SUPERVISORS	TOPIC	LEVEL	IMAGE
Dr. Renee Catullo renee.catullo@uwa.edu.au	**Genomics of naturally fragmented bird populations** A PhD project interested in genomic approaches to styding naturally fragmented bird populations is available. This project would be co-supervised by Leo Joseph (CSIRO), and if successful, a top-up to the scholarship is available through CSIRO. The questions on the project are flexible, but the focus would be Kimberley and Top End taxa such as endemic pigeons, honeyeasters, friarbirds, grasswrens, and shrike-tits. SW endemic species may also be a focus.	**PhD**	
Prof Jacqui Batley jacqueline.batley@uwa.edu.au	**Evolution of disease resistance genes** Genome sequencing is changing our understanding of biology and evolution, with implications for agriculture. However, a reference genome does not represent a species' diversity. Through sequence analysis of many individuals of a species (pan genomics) we can identify genes that are conserved or different within and between species. Brassicas constitute the world's main vegetable and oil crops; however pathogens lead to substantial yield loss, and the cultivated species contain little diversity for identification of novel resistance sources. This project will focus on characterising resistance genes across wild Brassica species and study their evolution and selection. An understanding of the diversity of the genes and how they affect disease resistance will help in the design of novel plant protection strategies and significantly increase crop yields.	**Honours** **Masters** **PhD**	
Prof Jacqui Batley jacqueline.batley@uwa.edu.au **Dr Jing Li** jing.li@uwa.edu.au	**A novel biotechnological approach to protect crops from insect pests** New approaches are required to control insect pests which cause enormous global crop losses. Phytophagous insects are incapable of synthesizing cholesterol. Cholesterol is a precursor of the molting hormone. Insects rely on converting host phytosterols to cholesterol. There are stringent structural demands on phytosterols used as substrates, therefore some phytosterols cannot be utilized by insects. This important pest-host interaction provides a unique platform from which to explore the opportunity for a new insect pest control strategy. The project aims to develop a novel technology which is achieved by modifying plants to produce non-utilizable sterols. The plants with modified sterols will unable to support insect growth & reproduction but will nevertheless function normally in plants. The specific aims are to modify canola plant sterols by overexpression/knock-out (using Crispr technology) of novel sterol biosynthetic genes, or by exploiting natural variation in sterols already present in canola and introgressing non-utilizable sterols from other Brassicaceae species.	**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**	
Prof Jacqui Batley jacqueline.batley@uwa.edu.au **Dr Emma Dalziell** emma.dalziell@uwa.edu.au	**RNA integrity in seeds of wild species stored in conservation seed banks** The storage of seeds in seed banks is an important conservation strategy for many wild plant species. However, for most wild species, we have a very limited understanding about their actual lifespan under storage conditions i.e. whether we can expect seeds to survive for 10 years or thousands of years. Currently, we rely on germination testing to ascertain viablility loss in a seedcollection, however this can be difficulty (due to complex dormancy and germination requirements), time consuming (somethimes months), wasteful of precious seed resources (using 100s of seeds), and results only in a binary answer of "yes" or "no" to whether the seed is alive. It has recently been shown that RNA integrity in crop seeds co-correlates with a loss in seed viability, may provide much more detailed information about the effect of aging on a seed lot, and can be done with as little as 5-10 individual seeds. Utilising the historical seed collection at Kings Park and working in the Batley lab at UWA, this project focuses on protocol development for RNA extraction and assessment of integrity in seeds of wild WA species and then seeks to apply this methodology to aged seeds (both in realt-time, and under accelerated aging conditions).	**Honours** **Masters**	
Prof Dave Edwards dave.edwards@uwa.edu.au	**Machine learning in biology** Machine learning, including deep learning, has revolutionised the analysis of large datasets in biology, allowing biologists to understand complex phenomena. The Applied Bioinformatics group at UWA is a 100% computational group that uses machine learning approaches in genomics and plant breeding. The majority of data the group works on comes from plant genomics and plant breeding. Projects include analysis of genomics data using Natural Language Processing machine learning approaches, crop phenotype prediction using deep learning, or drone and satellite image analysis using convolutional neural networks. Candidates are expected to have a good understanding of biology and rudimentary Linux skills, ideally with some experience in data science-style analyses. Candidates will receive training in the use of high-performance computing. Please contact Dave Edwards to discuss specific opportunities.	**Honours** **Masters** **PhD**	

Dr Heather Bray heather.bray@uwa.edu.au	**Media framing of scientific issues** The media has an important role in shaping people's understanding of scientific issues. Framing is when certain aspects of a story are made more or less prominent, or when particular types of metaphors are used to help audiences understand a story, but it can also influence **how** a story is understood. In this project, you are free to pursue an issue of your choice (eg coronavirus, the recent bushfires) and you will learn both qualitative and quantitative research techniques grounded in the social sciences to find out how the scientific issue is being 'made public' in Australia.	**Honours** **Masters** **PhD**	
Dr Heather Bray heather.bray@uwa.edu.au	**Public understanding of scientific issues** To improve conversations between experts and non-experts about scientific issues, it is important to understand how attitudes, perceptions, and understandings about scientific issues are shaped by social and cultural factors. What do people really think about scientific issues and why do they think that way? Are these understandings barriers to behaviour change? In this project you are free to choose a topic that you are interested in. Both qualitative and quantitative research methods can be used to explore public understandings of scientific issues.	**Honours** **Masters** **PhD**	
Assoc Prof Joseph Tomkins joseph.tomkins@uwa.edu.au	**Male dimorphism and sexual selection** 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. These mites are amenable to studies of evolution through sexual selection, evolutionary genetics, behavioural bcology and experimental evolution. I'm happy to chat (endlessly) about all the possibilities.	**Honours**	
Dr Belinda Cannell belinda.cannell@uwa.edu.au **Dr Renae Hovey** renae.hovey@uwa.edu.au	**Population characteristics of Little Penguins in King George Sound, Albany** The largest colony of Little Penguins in Western Australia was located, until recently, on Penguin Island. However, this colony has reduced by more than 50% in the last decade, largely attributed to a reduction in local fish abundance due to a warming trends in water temperature as well as increasing interactions with watercraft. Sadly, a population viability analysis based on current survival and breeding success has identified that the colony will be extinct within 40 years. There are other colonies on offshore islands in SW WA, close to a major shipping port in King George Sound . However, there is very limited information on the population ecology of the penguins in this region. This project will investigate some key population characteristics of the Little Penguins with the aid of artificial nestboxes that will be monitored regularly throughout the breeding season.	**Honours** **Masters**	
Dr Belinda Cannell belinda.cannell@uwa.edu.au **Dr Harriet Paterson** harriet.paterson@uwa.edu.au	**Does Chasmanthe, a bulbous plant, inhibit the habitat utilised by Little Penguins on Mistaken Island?** Little Penguins inhabit Mistaken Island, a DBCA -managed nature reserve, near Albany in SW WA, however there is limited data related to their ecology on the island. A study undertaken in 2020 identified many of the natural burrows utilised by the penguins. However it was noted that although *Chasmanthe* , a vigorous bulb from South Africa, was patchily distributed on the island, the density and height of it changed throughout the year, making it extremely difficult to walk through. Given that weeds such as Marram grass have been shown to inhibit penguins from being able to access, and dig burrows, in previously inhabited areas, it is thought that the *Chasmanthe* may have a similar impact on Mistaken Island. This project will investigate the density of *Chasmanthe* associated with penguin nesting habitat and document its change throughout the year. These data will support recommendations for the management of this weed.	**Masters**	
Dr Emma Dalziell emma.dalziell@uwa.edu.au **Dr David Merritt** david.merritt@dbca.wa.gov.au	**Predicting seed lifespan for the improved curation of conservation seed banks** The storage of seeds in seed banks is a primary strategy for plant conservation in the face of unprecedented biodiversity loss. However, recent evidence indicates the viability of seeds of many species, formerly presumed to be long-lived in low-temperature storage, declines much more rapidly than anticipated. We have several projects available for students interested in the following areas: -Using the historical seed collections at Kings Park, identifying species or collections performing poorly in storage. -Developing alternative storage protocols to improve storage stability of at-risk species, including investigations into cryogenic storage -Developing novel data analysis techniques to either characterise seed population response to time in storage or build models to predict species likely to be short-lived or problematic in storage. These projects will be primarily based out of the research facilities at Kings Park.	**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**	
Dr Tim Langlois tim.langlois@uwa.edu.au	**Developing Sea Country management protocols through combining traditional ecological knowledge of Indigenous Australians and Western Science.** Indigenous Australians have a profound connection to nature and a cultural obligation to take care of Country. As a result, Indigenous people have been sustainably managing their marine estates for millennia. There is an increasing interest in documenting and embedding traditional knowledge into marine management and monitoring yet little work has been done in developing methods and protocols to achieve these goals. This project will build upon participatory mapping methods to document knowledge of senior knowledge holders to help inform marine park and fisheries management in Western Australia.	**Honours** **Masters** **PhD**	
Prof Raphael Didham raphael.didham@csiro.au, raphael.didham@uwa.edu.au **Mariana Campos** mariana.campos@csiro.au **Dr Bruce Webber** bruce.webber@csiro.au bruce.webber@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. Ecological interactions between species are the glue that holds ecosystems together, but equally, novel interactions can threaten ecosystem resilience. Projects are available examining the insect communities associated with threatening weeds in Australia, both in their native and introduced range, including fieldwork across WA.	**Honours** **Masters** **PhD**	
Prof Dave Edwards dave.edwards@uwa.edu.au **Dr Elizabeth Sinclair** elizabeth.sinclair@uwa.edu.au **Dr Philipp Bayer** philipp.bayer@uwa.edu.au	**Comparative Genomics of Seagrass** Comparative genomics provide a powerful tool to study evolution. Marine plants, the seagrasses, are an extremely old polyphyletic group representing multiple 'return to sea' events. These independent events resulted in habitat-driven solutions to adaptation to a marine environment. A recent genome comparison among two seagrass species provided strong evidence for convergent evolution. This project will compare multiple seagrass genomes to further explore their evolution and to identify genes associated with stress responses and extreme climate events. Candidates are expected to have an understanding of Linux.	**Honours** **Masters** **PhD**	
Prof Dave Edwards Dave.Edwards@uwa.edu.au	**Applied bioinformatics** Data is increasingly abundant in biology, and being able to analyse data is fundamental to asking biological questions. The applied bioinformatics group at UWA is a dedicated computational group asking biological questions using big data and high performance computing. Projects range from genome and pangenome assembly and annotation, population analysis, trait association, evolutionary studies and crop improvement, predominantly using wild plant and crop species, though also venturing into animal and even human genomics. Candidates are expected to have a good understanding of biology and use of Linux and will recieve in training in the use of high performance computing in biology. Please contact Dave Edwards to discuss specific opportunities.	**Honours** **Masters** **PhD**	
Prof Jon Evans jonathan.evans@uwa.edu.au **Dr Rowan Lymbery** rowan.lymbery@uwa.edu.au	**Testing Bateman curves on broadcast spawning marine invertebrates:** Sexual selection can be viewed as the ultimate scientific paradigm; given certain expectations about patterns of reproductive investment (males typically invest less per reproductive event than females), we expect sexual selection to target males more strongly than females. The origins of the sexual selection paradigm can be found in Angus Bateman's classic studies of fruit flies, which showed that the relationship between reproductive success and the number of mates differed between the sexes, which Bateman attributed to the fact that female fertility is limited by egg production while males are rarely limited by the ability to produce sperm. However, theoretical models challenge these predictions for marine broadcast spawners, where sperm limitation is common and females likely compete for fertilisation opportunities. This project will provide a timely and critical re-evaluation of Bateman's principles using a series of innovative experimental approaches on broadcast spawning invertebrates (either sea urchins or mussels).	**Honours** **Masters**	
Prof Jon Evans jonathan.evans@uwa.edu.au **Dr Rowan Lymbery** rowan.lymbery@uwa.edu.au	**Egg competition in a broadcast spawning marine invertebrate:** When we think about sexual selection, and particularly competition among gametes from different individuals for fertilization opportunities, we rarely if ever think about 'egg competition'. Yet both theory and empirical data strongly support the idea that egg competition should be a pervasive evolutionary force in the sea, where gametes from both sexes are often limiting and eggs may need to compete to ensure that they are fertilized. This project is designed to fill a critical gap in our knowledge of sexual selection in marine invertebrates, many of which exhibit the ancestral mating strategy of broadcast spawning (releasing both sperm and eggs for external fertilization). The results from this study, performed on the mussel Mytilus galloprovincialis, will therefore also have far-reaching implications for sexual selection in more 'familiar' mating systems, where most studies of gamete ('sperm') competition have focused.	**Honours** **Masters**	

Assoc/Prof Patrick Finnegan patrick.finnegan@uwa.edu.au **E/Prof Hans Lambers** hans.lambers@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 up-take and transport of the essential nutrients phosphorus and nitrogen around *Hakea prostrata* and are involved in its profound nutrient use efficiency. We are particularly interested in exploring the trait of nitrate restraint, which we recently discovered in *H. prostrata*. Unlike other plants, *H. prostrata* only imports the amount of nitrate it needs to support growth. Other plants store excess nitrate in the vacuole. We are interested to learn whether convergent evolution has provided other species with nitrate restraint in our nutrient impoverished environment. Depending on the direction you decide to take, you will conduct plant ecophysiological and physiological experiments and perhaps make use of our in-house *Hakea prostrata* genome sequence and RNAseq data, supplemented with your own quantitative PCR results.	**Honours** **Masters** **PhD**	
Assoc Prof Patrick Finnegan patrick.finnegan@uwa.edu.au **Prof Elizabeth Watkin (Edith Cowen)**	**Does carbon exudation by banksia roots alter soil microbial community structure?** Most Proteaceae, such as banksias and grevilleas, produce specialised cluster roots that mine the soil for nutrients, especially phosphorus. This mining activity allows them to live on severely nutrient-impoverished soils and involves the release of large amounts of carboxylates, typically citric acid and malic acid. These carboxylates are a ready energy source for the soil microbial community. However, the impact of this source of energy on the microbial community and how this impact might be of benefit to the plant is unknown. Using molecular fingerprinting, this project will identify the differences in the prokaryotic community structure between the soil mined by cluster roots and the neighbouring soil not mined by cluster roots. Using database searches, the types of prokaryotes present will be determined, generating hypotheses about their potential impact on the plant.	**Honours** **Masters**	
E/Prof Hans Lambers hans.lambers@uwa.edu.au **Assoc/Prof Patrick Finnegan** patrick.finnegan@uwa.edu.au **Dr Kosala Ranathunge** kosala.ranathunge@uwa.edu.au	**Why do Fabaceae, Myrtaceae and Proteaceae co-dominate on the most nutrient impoverished soils on earth?** The soils of southwestern Australia are among some of the oldest and most nutrient impoverished soils on earth. They support a hyper-diverse flora that is dominated by species from three familes - Fabaceae, Myrtaceae and Proteaceae. We know much about the specific adaptations that allow the Proteaceae to live on these soils, such as cluster roots that mobilise phosphate, highly proficient phosphorus remobilisation from leaves and roots, low levels of ribosomal RNA and phospholipids in leaves, delayed greening in young leaves, preferential allocation of phosphorus to photosynthetic cells, among others. By comparison, we know very little about the adaptations that allow Fabaceae and Myrtaceae to co-dominate. This project will focus on plants in Alison Baird Reserve in Perth to investigate the ecophysiological and physiological adaptations in leaves and roots that allow members of these familes to live in nutrient poor environments.	**Honours** **Masters** **PhD**	
Dr Matthew Fraser matthew.fraser@uwa.edu.au **Dr Belinda Martin** belinda.martin@uwa.edu.au	**Saving our seagrass meadows with cutting-edge technology in environmental genomics.** Coastal ecosystems in Western Australia are facing a time of unprecedented pressures from a combination of population growth and climate change. This project will deliver impactful and innovative research in the field of environmental genomics that will increase the resolution and scale of the understanding of the processes and environmental drivers of habitat change across WA coastal systems. This project will involve sampling across several sites along the WA coastline, with a specific emphasis on Gathaagudu (Shark Bay), a World Heritage Site with important Traditional Owner, fisheries, and biodiversity significance that is under marked pressure from climate change.	**Masters** **PhD**	
Prof Pauline Grierson **p**auline.Grierson@uwa.edu.au **Svenja Tulipani (DWER)** **Dr Greg Skrzypek** **g**rzegorz.Skrzypek@uwa.edu.au **Brad Degens (DWER)**	**Managing excess nutrients in aquatic ecosystems - understanding interactions between dissolved organic matter and phosphorus-binding clays.** This research project will compare DOM adsorption by Phoslock® and HT-clay and investigate how this varies across a range of environmental conditions (e.g. salinity and P concentrations). The project will include a range of lab experiments to elucidate if particular types of DOM are preferentially retained by the clays. Outcomes from the project will help optimise both the efficacy of clay applications and also inform understanding of any potential environmental impacts of clay treatment on waterways. The project is supported by DWER will also offer the opportunity to experience fieldwork for the collection of water samples in the Mandurah region.	**Honours** **Masters**	
Dr Cyril C. Grueter cyril.grueter@uwa.edu.au **Prof Leigh Simmons** **l**eigh.simmons@uwa.edu.au	**Sexual selection in action: risk taking in humans** Sexual selection theory predicts that males will be more prone to taking risks than females and that males use risk taking as a mate advertisement strategy. These predictions can be tested by using everyday situations such as crossing a busy road. The attractiveness of physical risk taking in potential mates has received relatively little empirical attention, but can be assessed using questionnaire data.	**Honours**	
Dr Patrick Hayes patrick.hayes@uwa.edu.au	**Plants are never at rest - switching from photosynthesis during the day to respiration at night** The daily switching from photosynthesis during the day to respiration at night changes many cellular processes and consequently changes how nutrients are invested within leaves over a single day. A greater control over how resources are invested may improve whole-plant efficiency and if this can be applied to crop species then it can reduce fertiliser demand in agriculture. This project will focus on the essential plant nutrient phosphorus, as it is intrinsically involved with both photosynthesis and respiration and is a major component of fertilisers. We will investigate how the concentration of different forms phosphorus change within leaves over a 24-hour period and will compare this between slow-growing but efficient native species and faster-growing, less efficient species, both native species and crops. This project will involve both field and glasshouse work.	**Honours**	

Assoc Prof 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**	
Assoc Prof 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**	
Assoc Prof 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. Come and talk to me about the many questions we would like to answer in this context.	**Honours** **Masters** **PhD**	
Assoc Prof Jan Hemmi jan.hemmi@uwa.edu.au **Dr Zahra Bagheri** zahra.bagheri@uwa.edu.au	**The role of polarisation in navigation** Polarisation vision is used by a variety of species in many important tasks, including navigation and orientation, communication and signalling, and as a possible substitute for colour vision. Fiddler crabs possess the anatomical structures necessary to detect polarised light, and occupy environments rich in polarisation cues. Unlike many insects, however, polarisation vision is not confined to the dorsal part of the eye, but crabs have full field polarisation vision. However, it is unknown whether they can use polarisation to find their direction back home. The aim of this project is to investigate the role of polarisation vision in path integration and homing in fiddler crabs using a modified polarisation monitor in an artificial mudflat. You will learn how animals use vision to navigate and how to "ask" animals what information they use to make important decision by performing well balanced experiments in a realistic environment.	**Honours** **Masters**	
Assoc Prof 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**	
Assoc Prof Jan Hemmi jan.hemmi@uwa.edu.au **Dr Zahra Bagheri** zahra.bagheri@uwa.edu.au	**The role of polarisation in navigation** Polarisation vision is used by a variety of species in many important tasks, including navigation and orientation, communication and signalling, and as a possible substitute for colour vision. Fiddler crabs possess the anatomical structures necessary to detect polarised light, and occupy environments rich in polarisation cues. Unlike many insects, however, polarisation vision is not confined to the dorsal part of the eye, but crabs have full field polarisation vision. However, it is unknown whether they can use polarisation to find their direction back home. The aim of this project is to investigate the role of polarisation vision in path integration and homing in fiddler crabs using a modified polarisation monitor in an artificial mudflat. You will learn how animals use vision to navigate and how to "ask" animals what information they use to make important decision by performing well balanced experiments in a realistic environment.	**Honours** **Masters**	

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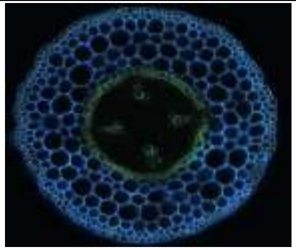
Assoc Prof Jan Hemmi jan.hemmi@uwa.edu.au **Dr Karen Osborn** osbornk@si.edu **Dr Zahra Bagheri** zahra.bagheri@uwa.edu.au	**Vision in deep sea animals** Hyperiid amphipods, small crustaceans that live in the deep, open ocean worldwide, have some of the most fascinating eyes seen in animals. In some species the eye accounts for up to 30% of the body, others have replicated their eyes, resulting in multiple eye pairs. Using our newly developed micro-CT-based technique, you will recontruct the detailed structure of the compound eyes of representative hyperiids. You will then use that data to prredict what these animals can see and which behavourial tasks have most likely driven the evolution of their eyes. There are projects here for at least three students - any number eye forms could be studied in detail, several eye forms could be compared, or you could investigate the steps leading to one of the more exrtreme eye forms, such as replicated eye pairs. You will work in a multidisciplinary team that is trying to understand what life in the largest habitat on earth (the midwater) is like in order to better understand the open ocean. You will learn about vision, phylogenetics and how to relate the structure of animal eyes and brains to their behaviour.	**Honours** **Masters** **PhD**	
Assoc Prof Jan Hemmi jan.hemmi@uwa.edu.au **Dr Zahra Bagheri** zahra.bagheri@uwa.edu.au	**Sampling the visual world** Visual systems are under strong selection pressure because they are often crucial in guiding the behaviour of animals. Physical constraints mean that an eye of a given size cannot simultaneously maximise both its resolution and sensitivity while maintaining the extent of its visual field. As a consequence, most eyes show distinct regional differences in how they allocate resolution and sensitivity. A new method, based on micro-CT, we have developed, predicts that fiddler crabs, have two parallel streaks of high resolution located just above and below the visual horizon. This is in stark contrast to previous results that such streaks of high resolution, which are very common in flat-world inhabitants, are centred on the horizon. We would like to confirm this exciting result with physiological recordings. You will learn how to measure the visual resolution of fiddler crab in different parts of the eye, using electrical recordings from the surface of the eye.	**Honours** **Masters** **PhD**	
Dr Zahra Bagheri zahra.bagheri@uwa.edu.au **Assoc Prof Jan Hemmi** jan.hemmi@uwa.edu.au	**Selective attention in the context of escape** 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**	
Assoc Prof Jan Hemmi jan.hemmi@uwa.edu.au **Dr Tim Langlois** tim.langlois@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 Renae Hovey renae.hovey@uwa.edu.au **Dr Harriet Paterson** harriet.paterson@uwa.edu.au	**Distribution of plastics in southern esturine ecosystems, Western Australia** The impact plastic is having on the marine environment is rapidly becoming the issue of the millennium. It has negative impacts on biology and degrades the visible qualities of the ocean and the coast line. The south coast of Western Australia can be considered relatively pristine yet plastic has been found in unpopulated areas. We are offering 4 projects that investigate plastic distribution and ecological impacts in esturine ecosystems which sit at the interface between land and sea.	**Honours** **Masters** **PhD**	

Prof Simon Jarman simon.jarman@uwa.edu.au	**Comparing and modeling patterns of biodiversity** Distributions of species composition and abundance can be modeled by a range of mathematical distributions. Different types of community are better described by some models than others. The aim of this project is to identify differences in the ability of mathematical predictions of species distribution to model observed biodiversity. The student will gather existing community biodiversity data from existing papers with a special focus on those that use DNA metabarcoding methods to describe biodiversity. They will then fit different models to the data under a range of parameters to determine the appropriate use of biodiversity models for environmental DNA metabarcoding analysis in particular and community types in general. The candidate should have good data analysis and scripting skills.	**Honours** **Masters**	
Prof Simon Jarman simon.jarman@uwa.edu.au **Dr Andrew Bissett** **andrew**.bissett@csiro.au	**How many species of Fungi are there in australian soils?** Soil fungi are critical for crop production and maintaining the diversity of native species. Australia has a great range of soil types and vegetation types that make it one of the most biodiverse continents for most groups surveyed so far, such as plants and animals. Fungi are more difficult to study because there are fewer taxonomic experts trained in researching them and there are many cryptic species. In this project, DNA sequence data from the CSIRO's national fungal collection survey will be used to estimate species diversity in samples from across the country. Analysis of species accumulation and cross-site occurence will be used to estimate the number of species of Fungi in Australia. The candidate should have good data analysis and programming/scripting skills in R, Python or a similar language.	**Honours** **Masters**	
Dr Jennifer Kelley jennifer.kelley@uwa.edu.au **Assoc Prof Jan Hemmi** jan.hemmi@uwa.edu.au	**Social behaviour and predation risk in freshwater fishes** Detecting and avoiding predators is an essential part of life for almost all animals. Animals make the decision of when to respond to an approaching predator based on the perceived level of risk and factors such as the presence of other group members. This project uses a native freshwater fish, the western rainbowfish (*Melanotaenia australia*), to determine whether an individual's response to a simulated threat depends on the reactions of other members of the shoal. The work will contribute towards our understanding of how information about predation risk is transmitted among members of a social group. This project will be most suited to students interested in predator-prey interations and grouping dynamics in animals.	**Honours** **Masters**	
Dr Jennifer Kelley jennifer.kelley@uwa.edu.au **Assoc Prof Jan Hemmi** jan.hemmi@uwa.edu.au	**Perception of colour patterns in freshwater fishes** Animal colour patterns (e.g. spots, stripes) are often used to thwart predators, by providing misleading information about a prey's size, shape and body movements. Although these patterns increase a prey's chance of survival, it is not clear how the colouration interferes with the predator's perceptual mechanisms to prevent attack. This project will use western rainbowfish (*Melanotaenia australis*) as predators to understand whether patterning can interfere with perception of prey shape, depth and distance from the viewer. The work will contribute towards our understanding of the function of colouration in animals and will be of particular interest to students interested in animal vision and visual perception.	**Honours** **Masters** **PhD**	
Dr Jennifer Kelley jennifer.kelley@uwa.edu.au **Assoc Prof Jan Hemmi** jan.hemmi@uwa.edu.au	**Detection of prey by fish predators** Predation risk is one of the most important factors affecting the behaviour and survival of prey animals. However, we know surprisingly little about the factors that influence the foraging behaviour of predators. The likelihood of a prey being detected depends on the colouration of the prey relative to the background. However, backgrounds can be 'noisy', consisting of complex colours and patterns, which can present a significant challenge for predators. To avoid issues of animal ethics, this project will use live fish as predators and virtual prey to examine the effect of background complexity of visual detection. The work will increase our understanding of the role of vision and colouration in predator-prey interactions.	**Honours** **Masters** **PhD**	
Dr Jennifer Kelley jennifer.kelley@uwa.edu.au **Assoc Prof Jan Hemmi** jan.hemmi@uwa.edu.au	**Decision-making and predator evasion in wild damselfish shoals** One of the main advantages of group living is a reduction in the risk of predation due to effects such as risk dilution and predator confusion. As a result, animals in smaller groups tend to display stronger antipredator responses than those in larger groups. However, defensive strategies also depend on other factors, such as nearest-neighbour distance and the distance to shelter. This project will investigate how shoals of wild damselfish respond to a looming visual threat (computer-simulated object approach) depending on the social organisation (e.g. distance and orientation of nearest-neighbour) and the size of the shoal.	**Honours** **Masters**	
Dr Jennifer Kelley jennifer.kelley@uwa.edu.au	**3D camouflage in artificial moths.** Predators and prey interact in a 3D world, but few studies have considered whether visual depth cues play a role in camouflage. For example, butterflies and moths often have wing patterning that produces the illusion of 3D form, but it is not clear if these patterns function for camouflage. This study will investigate the effect of 3D background textures on the success of different 3D camouflage strategies using wild birds as predators and artificial patterned 'moth' targets. The project will involved fieldwork in local woodlands and will involve photography and image editing techniques.	**Honours** **Masters** **PhD**	
Prof Gary Kendrick gary.kendrick@uwa.edu.au **Dr Elizabeth Sinclair** elizabeth.sinclair@uwa.edu.au	**Saving seagrass from climate change.** This project will address fitness in Posidonia, with a focus on the worlds largest plant in World Heritage site Shark Bay. There are several opportunities to develop projects around genomic diversity, sexual reproduction and sterility, and testing outcrossing in range edge populations.	**Masters** **PhD**	

Dr Jason Kennington jason.kennington@uwa.edu.au **Assoc Prof Joseph Tomkins** joseph.tomkins@uwa.edu.au	We have a number of project ideas relating to the evolutionary genetics of sexual selection. Primarily we are interested in separating the effects of different bouts of sexual selection and identifying their effects on fitness and the genome. The questions are directly relevant to Evolutionary genetics, sexual selection but also conservation and the management of species in captivity.We have a recently funded ARC discovery project and we are seeking students to help realise the objectives of theis research. The main task is understanding the difference between the outcomes of intrasexual and intersexual selection. This will involve mating trials, quantification of sexual selection and artificial selection for 'studs' and 'duds' (e.g. Dugand et al 2018,2019). These projects are focussed on Drosophila melanogaster. Topics: **1) Separating male competition and female choice.** **2) Separating the effects of pre and postcopulatory sexual selection.** **3) Testing the resurgence of Lamarck's hypothesis for the inheritance of environmentally induced variation.** **4) Manipulating the costs of male display.**	**Honours** **Masters**	
Dr Jason Kennington jason.kennington@uwa.edu.au **Rodney Duffy (DPIRD)**	**Assessing stock structure in nearshore and estuarine finfish.** The catch of nearshore and estuarine finfish from commercial and recreational fisheries in Western Australia is composed of many different species from distinct populations and sub-populations. Management of these stocks, and the definition of what constitutes a stock, is based on information related to movement, biology and existing fisheries management practices. Traditionally, a number of different techniques have been used to identify stocks, from tagging studies to determine movement and mixing, to various genetic methods. Whilst effective, these methods can prove costly and time consuming, and can lack fine scale resolution. Often these investigations have focussed on species of high value or high abundance caught within a single, or small number of fisheries. Species that are caught by many fisheries, but that don't dominate the catch of any, have been forgotten, despite the overall catch of these species being significant. To address this shortfall, we are interested in understanding stock structure of three finfish species: sea mullet (Mugil cephalus), yelloweye mullet (Aldrichetta forsteri) and tailor (Pomatomus saltatrix) using modern, cost effective techniques (SNPs), that offer fine scale resolution to understand stock structure. The outcome of this work will be of direct relevance to fisheries management within Western Australia.	**Honours** **Masters** **PhD**	
Dr Jason Kennington jason.kennington@uwa.edu.au **Jason How (DPIRD)** **Simon de Lestang (DPIRD).**	**Assessing stock structure in deep sea crabs.** Effective management of commercial fisheries requires an accurate delineation of self-sustaining subpopulations or stocks. When information on stock structure is lacking or based on arbitrary anthropogenic boundaries, stocks are susceptible to overexploitation. This can lead to a collapse of the exploited stocks, which may take considerable time to recover. The recent stock assessment of crystal crab in the SCCMF indicated an unacceptable level of stock depletion. Catches in this area have been highly cyclical unlike those on the west coast. This pattern is very similar to that of rock lobster and blue swimmer crab, whereby the main spawning stock resides on the west coast with large and consistent catches, while those on the south coast are sporadic with recruitment only flowing down in strong Leeuwin Current years. These south coast areas are considered a resource sink. Irrespective of the similarities, the south coast deep-sea crab fisheries are still managed conservatively under the assumption of self-recruiting (they are not treated as sink populations). Determination of the recruitment linkages between the west and south coast fisheries will have marked implications on the management arrangement required for both fisheries. Similarly, the WCDSCMF, which retains catch predominantly from 23-29°S, is currently managed as a single stock. However, the boundaries of the fishery extend well beyond this range, and with increasing interest in expanding the fishery, understanding any possible genetic sub-structuring within the fishery is critical to ongoing stock assessment and management. The aim of this project will be to assess stock structure in both species using genetic data generated using a genotype-by-sequencing approach.	**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 Tim Langlois tim.langlois@uwa.edu.au	**Fish-habitat associations in the nearashore environment of Western Australia** Strong and predictable relationships of fishes with seabed habitats, in conjunction with rapid advances in acoustic seabed mapping capabilities, result in great potential for using habitats as proxies or 'surrogates' to predict species distribution and abundance patterns at broad regional scales. An unbaited stereo-camera system will be used to assess different nearshore habitats (e.g. macroalgae beds, seagrass meadows, sand, etc) and quantify fish assemblages at 12 sites along the temperate coaste of western WA. Fish and habitat associations will be evaluated, at diffferent spatial scales and spatial predicition of key fish species and fish assemblages will be produced.	**Honours** **Masters**	

Dr Tim Langlois, tim.langlois@uwa.edu.au **Shaun Wilson** shaun.wilson@dbca.wa.gov.au **Thomas Holmes** thomas.holmes@dbca.wa.gov.au	**What drives change in size spectra of fish assemblages?** The structure of fish assemblages is influenced by both fishing pressure and habitat. Increased fishing typically removes large predatory species and allows proliferation of smaller bodied fish, whilst changes in structural complexity alter availability of refuge space for different sized fish. Consequently, the size distribution of fish assemblages can be linked to changes in both fishing pressure and habitat. On coral reefs habitat structure and complexity is often governed by the size and composition of the coral colonies which is also indicative of reef status with respect to disturbance history. This project will use information from stereo video to assess how the size distribution of fish and coral assemblages relate to each other. Using surveys from fished and unfished reefs and across reefs with different coral communities, the project will also explore the relative importance of fishing and habitat on the size distribution of fish.	**Honours** **Masters** **PhD**	
Dr Tim Langlois, tim.langlois@uwa.edu.au **Dr. Matt Navarro** matthew.navarro@uwa.edu.au **Dr. Jacquomo Monk** jacquomo.monk@utas.edu.au	**Monitoring highly targeted mesophotic fish populations: optimising stereo-video monitoring of large offshore no-take marine reserves** Large offshore no-take marine reserves have recently been created around Australia and New Zealand. This project will involve field work to collect baited remote stereo-video samples within no-take areas within the Ningaloo and South-west Capes region. Existing data sets will be provided from New Zealand. This project will use novel methods of power analysis to design optimal future monitoring plans to detect differences in highly targeted mesophotic grouper populations (e.g. hāpuku *Polyprion oxygeneios*) that may occur after the cessation of fishing. The student will develop skills in field work and novel statistical analyses applicable to marine park monitoring design.	**Honours** **Masters** **PhD**	
Dr Samuel Lymbery, samuel.lymbery@uwa.edu.au **Prof Raphael Didham** raphael.didham@uwa.edu.au	**What determines the outcome of battles between native and invasive ants?** Invasive ants are one of the most damaging groups of pest animals globally, and have a devastating effect on native species and ecosystems, as well as draining national economies of billions of dollars per year. We are exploring the factors that make invasive ants so ecologically dominant, and there are a number of possible projects that honours or masters students could pursue within this framework. For example, invasive ants are typically individually small but numerically abundant, and rely on outnumbering their native opponents at contests for resources. The complexity of the habitat in which these contests occur should affect the ability of invasives to capitalise on this numerical advantage. An honours or masters student could test this by manipulating the competitive arena in an experimental setting. We also welcome any input from potential students with their own ideas about projects to pursue within the general area of invasive ant ecology/behaviour.	**Honours** **Masters**	
Dr Samuel Lymbery, samuel.lymbery@uwa.edu.au **Assoc Prof Joseph Tomkins** joseph.tomkins@uwa.edu.au	**Fighting with my family: Kin seleciton and alternative reproductive tactics** 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 would like to use this mite to investigate the so far unexlpored question of how relatedness and kin structure influence this expression of alternative reproductive tactics. Becuse relatives share genes with each other, and can pass on those genes by helping each other to reproduce, behaviour and aggression often depends on the relatedness of competitors (this force is known in biology as kin seleciton). Alternative reproductive tactics, and the differential expression of weaponry, offer a fascinating testing ground for kin selection theory because different tactics inflict vastly different costs on competitors. As the effect of kin selection on alternative rerpoductive tactics has so far been ignored, any result here would represent an important advance in evolutionary biology. There are a number of experimental approaches which honours or masters students could pursue here, building of our existing work in this area.	**Honours** **Masters**	
Prof Jessica Meeuwig jessica.meeuwig@uwa.edu.au	**Changes in pelagic fish assemblages at Geogrpahey Bay, Geographe Bay Marine Park** We have 5 surveys through time of the pelagic fish assemblages in the outer region of Geographe Bay, a location that is included in the Commonwealth's Geographe Bay Marine Park, with data most recently collected in 2022. This project will involve (1) potential field work to Geographe Bay in February 2023, (2) image analysis of the videos from the Feb 2022 survey and (3) statistical analysis of the 2017, 2018, 2019, 2021 and 2022 surveys data in order to better understand spatial and temporal variability in pelagic fish assemblages. This analysis will feed directly into the evaluation of management effectiveness of the Australian government's marine park zoning.	**Honours** **Masters**	
Dr Matt Navarro, matthew.navarro@uwa.edu.au **Dr Tim Langlois** tim.langlois@uwa.edu.au **Dr Dave Fairclough** David.Fairclough@fish.wa.gov.au	**Designing recreaitonal fishing policies using representative fisher preferences** Whilst recreational fishing policies are designed to meet biological based management objectives, fishers preferences are also incorporated into these decisions. At present there is a lack of transparency about how these preferences are measured and accounted for. This study will test the use of an economic technique known as choice experiments to measure fishers' preferences for suites of management interventions including bag limits, seasonal closures and size limits and attempt to combine these preferences with biological based management strategy evaluations to generate recommendations for policy interventions.	**Honours** **Masters**	

Dr Matt Navarro, matthew.navarro@uwa.edu.au **Dr Tim Langlois** tim.langlois@uwa.edu.au **Dr. Jacquomo Monk** jacquomo.monk@utas.edu.au	**Spatial usage of the Australian Marine Parks network** In 2019 44 new marine parks were implemented in offshore commonwealth waters around Australia as part of the Australian Marine Parks network. At present little is known about how boat based fishers and non-fishing recreators are using these areas. This project will analyse existing data and collect new data on spatial usage patterns at boat ramps adjacent to 13 of these new marine parks. These usage patterns will form baselines in Parks Australia's social and economic monitoring program and inform the planned 10 year review of the marine parks zoning.	**Honours** **Masters**	
Dr Harriet Paterson harriet.paterson@uwa.edu.au **Dr Renae Hovey** renae.hovey@uwa.edu.au	**Plastics in the regurgitated content from sea birds from Lancelin, Western Australia** A number of Brown Noddies were recently banded in Lancelin Western Australia and during the process the birds regurgitated their food which consisted of whole fish. A number of samples were collected and have been stored for chemical analysis, with particular focus on the presence and composition of plastic fibres. This project will process and analyse these fish which will give us some insight into the levels of plastic pollution that sea birds are exposed to in their feeding grounds off the continental shelf of Western Australia.	**Honours** **Masters**	
Dr Pieter Poot pieter.poot@uwa.edu.au **Assoc Prof Erik Veneklaas** erik.veneklaas@uwa.edu.au **Sally Thompson** sally.thompson@uwa.edu.au	**Revegetation of solar farms** Solar farms are increasingly being established across SW Australia to generate renewable energy and they are an important component into transitioning our economy into one with net zero carbon emissions by 2050 or earlier. For obvious reasons, solar farms cannot have tall emerging vegetation amongst the array of solar panels, and thus solar farms need active management of vegetation, either through regular mowing or herbicide spraying. However, keeping vegetation to a minimum or having bare soil under solar panels could lead to wind or water erosion issues. Both vegetation and erosion control activities add considerable costs to the solar farm operation. Establishing low prostrate native vegetation under solar panels could potentially greatly reduce these ongoing site maintenance costs, while at the same time increasing local biodiversity values. Additionally, the likely reduction in ambient temperatures as a consequence of establishing a native vegetation cover could improve solar panel energy conversion. This project will evaluate the feasibility of establishing a range of prostrate native plant species (~18 species) at the Gingin solar farm. Measurements will include aspects of species growth & survival and linking these to spatial variation in microclimate due to solar panel position and movements. Options may also include investigating changes in faunal assemblages in response to replacing weeds by native plant species. Through collaboration with the Surface and Ecohydrology research group at UWA, there will also be an opportunity to investigate and document changes in microclimate in more detail, including water flows and erosion as a consequence of solar panel placement. The project will be in collaboration with local industry partners (solar energy companies, mining companies & nurseries), and is likely to lead to future grant applications to address these issues at a larger scale.	**Honours** **Masters (with the potential for a follow up 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	**Understanding the traits of cluster- and non-cluster-roots of 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 for plants. 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. Usually, roots undergo intense sealing, depositing suberin and lignin in cell walls. These barriers resist pathogens ingress into roots physically as well as chemically because they do have antimicrobial properties. However, successful carboxylate exudation by cluster-roots of Proteaceae would require a lack of perfect sealing. Absence of barriers in roots would be risky because of increased exposure and vulnerability to pathogens. Do Proteaceae roots have other mechanisms to cope with pathogens? Why don't they have mycorrhizal colonisation? We will explore, how these roots maximise P acquisition and pathogen defence using combination of anatomical, physiological, biochemical and genomic techniques.	**Honours** **Masters** **PhD**	
Dr Kosala Ranathunge kosala.ranathunge@uwa.edu.au **Assoc. Prof. Peta Clode** peta.clode@uwa.edu.au **Dr Lukasz Kotula** lukasz.kotula@uwa.edu.au	**Gaining deeper insights into silicon-mediated salinity tolerance of crops** Soil salinity hinders crop growth and productivity worldwide. Approximately one-third of agricultural land is saltaffected. Recently, silicon has become an exceptional candidate that can significantly enhance plant tolerance to salinity. However, the underlying mechanisms remain poorly understood. This project will use cutting-edge technologies in plant physiology, biochemistry and molecular biology to determine mechanisms of siliconmediated salt tolerance of rice and barley. Understanding of silicon enhanced plant tolerance to salinity will guide development of new plant breeds with better silicon acquisition, thus contributing to increased food safety, higher production with lower input costs and reduced negative impacts on environment.	**Honours** **Masters** **PhD**	
Dr Kosala Ranathunge kosala.ranathunge@uwa.edu.au	**Functional roles of different component roots in water and nutrient uptake of rice (*Oryza sativa* L.) under salinity** Water and nutrient uptake is one of the fundamental functions of a root system, which largely determines plant growth. Hydraulic conductivity and solute permeability are important parameters that express the ability of roots to take up water and solutes. The rice root system consists of three different types of roots: adventitious roots, long laterals (L-type) and short laterals (S-type). A series of previous studies have shown that these component roots are different in structure and also the developmental responses to soil water content. These facts strongly indicate that they may differ in water and solute uptake rates, and therefore, differently contribute to the overall water and nutrient uptake of the whole root system. In this project, we will determine water and solute transport rates of each type of component root and examine the relationship with some root traits that are closely linked with transport properties such as aquaporin gene activities and the depositions of apoplastic barriers in cell walls made of lignin and suberin. We will also analyse how these root traits change under salinity. Through these analyses, this study aims to deepen the understanding of different component roots for water and nutrient uptake of rice root system, which would be useful for future plant breeders.	**Honours** **Masters** **PhD**	
Dr Michael Renton michael.renton@uwa.edu.au **Dr Francois Teste** francois.teste@uwa.edu.au	**Evolution and ecology of plant-fungal interactions during invasion** Most invasive trees depend closely on mycorrhizal symbionts to provide required resources, and thus their invasive success depends on the dispersal of these symbionts as well as their own dispersal. Invasive trees may also be negatively impacted by pathogenic fungi in their natural range, and thus benefit from 'enemy release' if they spread into new areas faster than these pathogenic fungi. Previous empirical and theoretical work has shown that the dispersal characteristics of organisms can undergo selection pressure and evolution during the course of an invasion or colonization of new areas, but the evolutionary dynamics of dispersal during co-invasion has not been considered. This project will use spatially-explicit eco-evolutionary simulation modelling to investigate how the dispersal characteristics of trees and their mycorrhizal symbionts and pathogens evolve over the course of a tree invasion, and how managment that accounts for both evolution and ecology can help slow tree invasions and protect natural environments. Applicants do not need prior modelling experience, but should be passionate about ecology and evolution.	**Honours** **Masters**	
Dr Michael Renton michael.renton@uwa.edu.au **Dr Pieter Poot** pieter.poot@uwa.edu.au	**Evolution of rooting strategies** Plants use their roots to forage for the water and nutrients they need to survive and reproduce. Different rooting strategies evolve in different conditions, to enable plants to find these resources as efficiently as possible. This project will use eco-evolutionary models that simulate populations and communities of plants with detailed three-dimensional root structures evolving over time. This modelling can address big questions such as the costs and benefits of phenotypic plasticity, the uniqueness or repeatability of evolution, the drivers of diversity in plant communities, and the processes that lead to the creation of new species. Applicants do not need prior modelling experience, but should be passionate about ecology and evolution.	**Honours** **Masters**	

Dr Michael Renton michael.renton@uwa.edu.au	**Ecological and Evolutionary Modelling for Agriculture and Conservation** Modelling can be an essential tool for understanding, predicting and managing many aspects of ecological, evolutionary and agricultural systems. Ecological models can be used to address practical and theoretical questions such as: - How do plants and animals evolve optimal strategies to find, compete for, and share the resources they need to survive and reproduce, in variable and changing environments? - How can we maintain global food security by stopping weeds and pests evolving resistance to pesticides? - What is the best way to search for and manage invasive organisms that threaten our agricultural industries and natural resources? - How do interactions among the individual organisms in ecological communities affect the diversity, stability and resilience of these communities? If you are interested in learning more about ecological and evolutionary modelling, and applying it to important practical or theoretical issues, then please get in contact.	**Masters** **PhD**	
Assoc Prof Amanda Ridley amanda.ridley@uwa.edu.au	**Understanding the relationship between cooperation communication and cognition.** My research lab uses habituated groups of free-living cooperatively breeding Western Australian magpies to ask questions primarily focussed in the field of behavioural ecology. Students are expected to conduct fieldwork on one of the following topics: the benefits and dynamics of cooperation (group-living behaviour), patterns of communication, and causes of variation in cognition. My research lab also looks at research in relation to the impacts of anthropogenic noise on vocal communication, and heat stress effects on animal behaviour (in terms of the impact of heatwaves and increasingly high temperatures on wild animal behaviour). Students applying to my lab should be interested in a project in one of these research areas. I have not posted a specific project here, since there is scope for several research projects depending on the specific interests of the student. The magpies are ringed for individual identification, and can be observed from a distance of a few metres without alteration in their behavour. The study sites are based within urban Perth. Students will need access to reliable transport, and to have a full driver's license. Students not interested in fieldwork also have some desk-based options that will involve data modelling eg for populuation viaiblity anyalses.	**Honours** **Masters** **PhD**	
Dr Alison Ritchie alison.ritchie@uwa.edu.au **Dr Todd Erickson** todd.erickson@dbca.wa.gov.au	**Developing technologies to overcome barriers to seed recruitment and seedling establishment in restoration** This project aims to develop and implement innovative seed enhancement technologies to overcome native plant recruitment barriers. Despite technological advances in the agricultural industry to successfully establish plants, there is currently limited capacity to deliver this technology to restore biodiverse natural ecosystems. With ongoing degradation and significant biodiversity loss occurring in large parts of southern Australia, intervention is needed to reinstate critical ecosystems. In order to so, we need to overcome the diverse array of abiotic and biotic factors that currently limit restoration success. The student will focus on (1) overcoming the barriers to restoration, (2) the development of seed enhancement technologies and (3) test their scalability in the field.	**Honours** **Masters** **PhD**	
A/Prof Michael Burton michael.burton@uwa.edu.au **Dr Abbie Rogers** abbie.rogers@uwa.edu.au **Dr Belinda Cannell** belinda.cannell@uwa.edu.au	**How big is the value of a little penguin?** Little penguins are the smallest penguin species. Their largest breeding colony in Western Australia is just off the shore of Rockingham, in the Perth metropolitan region. They face many threats given their co-location with a major human population base, including marine and coastal developments, predation, watercraft strikes, and pressures from eco-tourism. To balance the benefits and costs of coastal activities with the benefits and costs of conserving little penguins, decision makers need to identify what the value of the penguin colony is. This project will involve developing a non-market valuation survey to estimate how much people are willing to pay to protect little penguins through improved management outcomes. Applicants will need to have a background in economics (e.g. units in microeconomic theory, environmental and resource economics) or strong skills in statistical analyses.	**Honours** **Masters**	
Dr Ana M M Sequeira (UWA) ana.sequeira@uwa.edu.au **Dr Matthew Fraser (UWA)** matthew.fraser@uwa.edu.au **Prof Gary Kendrick (UWA** gary.kendrick@uwa.edu.au	**Ecological links between coastal habitats and marine megafauna conservation** The 2011 Western Australian marine heatwave associated with global climate change has strongly affected the Shark Bay World Heritage Area, known for its extensive seagrass meadows and unique marine megafauna. The aftermath of this heat wave highlighted that strong links exist between the habitat-forming dominant temperate seagrass, Amphibolis antarctica, in Shark Bay and the health and abundance of marine megafauna, such as green turtles and dugongs. Understanding these ecological links is crucial to predicting the effects of predicted seagrass loss in Shark Bay on the populations of marine megafauna species that contribute to its World Heritage status. This project will be a collaboration between UWA and DBCA and will be most suitable for a student passionate about remote iconic areas in the Western Australia coastline and with strong interest in investigating behaviour and movement of marine megafauna in relation to coastal habitats.	**PhD** **Honours** **Masters**	

Dr Ana M M Sequeira (UWA) ana.sequeira@uwa.edu.au **Dr Matthew Fraser (UWA)** matthew.fraser@uwa.edu.au **Dr Hector Lozano-Montes (CSIRO)** hector.lozano-montes@csiro.au **Dr Ben Radford (AIMS)** B.Radford@aims.gov.au **Prof Gary Kendrick (UWA)** gary.kendrick@uwa.edu.au	**Understanding the iconic World Heritage Shark Bay using an ecosystem modelling framework** Regional warming and extreme events such as the 2011 Western Australian marine heatwave associated with global climate change has promoted large ecosystem shifts to the marine ecosystem in the Shark Bay World Heritage Area including extensive loss of seagrasses, starvation in turtles and major effects on invertebrate fisheries and fish communities. Understanding how to predict and manage the impacts of climate change on marine ecosystems is a key emerging issue and it is imperative that we are prepared to effectively manage ecosystem scale shifts in Shark Bay to safeguard its World Heritage status. Extreme climatic events are predicted to increase in frequency, intensity and duration. Therefore, understanding the ecosystem impacts of water temperature changes and climate-related seagrass loss is particularly pertinent in ecosystems where foundation seagrasses grow near the edge of their biogeographical range, such as in Shark Bay. This project will pull together physical, habitat, and animal community data into an ecosystem modelling framework to examine physical and biological interactions in Shark Bay, and help predict the trajectory of this World Heritage Site under future climate scenarios. This project will be a collaboration between UWA, AIMS and CSIRO and will be most suitable for a student with strong interest in understanding ecological links within ecosystems and with interest to develop quantitative skills.	**PhD** **Honours** **Masters**	
Professor Leigh Simmons leigh.simmons@uwa.edu.au	**Seminal fluid effects on female sexual receptivity** There is considerable evidence that males will increase the numbers of sperm ejaculated in response to sperm competition risk, however the ejaculate also comprises a host of seminal fluid proteins that mediate sperm performance and subsequent fertilization success. Male crickets (Teleogryllus oceanicus) have been shown to adjust the protein composition of the seminal fluid in response to sperm competition risk. Seven seminal fluid protein genes were found to have an increased expression in males exposed to rival calls. However, the function of these seminal fluid proteins remains unknown. This project will use RNA-knockdown to determine whether proteins in the ejaculate affect a females future receptivity to mating.	**Honours** **Masters**	
Professor Leigh Simmons leigh.simmons@uwa.edu.au	**Risk taking behaviour and residual reproductive value** Animals are able to modify their behaviour in response to changes in their internal and environmental state. The asset-protection principle predicts that an animal's risk taking behaviour should vary as a result of its residual reproductive value (RRV); animals with greater RRV would incur a greater cost if injured or killed and should therefore take fewer risks than those with low RRV. Despite the intuitive appeal of this hypothesis, few studies have effectively separated the effects of RRV on behaviour from those of age. This project will test the widely invoked hypothesis by measuring the risk-taking behaviour of female Australian field crickets (Teleogryllus oceanicus) of the same age after manipulating their RRV by surgical removal of the ovaries.	**Honours** **Masters**	
Professor Leigh Simmons leigh.simmons@uwa.edu.au	**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	**The evolution of mating spurs in trapdoor spiders** Many male trapdoor spiders use their front legs to move females into a suitable position during mating, by locking highly specialised mating spurs located on their anterior legs under the female's fangs during copulation. Using landmark geometric analyses, the project will quantify and map shape variation onto a pre-existing molecular phylogeny of the spiders, and test evolutionary hypotheses for the divergence of these male mating structures. The project will involve collaboration with the WA Museum.	**Honours** **Masters**	
Professor Leigh Simmons leigh.simmons@uwa.edu.au **Dr Nikolai Tatarnic** nikolai.Tatarnic@museum.wa.gov.a u	**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 **A/Professor 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**	

Prof Leigh Simmons leigh.simmons@uwa.edu.au **Dr Tim Langlois** tim.langlois@uwa.edu.au **Dr Simon de Lestang** **s**imon.deLestang@fish.wa.gov.au **Dr Jason How** jason.how@fish.wa.gov.au	**Fertilization ecology and implications of sperm limitation in the western rock lobster** The western rock lobster fishery is the highest value single species fishery in Australia, worth over $400 Million per annum. Very little is known about the occurrence of sperm limitation for the fertilization ecology of western rock lobster, however it is assumed that the selective removal of larger males from the fishery could result in the occurrence of sperm limitation.This study will involve conducting mating trials to establish the mechanics of fertilization within western rock lobster. In addition, both laboratory and field investigations will be used to investigate the relationship between sperm abundance and spermatophore size, using methods to count sperm isolated from spermatophores and relate this data to field surveys of spermatophore size across areas of the fishery with contrasting adult body-size distribution.	**Honours** **Masters**	
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 and will require at least 1 mth notice.	**Masters**	
Dr Greg Skrzypek **G**rzegorz.Skrzypek@uwa.edu.au **Brad Degens (DWER)**	**Stable sulfur isotope composition as a tracer of nutrients runoff form agrosystems** This research project is using a unique stable isotope tracer to estimate sufur budget in ecosystems downstream from a farm testing a new type of product limiting phosphorus leaching. This new product contains gypsum produced through neutralization of mine waste. A unique stable sulfur isotope composition will be distinguishable in soil, water, and plants. The project will include fieldwork and lab experiments. The project is supported by the Department of Water and Environmental Regulation (DWER) and will also offer the opportunity to experience fieldwork for the collection of samples in the Mandurah region with DWER team.	**Honours** **Masters**	
Dr Greg Skrzypek grzegorz.skrzypek@uwa.edu.au **Assoc Prof Erik Veneklaas** erik.veneklaas@uwa.edu.au **Dr Gavan McGrath** gavan.mcgrath@dbca.wa.gov.au	**Effect of forest thinning on residence times of water used by Jarrah trees** Regrowth jarrah forest (Eucalyptus marginata) tends to have a greater density of stems, larger sapwood area, and associated higher level of water use, as compared to old growth forest. Thinning may restore many environmental services and add resilience in a drying and warming climate. It has already been demonstrated that evapotranspiration declines, and both groundwater recharge and streamflow increase after thinning. It is not yet clear how thinning modifies root water uptake dynamics. In this project, advance methods (including in situ sap flow monitoring and stable isotope analyses) will be used to estimate water uptake, water residence time, and response to precipitation pattern. This project is financed by DBCA and will provide opportunity for fieldwork at Yarragil (Dwellingup, WA) and close interaction with DBCA researchers.	**Honours** **Masters**	
Dr John Statton john.statton@uwa.edu.au **Prof Gary Kendrick** garykendrick@uwa.edu.au	**Optimising sporophyte growth for commercialisation of the methane mitigating seaweed, *Asparagopsis taxiformis*** Seaweed is one of the most attractive emerging aquaculture industries Australia-wide. The Red Seaweed, Asparagopsis taxiformis, when fed to cattle in small quantities, can mitigate harmful methane emissions from the livestock industry by up to 98%. Asparagopsis could become the 'wheat crop' of Australia's oceans, and is on track to be grown and processed here in Australia. This project will focus on optimising cultivation techniques to produce high quality seed stock for Western Australian conditions. This project is aquaculture focussed and will use dose:response testing of environmental variables (light, nutrients) to optimise this life stage. This project will be based at the Watermans Bay Marine Research Facility (30 minutes north of UWA crawley campus), successful candidates need to be part-time located at this facility to undertake the research trials. Snorkelling, strongly lab-based project, desire to learn about aquaculture techniques and seaweed.	**Honours** **Masters**	
Dr John Statton john.statton@uwa.edu.au **Prof Gary Kendrick** garykendrick@uwa.edu.au	**Optimise sporophyte density of *Asparagopsis taxiformis* to enhance seeding onto cultivation string** Seaweed is one of the most attractive emerging aquaculture industries Australia-wide. The Red Seaweed, Asparagopsis taxiformis, when fed to cattle in small quantities, can mitigate harmful methane emissions from the livestock industry by up to 98%. Asparagopsis could become the 'wheat crop' of Australia's oceans, and is on track to be grown and processed here in Australia. This project will determine the density that optimises attachment, survivability and growth of sporophytes prior to transfer to grow-out trials. This project will be based at the Watermans Bay Marine Research Facility (30 minutes north of UWA crawley campus), successful candidates need to be part-time located at this facility to undertake the research trials. Snorkelling, strongly lab-based project, desire to learn about aquaculture techniques and seaweed.	**Honours** **Masters**	

Dr John Statton john.statton@uwa.edu.au **Prof Gary Kendrick** garykendrick@uwa.edu.au	**Enhance gametophyte fecundity of *Asparagopsis taxiformis* for aquaculture** Seaweed is one of the most attractive emerging aquaculture industries Australia-wide. The Red Seaweed, Asparagopsis taxiformis, when fed to cattle in small quantities, can mitigate harmful methane emissions from the livestock industry by up to 98%. Asparagopsis could become the 'wheat crop' of Australia's oceans, and is on track to be grown and processed here in Australia. This project aims to enhance fecundity of gametophytes by testing dose:response relationships of environmental conditions (nutrients x light x temperature). Enhanced fecundity of gametophytes is a necessary pathway to developing the commercialisation potential of this seaweed species. This project will be based at the Watermans Bay Marine Research Facility (30 minutes north of UWA crawley campus), successful candidates need to be part-time located at this facility to undertake the research trials. Snorkelling, strongly lab-based project, desire to learn about aquaculture techniques and seaweed.	**Honours** **Masters**	
Assoc Prof Joseph Tomkins joseph.tomkins@uwa.edu.au **Dr Jason Kennington** jason.kennington@uwa.edu.au **Wladimir Fae** wladimir.faeneto@research.uwa.edu.au	**Experimental Evolution of Anisogamy** Anisogamy is of central importance to the evolution of the sexes, however it is very difficult to understand from an experimental perspective. We have that opportunity for exciting and ground-breaking evolutionary research. We have a number of experimental evolution lines of the single celled alga *Chlamydomonas reinhardtii* that have diverged in size and in their growth conditions. These evolved lines are of interest to us from an evolutionary perspective in terms of the evolution of anisogamy, since we can test the fundamental assumptions behind the evolution of the sexes. Skill set preferred would be sterile lab techniques.	**Honours** **Masters**	
Assoc Prof Joseph Tomkins joseph.tomkins@uwa.edu.au **Dr Jason Kennington** jason.kennington@uwa.edu.au **Wladimir Fae** wladimir.faeneto@research.uwa.edu.au	**Experimental Evolution of Algal Production** We have a number of experimental evolution lines of the single celled alga *Chlamydomonas reinhardtii* that have diverged in size and in their growth conditions. These evolved lines are of interest to us from the perspective of applying them to questions of algal production (e.g. biomass, pigments and lipids) in the lab and 'field' conditions.Skill set preferred would be sterile lab techniques.	**Honours** **Masters**	
Assoc Prof Joseph Tomkins joseph.tomkins@uwa.edu.au **Dr Jason Kennington** jason.kennington@uwa.edu.au **Wladimir Fae** wladimir.faeneto@research.uwa.edu.au	**Experimental evolution of plastic tollerance** The environment is accumulating plastic representing an evolutioanry challenge to the biota that live alongside it. One of the effects of plastic is the toxicity to cells. This novel evolutionary environment might be easily adapted to or it might be evolutionarily challenging. Microplastics are toxic to algal cells, but can algae evolve to tollerate the presence of plastic? We have a number of lines of the single celled alga *Chlamydomonas reinhardtii.* These alga reproduce readily in the laboratory at a rate of 3-4 divisions per day. The large population sizes and rapid division mean tha chlamydomonas is a useful organism for studying adaptation. We would like to investigate the evolution of plastic tollerance over numerous generations. Fitness can be easily assayed in the lab. Skill set preferred would be sterile lab techniques.	**Honours** **Masters**	
Assoc 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**	
Assoc Prof Erik Veneklaas erik.veneklaas@uwa.edu.au **Dr Paul Drake** paul.drake@uwa.edu.au	**How does vegetation affect the water balance on mine waste rock dumps?** Vegetation on mine waste rock dumps is not only a legal requirement but also provides "ecosystem services". On waste dumps where net percolation is undesirable because of toxic material, plant transpiration helps create a favourable "store-and- release" function. This line of research aims at determining the ideal mix of water use behaviours and drought tolerance levels in plant species, as dependent on substrate properties and climate. Projects may have an emphasis on transpiration, root water uptake, hydraulics, etc.	**Honours** **Masters** **PhD**	
Assoc Prof Erik Veneklaas erik.veneklaas@uwa.edu.au **Dr Jason Stevens** jason.stevens@dbca.wa.gov.au	**Ecophysiological research to support mine-site restoration** Restoring a diverse plant community on post-mining sites in WA is challenging our understanding of what substrate and climatic conditions plants need and tolerate. Ecophysiology can help to identify the drivers of species success in plant establishment, growth and survival. Ongoing research addresses issues of plant nutrition, plant water relations, heat tolerance etc. in relation to soils, climate, seed provenance, management and other relevant factors. Our projects use traditional and novel technology in plant physiology to measure plant traits and plant condition. This includes gas exchange, hydraulics, spectral and thermal sensing and several other field and lab methods. Projects on plant-plant, plant-microbe and plant-pathogen interactions are also possible.	**Honours** **Masters**	

Assoc Prof Erik Veneklaas erik.veneklaas@uwa.edu.au **Dr Carolyn Harding** carolyn.harding@dbca.wa.gov.au	**Salinity and drought tolerance of samphires in a Swan river saltmarsh** Ashfield Flats is a threatened temperate coastal saltmarsh in the Perth Metropolitan Area. Changes are expected in the local hydrology of the site, due to likely modifications to urban drainage and due to climate change. Samphires are a characteristic element of salt marshes. Contrasting spatial distributions of the five species occurring at Ashfield Flats suggest that there is niche differentiation related to salinity and inundation regimes. This project, supported by DBCA, involves experimental research in a controlled environment to assess tolerance to salinity and inundation, which will assist with conservation efforts.	**Honours** **Masters**	
Assoc Prof Erik Veneklaas erik.veneklaas@uwa.edu.au	**Plant water relations** Water is an essential but scarce resource for almost all plants in WA. We do fundamental and applied research to understand how plants maximise water uptake, minimise water loss, and optimise water use efficiency. The projects can be field or lab-based, and may focus on roots, stems, leaves or whole plants. Techniques include hydraulics, gas exchange (photosynthesis/transpiration), micrometeorology, microscopy, stable isotopes and others.	**Honours** **Masters** **PhD**	
Assoc Prof Erik Veneklaas erik.veneklaas@uwa.edu.au **Dr Siegy Krauss** siegy.krauss@dbca.wa.gov.au **Dr David Merritt** david.merritt@dbca.wa.gov.au **Dr Michael Renton** michael.renton@uwa.edu.au **Dr Suzanne Prober** suzanne.prober@csiro.au **Dr Martin Breed** martin.breed@flinders.edu.au	**Optimising seed sourcing for effective ecological restoration** As the demand for ecological restoration grows rapidly, there is an increasingly urgent need and responsibility to use native seed for restoration as efficiently as possible. Our project's broad goal is to derive seed sourcing solutions that improve restoration efficiency under current and future environmental conditions. Specifically, we seek to comprehensively assess whether predictive sourcing for climate change increases restoration success. We are pursuing our aims by integrating cutting-edge approaches in plant physiology, seed biology, soil science, and plant genomics with experiments embedded within post-mining rehabilitation sites. Experimental trials in the glasshouse and seed lab will explicitly address hypotheses on provenance fitness and environmental factors for key restoration species of banksia woodlands to determine a mechanistic understanding of provenance related variation in adaptation. In particular, we seek to identify how provenances differ in their capacity to respond to environmental stressors associated with climate change (such as moisture and temperature), and the thresholds for different provenances. These experiments will help to attribute genetic differences observed in field trials to climate effects rather than site effects. Expected outcomes include clear seed-sourcing solutions for better restoration in a climate-change context. This research program is supported by an ARC linkage grant, with strong industry support from sand mining companies Hanson and Tronox.	**Honours** **Masters** **PhD**	
Dr Bruce Webber bruce.webber@csiro.au bruce.webber@uwa.edu.au **Mariana Campos** mariana.campos@csiro.au **Prof Raphael Didham** raphael.didham@uwa.edu.au raphael.didham@csiro.au	**Identifying vulnerabilities to improve the management of threatening weeds.** Improvements in weed management can be achieved through a greater understanding of the population ecology of the species in question, as well as itsplant ecophysiology and plant-ecosystem interactions. Niche theory can then be applied to identifying vulnerabilities to target for improved control. Projects are available, depending on the interests of the applicant, including controlled condition studies in Perth, as well as fieldwork in exotic locations across WA, interstate and overseas	**Honours** **Masters** **PhD**	
Prof Thomas Wernberg thomas.wernberg@uwa.edu.au wernberglab.org	**Thresholds for kelp forest loss and turf expansion.** Pervasive habitat deterioration and destruction presents one of the biggest threats to species and global ecological function. There has been an accelerating loss kelp forests globally, and an associated rise and persistence of degraded seascapes of sediment-laden algal 'turfs'. This project will conduct field experiments on kelp and turf reefs across different environments to identify thresholds for collapse and mechanisms for recovery. Advances here will improve how we understand the stability of these marine habitats, and the reversibility of sudden changes in the context of ongoing climate change. This is a collaborative project between UWA and the NSW Department of Primary Industries.	**Honours** **Masters** **PhD**	
Prof Thomas Wernberg thomas.wernberg@uwa.edu.au wernberglab.org	**Using strong genotypes to boost resistance or restore threatened kelp forests** Research on marine habitat loss has mainly focused on negative impacts and declining performance of foundation species, and the effectiveness of passive strategies for recovery (e.g. marine reserves). Instead, an innovative approach targets individuals and areas that perform well under stress ('bright spots') to discover mechanisms, traits and active interventions that promote persistence. This project will use cutting edge genetic analyses to identify strong genotypes in natural 'bright spots' where surviving kelps have resisted or adapted to degraded conditions. This will provide a foundation to develop innovative proactive restoration and conservation solutions to breed resistance or promote recovery of degraded systems. This is a collaborative project between UWA and the NSW Department of Primary Industries.	**Honours** **Masters** **PhD**	

Prof Thomas Wernberg thomas.wernberg@uwa.edu.au **Dr Karen Filbee-Dexter** karen.dexter@uwa.edu.au	**Export of blue carbon from kelp forests to deep marine sinks.** One approach to combat climate change is to increase carbon storages and sinks. Recent research suggests that large seaweed forests may sequester substantial amounts of carbon in the deep sea. Key unknowns remain about the fate of this carbon once it leaves the shallow reefs; especially how much is transported across the shelf and reaches deep marine sediments. This project will use an underwater camera system to track kelp detritus moving from shallow reefs (<20 m) to deeper areas (20 - 100 m) off Western Australia. Laboratory flume trials will be used to measure deposition and resuspension thresholds of different types of kelp detritus, which are essential to predict movement along the seafloor. This research should help assess the carbon storage potential of kelp forests. The project will involve work in the field and the lab. A background in field ecology and/or oceanography would be helpful but not essential.	**Honours** **Masters** **PhD**	
Prof Thomas Wernberg thomas.wernberg@uwa.edu.au **Dr. Karen Filbee-Dexter** karen.dexter@uwa.edu.au	**Developing a novel restoration tool for threatened kelp forests** Assessing a novel restoration tool for threatened kelp forests Human-driven impacts on our oceans are intensifying and there is urgent need for novel solutions to combat habitat loss and promote resilience in marine ecosystems. In warmer margins of their range kelp forests are being replaced by algal turfs, impacting associated communities. This project will help scale-up our restoration tool 'green gravel' and evaluate its ability to restore kelp forests and associated communities (fish, invertebrates, epifauna) in Australia. Green gravel involves seeding kelp spores onto rocks, where they grow into small sporophytes that can be scattered across an impacted area. This is a collaborative project between UWA and Industry Partners. This project is heavily field-based, and can involve techniques such as underwater visual census, video-based underwater surveys, machine learning and eDNA techniques. There are also opportunities for this project to include social-ecological research and science communication, such as engaging with communities to evaluate and test this restoration tool.	**Honours** **Masters**	
Dr Albert Pessarrodona albert.pessarrodona@research.uwa.edu.au **Prof Thomas Wernberg** thomas.wernberg@uwa.edu.au	**Historical changes in the distribution and productivity of WA marine forests** The marine environment is becoming increasingly modified by human pressures, driving the reconfiguration of marine ecosystems worldwide. Establishing a historical baselines to compare change to is however a central challenge in the subtidal marine environment, which has traditionally been less accessible. This project will use historical ecology to investigate potential changes in the distribution and productivity of marine forests across the coast of WA. The project will involve the examination of archived herbaria specimens, compilation of anectodal evidence, and repeat of historical surveys. A background in field ecology would be helpful but is not essential.	**Honours** **Masters**	
Dr George Wood george.wood@uwa.edu.au **Prof Thomas Wernberg** thomas.wernberg@uwa.edu.au	**Mapping where seaweed restoration should occur** As the demand for seaweed restoration increases globally, scientists, communities and businesses need solid frameworks that identify when and where restoration is needed. This project will use biodiversity and satellite data to identify thresholds of ecosystem collapse and develop an interactive map of areas where seaweed restoration is not only needed but expected to be successful.	**Honours** **Masters**	
Dr George Wood george.wood@uwa.edu.au **Prof Thomas Wernberg** thomas.wernberg@uwa.edu.au	**Development of fucoid gene-banking techniques** Worldwide, kelp and fucoid forests are in decline with the loss of unique genetic diversity presenting real problems for adaptability and ecosystem resilience. Ex situ seed banking is important for biodiversity conservation and ecosystem restoration, however many fucoid gametes lose viability within hours. This project will utilise experimental cryogenic approaches to investigate methods for preserving viable seaweed germplasm that may be used for restoration and assisted gene flow in several key Australian fucoid species.	**Honours** **Masters**	
Prof 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**	
Prof Philip Withers philip.withers@uwa.edu.au **Dr Emma Dalziell** emma.dalziell@uwa.edu.au	**Using metabolic rate to predict viability of seeds in conservation seed banks** Preservation of seed stocks for plant species in seed banks is an important conservation strategy, and it is important to be able to routinely assess the viability of stored seeds. We are investigating various aspects of the survival of stored seed collections, including physiological assessment of viability of seeds by measuring their metabolic rate, but this is a difficult proposition because most seeds and enter a dormant stage and have a low metabolic rate. We are investigating the potential for measurement of metabolic rate as an index of viability and its relationship to temperature and humidity using highly sensitive state-of-the-art carbon dioxide analyser.	**Honours** **Masters** **PhD**	

Prof Philip Withers philip.withers@uwa.edu.au **Dr Emma Dalziell** emma.dalziell@uwa.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**	
Prof Phillip Withers phillip.withers@uwa.edu.au **Dr Graham Thompson** graham.thompson@uwa.edu.au **Dr Christine Cooper** christine.cooper@uwa.edu.au	**Assessing the efficacy of camera traps for fauna surveys** Camera traps are now widely used in vertebrate fauna surveys and monitoring programs. There is a general assumption that these traps are a reliable and valid tool that record all or at least a majority of mammals that pass through the detection zone. However, some literature suggests that camera traps are not as reliable as many users believe, and modification of camera settings can imporve detection sensitivity from 33% to 75%, including appreciable room for improvement. This research project will use 100 Reconyx (HC600) camera traps to test their efficiency to detect cat/fox sized mammals in a variety of orientations and settings. The outcome of this project has wide application for vertebrate fauna surveys, assessments and monitoring prgrams, and should interest a student that is intending to establish a career as a field zoologist that undertakes vertebrate fauna surveys. Equipment, advice and assistance for this project are available from experienced zoologists that routinely use camera traps as a detection and survey method.	**Honours** **Masters**	
Prof Phillip Withers phillip.withers@uwa.edu.au **Dr Sean Thomlinson** sean.thomlinson@dbca.wa.gov.au **Dr Christine Cooper** christine.cooper@uwa.edu.au **Amanda Bourne** abourne.uct@gmail.com	**Validation of non-invasive measurement of energy and water turnover for birds** Stable isotopes (doubly-labelled water, 2H2O18) are now routinely used to measure energy and water turnover of free-living animals but the traditional protocol involves capture, injection of isotopes, blood sampling and recapture, which can be experimentally challenging especially for small birds. An alternative non-invasive approach is to administer the stable isotope mixture to free-living birds in food, and using faeces collected from birds to measure isotope turnover rates. This project will compare isotope turnovers for captive birds using both the traditional and non-invasive approaches to determine whether the non-invasive approach is feasible. We anticipate studying small bird species with varied diets (e.g. insectivorous, granivorous, nectarivorous).	**Honours** **Masters**	
Dr Samuel Lymbery samuel.lymbery@uwa.edu.au **Assoc Prof Amanda Ridley** amanda.ridley@uwa.edu.au **Dr Benjamin Ashton** benjamin.ashton@mq.edu.au	**Cognition and Warfare** Humans aren't the only animals that go to war. Other group-living or social animals also engage in large, dangerous battles over territory and resources. The mechanisms that determine success in warfare in non-human animals, however, remains an understudied and exciting area of research. Ants, with their complex social structures, propensity to engage in large-scale conflicts, and amenability to laboratory manipulation, provide the ideal model system for studies of non-human warfare. This project will use this system to examine the link between success in group battles and a crucial element of animal behaviour: cognitive ability. There will be opportunity for students to work flexibly with us to develop their own projects within this over-arching goal. Broadly, we envision assaying the cognitive abilities of individual ants, constructing experimental armies from relatively "smart" or "stupid" individuals, and staging laboratory battles between these armies. This work will provide valuable data on ant cognition, and has the potential to generate insights into the relative success of certain ants over others. Since ants are one of the world's most important groups of animal pests, such information is always of practical importance. In a more fundamental sense, this work could significantly advance the study of non-human warfare.	**Honours** **Masters** **PhD**	
Assoc Prof Erik Veneklaas erik.veneklaas@uwa.edu.au **Sally Thompson** sally.thompson@uwa.edu.au **Asst Prof Matthias.Leopold** matthias leopold@uwa.edu.au	**Urban green - water use and cooling effect** Urban environments are bound to become hotter, with important negative effects on public health and biodiversity. Trees and other plants cool themselves and the environment through the evaporation of water (transpiration). Policy makers are needing evidence about the magnitude of this effect, and how it is influenced by factors such as species, size, growth rate, leaf traits etc. Importantly, most urban green is irrigated, and therefore represents a cost (environmental and financial). How much watering is needed to maximise or optimise the cooling effect of urban green?	**Honours** **Masters (with the potential for a follow up PHD)**	

Prof 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 at the national and regional level, as they are often dominated by marginalized small-scale fisheries with substantial data gaps. As part of the international Sea Around Us - Indian Ocean research initiative (www.seaaroundus-io.org), the student will undertake country-level or ocean-basin fisheries research using data approaches. These types of projects could be especially interesting for students that are excited by data mining and historical ecology, or wish to be challenged by big-data approaches in an interdisciplinary setting. The Sea Around Us – Indian Ocean collaborates closely with the global Sea Around Us initiative (www.seaaroundus.org) as well as the Fisheries Economics Research Unit at the University of British Columbia in Vancouver, Canada, and with FishBase (www.fishbase.org) and SeaLifeBase (www.sealifebase.org) hosted in the Philippines. Our research emphasizes the utility of secondary data sets, data gap analysis and large-scale data approaches. An open mind, critical thinking skills, team work abilities and above all a curiosity about fisheries science is all that is required.	**Honours** **Masters** **PhD**	
Prof Dirk Zeller dirk.zeller@uwa.edu.au	**The largest freshwater fishery in Africa: Lake Victoria** Tanzania, Kenya and Uganda are the major stakeholders in the largest freshwater body in Africa, Lake Victoria, which has the biggest freshwater fishery in Africa. Much of the regional food security, domestic livelihoods and local economic benefits are derived from this freshwater fishery, yet it is heavily under-valued and under-represented in fisheries science and policy at the national and regional level, as it is largely dominated by marginalized small-scale fishers that do not feature adequately or accurately in national data used for decision making. As part of the international Sea Around Us - Indian Ocean research initiative (www.seaaroundus-io.org), the student will engage in a fisheries data project to investigate and estimate freshwater fisheries catches and fishing effort of Lake Victoria's freshwater fisheries. This research builds on a successful freshwater project in 2020 for Kenya, and may directly contribute to and participate in a regional capacity enhancement workshop and training initiative for the Lake Victoria scientific community. We emphasize the utility of secondary data sets and close international collaborations with in-country experts for enhancement through data gap assessments and large-scale meta-analyses. Such collaborations require cultural sensitivity and diplomatic interpersonal skills. An open and keen mind, critical thinking skills, self-drive and a curiosity about fisheries science is crucial.	**Honours** **Masters** **PhD**	
Prof Dirk Zeller dirk.zeller@uwa.edu.au	**Recreational fishing in Australia: the unmonitored shoreline?** This project will use online and social-media based assessments of land-based recreational fishing around Australia to derive field-survey independent baseline data for shore-based recreational fishing. It is anticipated that the findings can complement current and future monitoring approaches for recreational fishing in Australia. This research emphasizes the utility of unique and often un-tapped secondary data sets for enhancement through data harmonization, data gap assessments and large-scale data approaches. An open mind, critical thinking skills, team work abilities and above all a curiosity about fisheries science is all that is required.	**Honours** **Masters**	
Prof Dirk Zeller dirk.zeller@uwa.edu.au	**Australia's freshwater fisheries** With is large coastline, much emphasis in Australian scientific and management circles is focused on marine fisheries. Yet Australia's freshwater and estuarine environments provide a distinct fisheries science challenge. Some commercial fisheries exist in freshwater systems, yet the majority of fishing activities in these environments are either recreational or traditional in nature. This makes the scientific and socio-economic understanding of freshwater fisheries a unique challenge in Australia. This research builds on a successful freshwater fisheries science project in 2020 for Kenya, and will link into the current global research collaboration efforts by the international Sea Around Us research initiative to derive advanced and comprehensive global freshwater fisheries data systems. The focus of this project is to create a nation-wide baseline of available data and knowledge, and identify and fill major data gaps. We emphasize the utility of secondary data sets and collaborations with regional and state subject-matter experts for enhancement through data gap analyses. An open and keen mind, critical thinking skills, self-drive and a curiosity about fisheries science and Australia's freshwater environments is crucial.	**Honours** **Masters** **PhD**	
Prof Dirk Zeller dirk.zeller@uwa.edu.au **Vania Andreoli** vania.andreoli@research.uwa.edu.au	**Wasted nutrition: the nutritional content of discards in Indian Ocean fisheries** Fisheries discarding, the practice of throwing overboard unwanted fish and other marine life that are too small, damaged, inedible, or have no market value or cannot be retained due to management restrictions, is declining at the global level. However, this practice is still widespread in developing countries around the Indian Ocean, driven largely by industrialized distant-water fleets. This practice has major impacts on sustainability and is also extremely wasteful from a nutritional point of view, especially given that much of it occurs in the waters of food insecure countries. The nutritional profile of the discards of the Indian Ocean fisheries is currently unknown, and this project aims to remedy this by estimating the nutritional wastage due to discarding in the Indian Ocean. As part of the Sea Around Us - Indian Ocean collaboration with the Harvard University T.H. Chan School of Public Health and the newly developed Nutrient Tool in FishBase (www.fishbase.org), the student will engage in ocean basin-scale nutritional aspect of fisheries science using big-data analysis	**Honours** **Masters** **PhD**	

Prof Dirk Zeller dirk.zeller@uwa.edu.au **Vania Andreoli** vania.andreoli@research.uwa.edu.au	**Nutritional context of fisheries in Western Australia** Western Australia fisheries are well-managed in an international context. However, Australia and WA export considerable amounts of high-value domestic seafood, and in turn import lower-value, prepared and preserved products for domestic consumption, mainly from Asia. While the tonnage and economic value of Western Australia's fisheries and import/export trade is well documented and understood, the nutritional implications are less so. Using the taxon-specific nutrient values for several macro- and micro- nutrients as part of the Sea Around Us - Indian Ocean collaboration with the Harvard University T.H. Chan School of Public Health and the newly developed Nutrient Tool in FishBase (www.fishbase.org), the student will quantify the nutritional profiles of Western Australian fisheries and compare domestically retained seafood with exports and imports. This project will contribute crucial policy information for fisheries, trade and human health in Australia and Western Australia.	**Honours** **Masters**	
Dr Elizabeth Sinclair elizabeth.sinclair@uwa.edu.au **Prof Gary Kendrick** gary.kendrick@uwa.edu.au **Dr Marion Cambridge** Marion.cambridge@uwa.edu.au	**The world's largest plant is a seagrass, *Posidonia australis* .** It lives in Shark Bay. We know it's a polyploid, and its been growing for up to 4,500 years. We suspect having two complete genomes ensures it's a pretty resilient organism. We are interested in comparing growth rates with its diploid parent(s) and determine whether it is capable of having (plant) sex. It will be possible to develop several projects, depending on interests and skills. There may be opportunities for field work, tank-based experiments, and lab work. A background in botany, plant anatomy and physiology, and/or genetics would be advantageous. Qualifications: Diving or snorkeling may be helpful, but not necessary.	**Honours** **Masters**	
Prof Gary Kendrick gary.kendrick@uwa.edu.au **Rachel Austin** rachel.austin@uwa.edu.au	**Reducing invertebrate caused mortality in Posidonia seeds in the Seeds for Snapper program** The annual Seeds for Snapper program uses volunteers to collect the fruits of Posidonia, these are then stored in tanks until they split open and release the seeds, which are then dispersed at pre-selected restoration sites in Cockburn Sound. However, monitoring has revealed a large portion of seed mortality is to do blue manna crabs, sand dollars and worms in the sediment. This project will conduct a few field experiments to find ways to reduce invertebrate caused mortality in seagrass seeds using fencing, hessian bags and top dressing. Qualifications: Min. rescue scuba diver and be willing to obtain a medical and pass an in-water assessment, drivers' licence	**Honours** **Masters**	
Prof Gary Kendrick gary.kendrick@uwa.edu.au **Rachel Austin** rachel.austin@uwa.edu.au	**Scaling up seed and shoot based seagrass restoration to ecologically relevant scales in Cockburn Sound** Over the past 40 years the majority of seagrass restoration in Cockburn Sound has been done on the small/experimental scale. Whilst this research has provided invaluable information, to carry out restoration on ecologically relevant scales (hectares), methodologies need to be commercialised/industrialised/mechanised to increase the amount of seagrass material that can obtain and used for restoration, and to increase the survival of this material. This project will investigate ways that we could do this including mechanical fruit collection, mechanical seed preparation and benthic modification. Qualifications: Min. rescue scuba diver and be willing to obtain a medical and pass an in-water assessment, drivers' licence	**Honours** **Masters**	
Assoc Prof Joseph Tomkins joseph.tomkins@uwa.edu.au **Dr Jason Kennington** jason.kennington@uwa.edu.au	**Sexual Selection** We have a number of project ideas relating to the evolutionary genetics of sexual selection. Primarily we are interested in separating the effects of different bouts of sexual selection and identifying their effects on fitness and the genome. The questions are directly relevant to Evolutionary genetics, sexual selection.We have a recently funded ARC discovery project and we are seeking students to help realise the objectives of theis research. The main task is understanding the difference between the outcomes of intrasexual and intersexual selection. This will involve mating trials, quantification of sexual selection and artificial selection for 'studs' and 'duds' (e.g. Dugand et al 2018,2019). These projects are focussed on Drosophila melanogaster. Topics: **1) Separating male competition and female choice.** **2) Separating the effects of pre and postcopulatory sexual selection.** **3) Testing the resurgence of Lamarck's hypothesis for the inheritance of environmentally induced variation.** **4) Manipulating the costs of male display.**	**Honours** **Masters** **PhD**	
Dr Paul Close paul.close@uwa.edu.au	**Fire-fighting waterpoints as refuges for biodiversity** Freshwater and riparian ecosystems are the most biologically diverse in the world per unit area but are also disproportionately threatened by climate change. The most severe effect of climate change is the loss of permanent pools that provide essential refuges for the survival of species during the dry season. We have recently found that fire-fighting waterpoints can mimic natural refuge pools to maintain biodiversity. However, the utilization of waterpoints for conservation is currently hindered by an inadequate understanding of the characteristics that make them effective as biodiversity refuges. This project aims to identify the ecological characteristics that make fire-fighting waterpoints effective biodiversity refuges. Projects can be designed to focus on any of the flora and fauna that are dependent on natural refuge pools for survival, including fishes, frogs, macroinvertebrates, and terrestrial flora and fauna (including feral animals). This project is fully funded and includes the scope to design field and/or laboratory-based studies.	**Honours** **Masters**	

Prof Gary Kendrick gary.kendrick@uwa.edu.au **Dr Greg Skrzypek** grzegorz.skrzypek@uwa.edu.au **Dr Matt Fraser** (Minderoo)	**Seagrass contribution to “blue carbon” storage in Shark Bay sediments** Seagrass are important primary producers and ecosystem engineering species. They also significantly contribute to carbon storage in marine sediments. This project will explore seagrass inputs to sediments along nutrient and salinity gradients in Hamelin Pool and their sedimentation rates. The sediment cores will be analysed for stable nitrogen and carbon isotope compositions and elemental concentrations. The cores have already been collected, but there is an opportunity to participate in fieldwork at the sampling sites. The project is founded as a part of ARC Linkage entitled “Ecosystem Resilience of Shark Bay under Changing Ocean Climate”.	**Honours** **Masters**