic impact such as trampling or harvesting is unknown. This project would begin to investigate the causes of this difference with descriptive surveys and manipulative experiments. This project will involve a lot of field work and the student will require a C class driver's licence.	Honours Masters
Prof Bradley Pusey bpusey@westnet.com.au Dr Leah Beesley leah.beesley@uwa.edu.au Prof Michael Douglas michael.douglas@uwa.edu.au	Do thermal associations drive the spatial aggregation of fish in dry season pools of the Fitzroy River? Dry season waterholes in intermittent rivers are important refuges for biota, including fish. These waterholes are typically supported through the dry season by the influx of cool groundwater. Water resource development that lowers the water table and reduces the depth of refuge pools may impact the suitability of these habitats for fish. This study will map the depth and temperature of a number of pools using GPS data-logger technology. Sonar will also be used to map the location of fish during different times of the day (dawn, midday, dusk, night). Temperature-related changes in fish habitat use will be assessed by examining the extent to which fish spatial positioning is linked with temperature. This project will contribute the determining the environmental flow requirements of the Fitzroy River, and is part of National Environmental Sciences Program.	Honours Masters

Dr Kosala Ranathunge kosala.ranathunge@uwa.edu.au E/Prof Hans Lambers hans.lambers@uwa.edu.au Assoc/Prof Patrick Finnegan patrick.finnegan@uwa.edu.au	Understanding the traits of cluster- and non-cluster-roots in Proteaceae plants The ancient, highly-weathered and severely nutrient-impoverished landscapes of south-western Australia are home to an enormous diversity of vascular plants, and one of the world's hotspots for diversity of the Proteaceae family. The extremely low concentration of P in these soils is often unavailable to plant roots. Almost all Proteaceae are non-mycorrhizal. Instead, they develop 'cluster' roots that exude carboxylates, a remarkable morphological and physiological adaptation that chemically extracts P from P-impoverished soil. However, roots of plants usually undergo intense sealing, depositing suberin and lignin. These barriers protect roots against pathogens and they also have antifungal properties. However, successful carboxylate exudation by cluster-roots of Proteaceae would require a lack of perfect sealing. Absence of perfect barriers would be risky for the plant, due to an increased exposure and vulnerability to pathogens. Do Proteaceae roots have other mechanisms to fight against pathogens? Why don't they have mycorrhizal colonisation? We will explore, how these roots maximise P acquisition and stress tolerance at anatomical, physiological, biochemical and genomic levels.	Honours Masters PhD
Dr Cristina E Ramalho cristina.ramalho@uwa.edu.au	Biodiversity and human-nature connection considerations in urban forest management Urban forests are vital for climate change adaptation and mitigation, human wellbeing, and biodiversity conservation in cities. Although socio-ecological values are normally identified as primary drivers of urban forest management, they are often not properly, if at all, taken into account in the actual decision-making process for tree species selection. This socio-ecological study aims to provide insight and guidance on how to better cater for biodiversity and human-nature connection values in urban forest management. A first component of this project will analyse how biodiversity and human-Nature connection values are considered in other cities located in global biodiversity hotspots. A second component of the project, will survey actors in urban forest management in the Perth Area to understand among others: 1) the biodiversity and social-ecological aspects that they perceive as relevant in urban forest management, 2) the challenges and dilemmas they face when trying to address those aspects in decision making, 3) how those aspects influence practical decision-making on the ground, and 4) the knowledge gaps perceived. Project of the Clean Air and Urban Landscapes hub.	Honours Masters PhD
Dr Cristina E Ramalho cristina.ramalho@uwa.edu.au	Ecological benefits and functional gaps in native plant palettes commonly used in urban greening Urban greening often relies on a limited pallet of native and non-native plants that are 'proven performers' and have a range of traits that makes them suitable for urban green spaces. While biodiversity conservation is normally presented as a key reason for the use of native plants, often little thought is put into what ecological functions may be provided by and which native fauna may benefit from a particular plant pallet. Urban plantings have the potential to provide several ecological functions to a variety of native bird, reptile, and arthropod functional guilds. However, the limited range of native plants likely means that their potential for biodiversity conservation is not fully realized. This study aims to understand the biodiversity conservation value of native plant pallets used in urban greening in the Perth Metropolitan Area, and how these pallets could be improved so to cater for a wider range of biodiversity values. The study examines 1) the native fauna functional guilds that are known to or that could use the urban environment (with focus on species with positive or neutral interactions with people); 2) the range of native plants commonly used in urban plantings and that are available in commercial nurseries, the ecological services they provide and the taxa and functions they support; 3) which functional groups are not supported by those plant pallets; 4) candidate species to fill the identified gaps, based on the analysis of local remnant plants, and plant lists provided by specialized native nurseries and volunteering groups (WA Wildflower Society and Friends of Kings Park). Project in collaboration between the Clean Air and Urban Landscapes hub and Kings Park Science	Honours Masters PhD

Dr Kosala Ranathunge kosala.ranathunge@uwa.edu.au E/Prof Hans Lambers hans.lambers@uwa.edu.au	Grevillea thelemanniana: what determines its very narrow distribution and why is it so rare? Grevillea thelemanniana (Proteaceae) is a Declared Rare Flora species with a very narrow distribution. It is easy to grow in a garden, yet can be found in only very few natural habitats. Alison Baird Reserve is one of very few locations where this species occurs naturally, on swampy sites, alongside with two other Proteaceae, Banksia telmatiaea, swamp fox banksia. However, we cannot explain the distribution of G. thelemanniana simply by its water relations, because the two co-occurring Proteaceae (Banksia telmatiaea and Hakea sulcata) have much wider distributions, albeit restricted to wet habitats. Other soil factors are likely responsible for the narrow distribution of G. thelemanniana. The aim of the project is to discover what soil and plant traits determine the extreme rarity of Grevillea thelemanniana. The main outcome of the project will be a thorough understanding of the specific requirements of a rare species which has important implications for the management of species associated with Muchea limestone.	Honours Masters PhD
Dr Amanda Ridley amanda.ridley@uwa.edu.au	Conflict and cooperation in group-living species Western Australian magpies live together in cooperative groups in which they help one another to raise young, defend resources and repel predators. They interact regularly and as a result, not only do they cooperate, but they also come into conflict. The Magpie Project based here at UWA is a long-term research project that studies the behaviour of ringed, habituated magpies in 12 different groups. We use these groups to ask a number of questions regarding cooperation, conflict, communication and cognition. Because this is a long-term study, students are expected to join a collaborative research team, and to work in the field with the magpies. There are many questions that can be asked of the magpies (becasue of the amount of data we can collect on them), but most questions will be based around the themes of: the causes and consequences of cooperation, the complexity of vocal communication, parental care and offsrping development, parent-offspring conflict, population dynamics and viability. Students are encouraged to contact me for the the specific research areas they are interested in among those listed and I will give furhter details of the projects avaialble	Honours Masters PhD
Professor Leigh Simmons leigh.simmons@uwa.edu.au+A56:C58	Sexual selection and sperm competition Research opportunities are available to explore the role of pre-copulatory and post-copulatory sexual selection in the evolution of male and female reproductive behaviour and morphology. We seek to understand how life-history trade-offs affect male allocation of resources to the weapons and ornaments of mating competition and sperm production for competitive fertilization success. These questions can be addressed in a variety of taxa from insects to humans, and using a variety of approaches, from comparative morphology to genetics.	Honours Masters PhD
Professor Leigh Simmons leigh.simmons@uwa.edu.au	Paternal effects on offspring performance. Although offspring are known to resemble their parents through the action of genes, there is now a growing awareness of non-genetic mechanisms by which parents can affect the growth and health of their offspring. This project aims to quantify the putative role of the social environment on so-called non-genetic inheritance. Using an insect model, the research aims are to identify proteins in the seminal fluid that promote early embryo development, explore how males allocate these proteins to their mates, and how females adjust their own reproduction in response to seminal fluid proteins.	Honours
Professor Leigh Simmons leigh.simmons@uwa.edu.au	Traumatic insemination in plant bugs In traumatic insemination (TI), males use hypodermic genitalia to inject sperm into the female through the side of her abdomen, bypassing her genitalia. This project will use plant bugs in the genus Coridromius to examine sexual conflict arising from TI. Experiments might include but are not limited to: determining the costs of TI to females; measuring the immune response of females to TI; studies of mating behaviour/mate choice; identifying the sperm pathway through the female bloodstream. The project will involve collaboration with researchers at the WA Museum.	Honours Masters PhD

Professor Leigh Simmons leigh.simmons@uwa.edu.au Dr. Jan Hemmi jan.hemmi@uwa.edu.au	The costs of male weaponry: are males with enlarged weapons visually impaired Male dung beetles invest in horns which are used in battles over access to tunnels and the females breeding within. However, some males do not develop horns or fight for access to females, but rather sneak copulations guarded by horned males. Males that develop horns compromise the development of their eyes. This project will compare the visual capabilities of minor and major males using a combination of anatomical, physiological and behavioural methods. You will learn how to make electroretinogram measurements to assess the beetles' visual acuity and light sensitivity and correlate these findings with anatomical predictions based on 3D microCT measurements of the beetles' eyes.	Honours
Dr Miriam Sullivan miriam.sullivan@uwa.edu.au	How private is the public domain? Most universities consider that all posts made to public online discussion boards are in the public domain. Therefore, people's posts on the internet are able to be used as research data without needing specific consent from the poster.While researchers are sensitive to the potential ethical issues involved and have suggested guidelines for use of public posts, we do not know if people understand the implications of posting in the public domain or if they would consent to their data being used if they did know. In this project, you will explore people attitudes and emotional responses to the use of their social media posts for research purposes.	Masters Honours
Dr Miriam Sullivan miriam.sullivan@uwa.edu.au	Employment outcomes for science communication students Employers specifically look for good communication skills when hiring science students. However, we don't know specifically which communication skills or theoretical knowledge is important for employers who are specifically looking to hire science communication specialists. In this project, you will explore what science communication employers (eg. museums, science centres, zoos, government, etc) view as desirable graduate outcomes for potential employees.	Masters Honours
Dr Greg Skrzypek grzegorz.skrzypek@uwa.edu.au Dr Mat Vanderklif mat.vanderklift@csiro.au	Ecology of feral predators at Ningaloo: Feral cats and foxes are a threat to fauna along the Northwest Cape, including to hatchling turtles. This project will work with DBCA (Department of Biodiversity, Conservation and Attractions Western Australia) to understand what these predators eat, and will use the stable nitrogen and carbon isotopes and stomach content. This is a collaborative project with CSIRO.	Masters
Dr Greg Skrzypek grzegorz.skrzypek@uwa.edu.au Dr Mat Vanderklif mat.vanderklift@csiro.au	Refining methods for studying trophic ecology of sharks: Understanding the trophic ecology of sharks is useful for a range of reasons. We typically use the stable nitrogen and carbon isotope compositions to study them, but the methods used are sometimes vague and imprecise. This project will attempt to understand and refine methods for studying sharks using stable isotopes. This is a collaborative project with CSIRO.	Masters
A/Prof Erik Veneklaas erik.veneklaas@uwa.edu.au Dr Paul Drake paul.drake@uwa.edu.au	Water and CO2 transport in relation to stomatal distribution Why do fast-growing crops and drought-tolerant trees, very different plant types, have pores on both sides of their leaves, when the vast majority of plants don't? This project aims to assess the (dis)advantages of having stomata (leaf pores bound by guard cells) on both leaf sides (amphistomaty), rather than on one side (hypostomaty), and determine how these traits relate to the leaf's specific micro-climate. This knowledge will provide novel insights into the functional diversity of plants, direct plant breeding targets and contribute to the fundamental understanding of plant transpiration and photosynthesis, two processes that regulate the global exchange of water, CO2 and energy.	Honours Masters
Bruce Webber bruce.webber@csiro.au, bruce.webber@uwa.edu.au	Identifying vulnerabilities to improve the management of threatening weeds. Improvements in weed management can be achieved through a greater understanding of plant ecophysiology and plant-ecosystem interactions. Projects are available, depending on the interests of the applicant, including fieldwork across WA, interstate and overseas	Masters PhD

Professor Philip Withers philip.withers@uwa.edu.au Dr. Christine Cooper c.cooper@curtin.edu.au	What controls insensible evaporative water of mammals and birds? The insensible evaporative water loss (non-thermoregulatory evaporative water loss, EWL) has traditionally been considered to be a passive biophysical process, not under physiological control, but we have recently shown that it is regulated by mammals (dasyurid marsupials) and birds (parrots). This project will measure the effect of ambient relative humidity on the insensible EWL of a mammal or bird, and investigate the biological control of its regulation, either water conservation at low humidities or facilitation of thermoregulation at high humidities.	Honours Masters
Professor Philip Withers philip.withers@uwa.edu.au Dr. Christine Cooper c.cooper@curtin.edu.au	Comparison of thermal imaging and spot-lighting as tools for nocturnal mammal surveys Environmental researchers have typically used spotlights or head torches as the primary technique for non-invasive fauna observations and surveys of nocturnal fauna. In recent years, thermal technology has advanced and there are now commercially available high quality thermal scopes. But, are they as good as a spotlight or a head torch in determining abundance, based on distance sampling (now widely used to determine relative abundance based on transect searches). Distance sampling techniques will be used to test the comparative efficacy of these relatively new thermal imagery devices compared with traditional spotlighting in relatively open areas (e.g. pastures) and in open Banksia and eucalypt woodlands, which are both typically found on the Swan Coastal Plain. The project will involve collaboration with a local environmental consulting company.	Honours Masters
Professor Dirk Zeller dirk.zeller@uwa.edu.au	Fisheries in Indian Ocean Rim countries Science and policy on Indian Ocean fisheries are heavily skewed towards industrial tuna fisheries, yet most Indian Ocean Rim countries gain domestic food security, livelihoods and economic benefits from domestic non-tuna fisheries within their Exclusive Economic Zone waters. These coastal fisheries, however, are often heavily under-valued and under-represented in fisheries science and policy at the national and regional level, as they are often dominated by marginalized small-scale fisheries. As part of the international Sea Around Us - Indian Ocean research initiative (www.seaaroundus-io.org), students will engage in country-level or ocean-basin scale aspects of fisheries data science. These types of projects could be especially interesting for students that have links to or interests in specific countries in the Indian Ocean basin, or are excited by the concept of big-data science or meta-analysis in an interdisciplinary setting. The Sea Around Us – Indian Ocean collaborates closely with the global Sea Around Us initiative (www.seaaroundus.org) and the interdisciplinary Global Fisheries Cluster (http://global-fc.oceans.ubc.ca/) at the University of British Columbia in Vancouver, Canada, and with FishBase (www.fishbase.org) and SeaLifeBase (www.sealifebase.org) hosted in the Philippines. Most Sea Around Us research does not involve field-based data collection, as we emphasize the utility of pre-existing large databases for enhancement through data gap assessments and large-scale meta-analyses. An open and keen mind, critical thinking skills and a curiosity about fisheries data science is all that is required, but if you also have meta-analysis or computer coding skills…. all the better.	Masters PhD