THE UNIVERSITY OF WESTERN AUSTRALIA

Honours and Masters of Biological Sciences

Research Projects 2024

School of Biological Sciences

study.uwa.edu.au/schools/biological-sciences

Welcome

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

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

Ecology & Conservation

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

Evolutionary Biology

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

Science Communication

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

Neuroscience and Neuroecology

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

Computational Biology

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

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

If you want to discuss designing projects around your interests, please contact the staff member by research disciplines listed under 'Our research' on the School of Biological Sciences webpage. The projects available are not necessarily limited to those outlined in this booklet.

THE UNIVERSITY OF WESTERN AUSTRALIA

SUPERVISORS	TOPIC	LEVEL	IMAGE
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 be unable to support insect growth and 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, by screening mutagenized canola populations for novel sterols, 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 and 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 ten years or thousands of years. Currently, we rely on germination testing to ascertain viability loss in a seed collection, however this can be difficult (due to complex dormancy and germination requirements), time consuming (sometimes months), wasteful of precious seed resources (using hundreds 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 real-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	**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**	

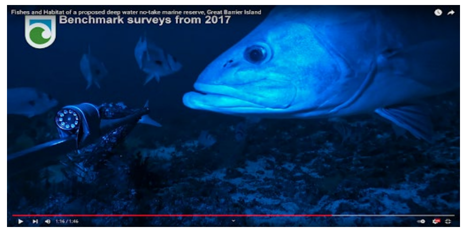
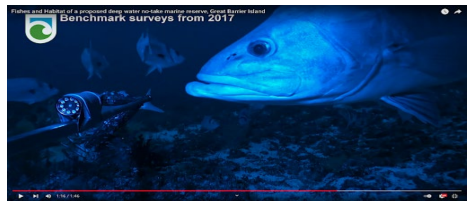
Assoc Prof Joseph Tomkins joseph.tomkins@uwa.edu.au	**Male dimorphism and sexual selection** Male dimorphism usually reflects alternative reproductive tactics among males: the large male morphs typically guard females or reproductive territories and have more elaborate weaponry; the small male morphs 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 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 South West 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**	
Prof Philip Withers philip.withers@uwa.edu.au **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 receive 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**	
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 take up and 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**	
Prof Patrick Finnegan patrick.finnegan@uwa.edu.au	**Can the leaf proteome give insights into plant species plasticity?** Hakea are a group of plants that have arisen out of the genus Grevillea. Species of Hakea tend to inhabit more infertile and drier habitats, have lower leaf phosphorus and nitrogen concentrations and have more flexibility in allocating phosphorus to various biochemical fractions in the leaves than species of Grevillea. This project will determine if the leaf protein complement (proteome) can provide clues as to why species of Hakea are seemingly better adapted to more extreme environments than species of Grevillea. You will use proteomic and bioinformatic methods to identify the proteins in leaves of a variety of species from these two genera. By comparing these protein profiles, you will strive to identify proteins and biochemical pathways that are differentially enriched in leaves from each genus. These selectively enriched groups of proteins may give clues to the adaptations that restrict each genus and perhaps each species to its specific habitat.	**Honours** **Masters**	

E/Prof Hans Lambers hans.lambers@uwa.edu.au **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 Cyril C. Grueter cyril.grueter@uwa.edu.au **Prof Leigh Simmons** leigh.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**	
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 4m2 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**	

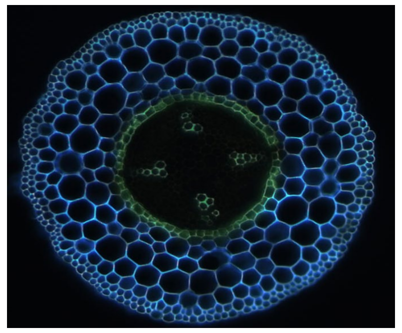
Assoc Prof Jan Hemmi jan.hemmi@uwa.edu.au **Dr Karen Osborn** osbornk@si.edu **Dr Zahra Bagheri** zahra.bagheri@uwa.edu.au	**Vision in deep sea animals** Hyperiid amphipods, small crustaceans that live in the deep, open ocean worldwide, have some of the most fascinating eyes seen in animals. In some 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 predict 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 extreme 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 flatworld inhabitants, are centred on the horizon. We would like to confirm this exciting result with physiological recordings. You will learn how to measure the visualm 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. Catarina Serra-Goncalves anacatarina.serragoncalves@uwa.edu.au **Dr. Ronen Galaiduk** R.Galaiduk@aims.gov.au **Dr Renae Hovey** renae.hovey@uwa.edu.au	**Remote sensing (e.g. satellite and/or drone) detection and mapping of marine debris (e.g. ghost nets)** Identifying hotspots of plastic accumulation in the ocean and along the coastline is an important step towards managing and mitigating the impacts of marine pollution on the environment. Remote sensing technologies have a great potential to be effective monitoring methods for the identification of debris distribution and accumulation patterns in coastal and marine environments. These remote sensing survey techniques can cover large areas of sampling in a relatively short period of time, can be used to monitor areas that are difficult to access using traditional monitoring methods, such as remote and offshore regions of the ocean, providing a more comprehensive and efficient approach to marine debris monitoring. Investing in advancing the detectability, improving the implementation of these methods and image processing times is crucial for the effective identification of marine debris distribution and accumulation patterns. This project would involve obtaining, processing, and analysing high resolution remote sensing imagery of coastal areas in WA. The student will be applying and developing a novel methodology using machine learning and artificial intelligence algorithms to detect and map marine debris. Good working knowledge of GIS, python programming skills would also be very useful.	**Honours** **Masters** **PhD**	
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 rainbow fish (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 predatorprey interactions 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 rainbow fish (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**	
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 focused 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 substructuring 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**	

E/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	**Habitat mapping at scale** 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 habitat and fish assemblages will be produced. The student will learn robust and useful methods tyically sought after in environmental studies.	**Honours** **Masters**	
Dr Tim Langlois tim.langlois@uwa.edu.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**	
Prof Jessica Meeuwig jessica.meeuwig@uwa.edu.au **Dr Naima Andrea López** naima.lopez@research.uwa.edu.au	**Characterisation of fish assemblages at the Shoalwaters Islands Marine Park** We have 3 BRUVS surveys (baited remote underwater video systems) of fish assemblages at the Shoalwater Islands Marine Park (south of Perth) within different management zones of the marine park. These surveys were coincident with a scalloped hammerhead aggregation we are studying in this region. The project will involve (1) image analysis of BRUVS surveys from summer 2020-2021 and (2) statistical analysis of the 2020-2021 surveys in order to better understand spatial variability in fish assemblages within the marine park and in relation to scalloped hammerheads abundance. This analysis will feed directly into the current WA State government marine park planning process.	**Honours** **Masters**	
Prof Jessica Meeuwig jessica.meeuwig@uwa.edu.au **Dr Naima Andrea López** naima.lopez@research.uwa.edu.au	**Characterisation of scalloped hammerheads aggregations** We are currently studying a recurrent aggregation of scalloped hammerheads within the Shoalwater Islands Marine Park. We use aerial drones as a non-invasive method to monitor and characterise the aggreation, and we plan to expand this research project by implementing a stereo diver operated video system (DOVS) monitoring. Using DOVS will allow us to identify individuals, record sex and improve size estimates. Determining the size classes and sex ratios of the individuals in this aggregation will provide insights into the sizes (i.e. ages) at which hammerhead sharks recruit to and emigrate from the aggregation and, thus, to assess the role that marine protected areas play in their protection in Western Australia. The project will involve (1) potential field work to Shoalwater during summer 2023-2024, (2) image analysis of the DOVS 2023-24 survey, and (3) statistical analysis of size estimates of DOVS and drones surveys. This analysis will feed directly into the current WA State government marine park planning process.	**Honours** **Masters**	
Prof Jessica Meeuwig jessica.meeuwig@uwa.edu.au **Dr Sean van Elden** sean.vanelden@uwa.edu.au	**A comparison between marine communities associated with artificial and natural habitats in Northwest Australia** There is increasing evidence that artificial marine habitats, such as oil and gas infrastructure, are associated with higher abundance and diversity of marine life. As offshore infrastructure comes to the end of its lifespan, decisions need to be made around either removing the infrastructure, or leaving it wholly or partly in place as an artificialreef. It is important that we understand the ecological role played by these artificial structures before they are decommissioned and potentially removed from the marine environment. This project aims to compare the abundance and diversity of marine communities associated with subsea infrastructure and nearby natural habitats, using existing video imagery.	**Honours** **Masters**	
Prof Jessica Meeuwig jessica.meeuwig@uwa.edu.au **Dr Sean van Elden** sean.vanelden@uwa.edu.au	**Investigating the sponges gardens associated with subsea infrastructure in Northwest Australia** The Pilbara region of Northwest Australia is considered a bioregional diversity hotspot for sponges, with hundreds of species found there. Historical trawling activity has removed much of the sponge and soft coral (macrobenthos) biomass throughout this region, however trawling is prohibited around oil and gas infrastructure. This project would use video footage from ROVs and BRUVS to determine whether the abundance and diversity of macrobenthos is higher around offshore infrastructure than at natural habitats exposed to trawling. The findings from this project would help to identify local macrobenthos hotspots in the Pilbara which may aid in recovery of these communities throughout the region. These findings would also inform decommissioning recommendations for offshore infrastructure in Western Australia.	**Honours** **Masters**	
Prof Jessica Meeuwig jessica.meeuwig@uwa.edu.au **Dr Chris Thompson** christopher.thompson@uwa.edu.au	**Investigating the role of fish scraping behaviour in removing ectoparasites** Scraping behaviour, where a fish scrapes its body against a physical or biological substrate, is widespread in marine environments. Fish have been observed scraping against sharks, rays, turtles, other fish, sandy substrates, and other materials. There support for the hypothesis that this behaviour is used to remove ectoparasites and therefore may improve the fitness of the species involved. This project would use video footage from BRUVS to identify species involved in these interactions and investigate empirically whether this behaviour results in parasite removal. This work highlights the importance of biodiversity, the intricate relationships among species, and the possible fitness implications if these links are lost.	**Honours** **Masters**	
Prof Jessica Meeuwig jessica.meeuwig@uwa.edu.au	**A first assessment of pelagic fish assemblages in the Amirantes Islands - Seychelles** Seychelles comprises 115 islands which cover only 452 km2 of the countries' 1,336,559 km2 exclusive economic zone. The small island developing nation committed to protect 30% of it's national waters by May 2023 and the majority of their marine park network will cover open ocean areas which remain unstudied. Featuring the largest tuna fishing operation in the Indian Ocean, there is a lack of benchmarks on pelagic wildlife communities which are needed to effectively manage fish populations including species of conservation concern such as transient elasmobranchs. The project will involve image analysis of footage from midwater baited remote underwater video systems (BRUVS) to characterize the pelagic wildlife assemblage around the remote Amirantes Islands group. This study can improve the management of large scale marine protected areas in the region and can directly aid in the conservation of a range of threatened species.	**Honours** **Masters**	

Prof Jessica Meeuwig jessica.meeuwig@uwa.edu.au	**A comparison between sounds in pelagic and benthic environments in Shark Bay & Exmouth** Sound is a vital sensory cue for marine wildlife, however there is increasing underwater noise from human activities. Baited remote underwater video systems (BRUVS) are capabale of recording the soundscape of the surrounding environment. Data from soundscapes can provide information about the health of the ecosystem and anthropogenic stressors that occur in that region. This project will involve anlaysis of audio recordings from both mid-water and benthic BRUVS to benchmark the soundscape of these environments and compare how soundscapes differ between benthic and pelagic environments.	**Honours** **Masters**	
Prof Jessica Meeuwig jessica.meeuwig@uwa.edu.au	**Invertebrate ecology of the Antarctic Peninsula** We have been deploying BRUVS along the Antarctic Peninsula, observing a diverse invertebrate community. This project will involve analysis of BRUVS footage to document the diversity, abundance and size structure of the invertebrate community to determine how it varies across habitats and along a 7o gradient of latitude. The Antarctic Peninsula is one of the most rapidly warming areas of Antarctica with an expectation of significant invasions by invertebrates, making this an important study to generate a first characteristaion of the existing communities.	**Honours** **Masters**	
Prof Jessica Meeuwig jessica.meeuwig@uwa.edu.au **Dr Chris Thompson** christopher.thompson@uwa.edu.au	**What can BRUVS tell us about sea jellies: a big data analysis** Baited remote underwater video systems (BRUVS) are typically used to study vertebrates. However keen eyes observe a diversity of gelatinous organisms. Such observations are important as, for instance, we know that siphonophores are more common in warm years in Antarctica while krill are less common. This project will involve analysis of a global BRUVS dataset of more than 100,000 records to develop a methodology to classify and count planktonic invertebrates as well as looking at their distributions through space and time. You will hone your quantitative skills and opportunities for field work will be made available when possible.	**Honours** **Masters**	
Prof Jessica Meeuwig jessica.meeuwig@uwa.edu.au **Dr Chris Thompson** christopher.thompson@uwa.edu.au	**What can BRUVS tell us about larval fish: a big data analysis** Baited remote underwater video systems (BRUVS) are typically used to study animals larger than 5cm. However keen eyes observe a diversity of small organisms including larval fish. This project will involve image analysis of a global BRUVS video to develop a methodology to classify and count fish larvae as well as looking at their distributions through space and time. You will hone your quantitative skills and opportunities for field work will be made available when possible.	**Honours** **Masters**	
Prof Jessica Meeuwig jessica.meeuwig@uwa.edu.au **Dr Chris Thompson** christopher.thompson@uwa.edu.au	**Relationships among pilot and host fish, who hangs with who and what does that mean for ecology and distribution of the pilots** Relationships among large pelagic animals and their retinue of pilots and hitchhikers are little studied. A broad range of behavioural and symbiotic links are present among animals ranging from sharks, rays, turtles, and whales, to remora, juvenile trevallies, and driftfishes. Many of these are not well documented and there are many questions in regard to what these these relationships mean for the distribution and ecology of the species involved. This project will involve analysis of a global BRUVS dataset of more than 100,000 records to identify pairs of hosts and pilot species and how these relationships may influence their ecology.	**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 recreational 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 Pieter Poot pieter.poot@uwa.edu.au **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, 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 and 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 **Prof Erik Veneklaas** erik.veneklaas@uwa.edu.au **Dr Tim Kurz** tim.kurz@uwa.edu.au	**Human-nature connection considerations in urban forest management** Urban forests are vital to cool our streets and neighbourhoods, they shape our connection to the places where we live, and they provide habitat to many species we appreciate having around us. Their management is though complex, and many times political, because of the multiple, intersecting and ever evolving biophysical, land-use, environmental and social-cultural factors that shape our cities. Climate change and the impacts of new pests make the management of urban forests a wicked challenge. There's ample scope to explore research gaps in the urban forest management so to increase the evidence base available to support robust, informed decision making (in opposition to ad-hoc, political decision making). In particular, social, cultural and historical factors that influence our connection to urban trees are still poorly understood and could be further unpacked through multidisciplinary research, and possibly, collaboration with local government authorities.	**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 nonmycorrhizal. Instead, they develop 'cluster' roots that exude carboxylates, a remarkable morphological and physiological adaptation that chemically extracts P from Pimpoverished 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 mtechnologies 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 canbe 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 impact of anthropogenic stressors on behaviour and cognition, the benefits and dynamics of cooperation (group-living behaviour), patterns of communication, and causes of individual and population-level variation in cognition. My research lab also looks 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. The magpies are ringed for individual identification, and can be observed from a distance of a few metres without alteration in their behaviour. The study sites are based within urban Perth. Students will need access to reliable transport, and to have a full driver's license to get to the study site in Guildford (students living in Guildford may not need this). Students not interested in fieldwork also have some desk-based options that will involve data modelling e.g. for population viablity analyses.	**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**	
Assoc 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 ecotourism. 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**	

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.au	**Traumatic insemination in plant bugs** In traumatic insemination (TI), males use hypodermic genitalia to inject sperm into the female through the side of her abdomen, bypassing her genitalia. This project will use plant bugs in the genus Coridromius to examine sexual conflict arising from TI. Experiments might include but are not limited to: determining the costs of TI to females; measuring the immune response of females to TI; studies of mating behaviour/mate choice; identifying the sperm pathway through the female bloodstream. The project will involve collaboration with researchers at the WA Museum.	**Honours** **Masters** **PhD**	
Professor Leigh Simmons leigh.simmons@uwa.edu.au **Assoc 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**	

Assoc Prof 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 month notice.	**Masters**	
Assoc Prof 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**	
Assoc Prof Greg Skrzypek grzegorz.skrzypek@uwa.edu.au **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	**Cultivating Asparagopsis seaweed under natural light – improving the efficiency of a novel production system** The Seaweed Aquaculture Research and Hatchery (SARaH) Lab at the Watermans Bay marine research facility (UWA) are seeking a motivated student to understand the light requirements of Asparagopsis under natural light conditions within a novel production system. By determining the light intensity and availability, your research will aim to enhance growth rates, biomass yield, and overall seaweed quality. This will be achieved through controlled shading experiments and analysis of key growth parameters such as photosynthetic efficiency, and physiological responses. Asparagopsis, a red seaweed species, has gained significant attention due to its potential to mitigate greenhouse gas emissions, particularly methane, when fed to livestock. To determine the light requirements of Asparagopsis under natural light, a series of experiments will be conducted within a novel seaweed production system as well as smaller experimental systems. Different shading levels will be tested to assess their impact on growth, productivity, and biochemical composition. By monitoring and analyzing these variables, the project aims to identify the ideal light profile under natural conditions for maximizing Asparagopsis cultivation.	**Honours** **Masters**	
Dr John Statton john.statton@uwa.edu.au **Prof Gary Kendrick** garykendrick@uwa.edu.au	**Determining nutrient requirements of Asparagopsis seaweed within a novel aquaculture production system** The Seaweed Aquaculture Research and Hatchery (SARaH) Lab at the Watermans Bay marine research facility (UWA) are seeking a motivated student to determine the specific nutrient requirements of Asparagopsis within a novel production system. By optimizing the nutrient composition, your research will aim to enhance growth rates, biomass yield, and overall seaweed quality. This will be achieved through controlled experiments and analysis of key growth parameters such as nutrient uptake, photosynthetic efficiency, and physiological responses. Asparagopsis, a red seaweed species, has gained significant attention due to its potential to mitigate greenhouse gas emissions, particularly methane, when fed to livestock. To determine the nutrient requirements of Asparagopsis, a series of experiments will be conducted within a novel seaweed production system. Different nutrient formulations and concentrations will be tested to assess their impact on growth, productivity, and biochemical composition. By monitoring and analyzing these variables, the project aims to identify the ideal nutrient profile for maximizing Asparagopsis cultivation.	**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 **Dr Rowan Lymbery** Rowan.lymbery@uwa.edu.au **Dr Robert Dugand** Robert.dugand@uwa.edu.au	**Evolution and plastic tollerance** The environment is accumulating plastic representing an evolutioanry challenge to the biota that live alongside it. This novel evolutionary environment might be easily adapted to or it might be evolutionarily challenging. We have evidence to suggest that plastics reduce the size of male drosophila and affect their mating performance. This project will continue to enquire into the transgenerational effects of plastic exposure in fruit flies.	**Honours** **Masters**	
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**	
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**	
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**	
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**	
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**	

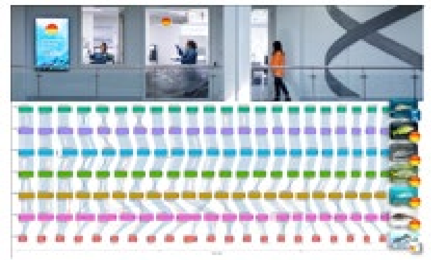
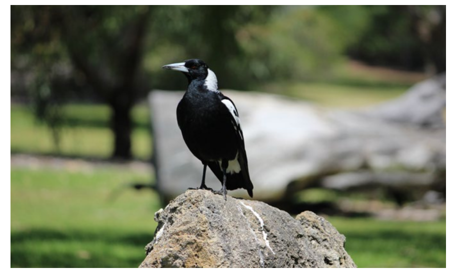
Prof Erik Veneklaas erik.veneklaas@uwa.edu.au **Dr Siegy Krauss** siegy.krauss@dbca.wa.gov.au **Dr David Merritt** david.merritt@dbca.wa.gov.au **Dr Michael Renton** michael.renton@uwa.edu.au **Dr Suzanne Prober** suzanne.prober@csiro.au **Dr Martin Breed** martin.breed@flinders.edu.au	**Optimising seed 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 climatechange 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 its plant 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, videobased 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@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 baseline 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 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 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**	
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 nonhuman warfare.	**Honours** **Masters** **PhD**	
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 are often heavily under-valued and under-represented in fisheries science at the national and regional level, as they are often dominated by 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. These types of projects could be especially interesting for students that are excited by historical ecology and shifting baselines, or wish to be challenged by 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 general data approaches. An open mind, critical thinking, team work and above all scientific curiosity is all that is required.	**Honours** **Masters** **PhD**	
Prof Dirk Zeller dirk.zeller@uwa.edu.au **Dr Wanja Nyingi** wanja.nyingi@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. The project aligns with the new Freshwater Hub in the Sea Around Us - Indian Ocean research initiative (www.seaaroundus-io.org), and engages in fisheries data and stock assessment projects for Lake Victoria's freshwater fisheries. This research builds on a successful and published freshwater project in 2020 for Kenya, and may directly contribute to and participate in a regional capacity enhancement 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, 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 **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**	
Dr Elizabeth Sinclair elizabeth.sinclair@uwa.edu.au **Prof Gary Kendrick** gary.kendrick@uwa.edu.au **Prof Jacqui Batley** jacqueline.batley@uwa.edu.au	**The world's largest plant is a seagrass, *Posidonia australis*** This giant polyploid plant lives in Shark Bay, and its been growing for up to 4,500 years. We suspect having two complete genomes ensures it's a pretty resilient organism. A large scale restoration experiment was established in Shark Bay approximately 12 months ago to compare survival, growth rates, and sexual reproduction among cuttings sourced from different locations across Shark Bay. This project will be confirming ploidy of the transplanted cuttings through genomic analysis and then comparing growth rates among diploid and polyploid cuttings. Qualifications: a background in genetics and/or bioinformatics is strongly recommended. 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	**Optimising the collection and dissemination of 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, we would like to develop methodologies to improve both the collection and dissemination of seeds to increase both seed survival and optimisation of methods to enhance seed recruitment. Qualifications: min. rescue scuba diver and be willing to obtain a medical and pass an in-water assessment, drivers' license.	**Honours** **Masters**	

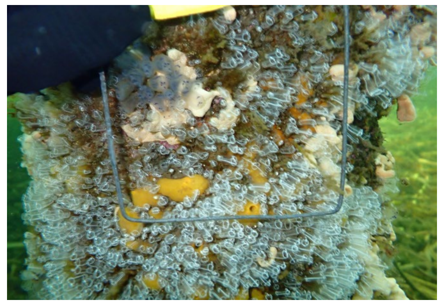
Dr Robert Dugand Robert.Dugand@uwa.edu.au **Assoc Prof Joseph Tomkins** joseph.tomkins@uwa.edu.au **Dr Jason Kennington** jason.kennington@uwa.edu.au	**Sexual Selection** We have a number of project ideas relating to the evolutionary genetics of sexual selection. Primarily we are interested in separating 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 this 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 focused 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 firefighting 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 laboratorybased studies.	**Honours** **Masters**	
Prof Gary Kendrick gary.kendrick@uwa.edu.au **Assoc Prof 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**	
Prof Gary Kendrick gary.kendrick@uwa.edu.au **Dr Maria Jung** maria.jung@uwa.edu.au	**Investigating the effect of phytotoxic hydrogen sulfides on seagrass performance** Seagrasses are important ecosystem engineers. In addition, seagrass ecosystems are critical for climate change mitigation due to their large capacity for removing CO2 from the atmosphere. However, seagrasses are highly sensitive to environmental disturbances and are continuing to decline globally at an alarming rate. In Cockburn Sound, WA, seagrass health has been previously found to be impacted by phytotoxic hydrogen sulfide intrusion. Hydrogen sulfides are formed under anoxic sediment conditions and can be detoxified inside the plantâ€™s below ground tissue (roots and rhizomes). However, if hydrogen sulfides reach the leaves they can have damaging consequences on both seagrass performance and survival. Several studies have assessed the effects of hydrogen sulfides on seagrass performance in the past, yet the underlying mechanisms are still not well understood. This masterâ€™s project offers the opportunity to address these knowledge gaps within the scope of a multi-disciplinary study. We aim to investigate critical contributors to seagrass health such metabolism and microbiome in combination with physiological parameter assessment and phenotypic monitoring. Seagrasses will be exposed to a range of hydrogen sulfide levels in a mesocosm (tank) setting. We are looking for an enthusiastic and committed student who can work both independently and as part of a team. Lab work experience essential, technical know-how and field work experience desirable.	**Honours** **Masters**	
Prof Pauline Grierson pauline.grierson@uwa.edu.au	**Dendrochronology** (The study of growth rings in trees and shrubs) can reveal remarkable insights in to climate and ecological and physical responses to environmental change (drought, flood, insect attack and urban pollution to name a few). We currently have projects on (i) mangroves and hydrology using water isotopes; (ii) reconstructing environmental histories from Callitris; (iii) using wood anaotical structures to understand when and how karri and understorey species grow; (iv) looking at shrubs in understories to understand fire responses. We're looking for enthusiastic and committed students with an eye for detail (pattern recognition is great!) who enjoy working in the field but also in the lab with a microscope. An interest in data analysis and modeling is also useful.	**Honours** **Masters**	
Prof Pauline Grierson pauline.grierson@uwa.edu.au	**Carbon and nutrient fluxes in soils can be strongly impacted by fire and other disturbances** We have a range of projects exploring organic matter transformations in forest and aquatic ecosystems, including exploring relationships between organic matter transformations with fire intensity and relationship with functioning of the microbiome. Get in touch if these themes are of general interest.	**Honours** **Masters**	

Prof Pauline Grierson pauline.grierson@uwa.edu.au	**Determinism of eucalypt root growth under changing environmental conditions** This project will explore plasticity in the development of eucalypt root systems of key species being impacted by ltered hydrology in the Pilbara. The project includes pot experiments and field observations.	**Honours** **Masters**	
Dr Cristina E Ramalho cristina.ramalho@uwa.edu.au **Prof Pauline Grierson** pauline.grierson@uwa.edu.au	**Caring for Country in our city: understanding when ecological restoration activities hinder or support cross-cultural collaboration and Reconciliation** The Swan-Canning River (Derbal Yerrigan-Djarlgarro Beeliar) system and the surrounding wetlands that still persist in the Swan Coastal Plain are nowadays some of our most precious urban green spaces. Not surprisingly, they are also places of immense significance to Noongar people. A change of attitudes by local governments since the 1960s has seen a growing appreciation for these environments for their recreational and wellbeing value, with many being cared for and restored by local volunteer groups. This project aims to explore the social-cultural-governance aspects framing stewardship of local waterways and remnant bushland by local community groups, and how those aspects can hinder or foster Reconciliation, i.e. the meaningful, respectful and inclusive collaboration with Traditional Custodians to care for Country and urban places that are loved by all. This is a project that can be approached from a number of different angles, and will include collaborations with different people, Noongar Elders, land care groups, local government practitioners, as appropriate.	**Honours** **Masters** **PhD**	
Prof Jessica Meeuwig jessica.meeuwig@uwa.edu.au **Prof Dirk Zeller** dirk.zeller@uwa.edu.au	**Bait in wild-capture fisheries: an overlooked conservation impact** A number of fishing gears such as long-lines and traps rely on bait to catch fish. While there has been much concern about the use of wild-caught fish as a feed input to aquaculture production, the nature and scale of bait use in wild fisheries remains undocumented and undiscussed. Consequently, the conservation implications of bait as an input to wild fisheries are unknown. This project will empirically model bait consumption in wild fisheries by collating data on global fishing effort, global catch of bait species, and bait consumption by fishing gear. The temporal spatial distribution of bait procurement and bait consumption will be analysed, particularly in light of geopolitical considerations such as the Human Development Index.	**Masters**	
Prof Jessica Meeuwig jessica.meeuwig@uwa.edu.au **Dr Sean van Elden** sean.vanelden@uwa.edu.au	**What can BRUVS tell us about sea snakes: a big data analysis** Baited remote underwater video systems (BRUVS) are typically used to study fishes and sharks. However, deploying large numbers of BRUVS increases the chances of recording less abundant animals such as sea snakes. Sea snakes are typically studied by direct human observation, but BRUVS allow for these animals to be studied with minimal disturbance of natural behaviour. Sea snakes are threatened by human activity including commercial fishing and habitat loss, and their populations have declined in parts of north west Australia. This project will involve analysis of a BRUVS dataset of more than 100,000 records in Australian waters to identify and count sea snakes, as well as looking at their distributions through space and time.	**Honours** **Masters**	
Assoc Prof Amanda Ridley amanda.ridley@uwa.edu.au **Natasha Harrison** natasha.harrison@research.uwa.edu.au **Grace Blackburn** grace.blackburn@research.uwa.edu.au	**Exploring the effect of anthropogenic noise on quenda behaviour** Anthropogenic noise can have profound effects on wild animal populations by disrupting individuals' behaviour. This has the potential to influence demographic rates such as survival and reproduction. With this project, we aim to explore the effect of anthropogenic noise on the foraging and vigilance behaviours of quenda (Isoodon fusciventer) in an urban reserve. The student will work to quantify anthropogenic noise, creating a landscape of sound within the reserve, and will then investigate how such noise affects documented foraging and vigilance behaviours of over 20 individuals. The outcomes of the study can be presented to conservation managers to help inform the management of this, and other urban populations.	**Honours** **Masters**	
Dr Barbara Cook barbara.cook@uwa.edu.au	**Optimising the use of wildlife camera traps for remote monitoring of terrestrial fauna in Australia** To be able to cost-effectively monitor biodiversity in repaired landscapes at the scale needed in Australia, automation of processes will become essential. Despite the existence of some 'stand out' examples of using automated processes such as the monitoring of fauna in fire damaged landscapes in eastern Australia using remote cameras, adoption across other parts of Australia of automated workflows for camera trapping has been poor. Many regions lack adequate training image data sets to ensure that AI models are accurate, and potential users vary in terms of their access to high level internet (and thus Google Cloud) and computers and adequate mobile phone coverage. For a honours or masters project, you could focus on independent testing of the performance of selected AI models at sites in a selected region.	**Honours** **Masters** **PhD**	
Dr Barbara Cook barbara.cook@uwa.edu.au **Dr Paul Close** paul.close@uwa.edu.au	**Sensitivity of aquatic macroinvertebrates to acidity** Extensive networks of deep drains have been built in Western Australia to reduce the effects of dryland salinity on agricultural lands. Most of these drains discharge highly saline and acidic waters into natural river and wetland systems, with little consideration given to environmental impacts. Using existing data, this project will investigate pH tolerances of aquatic biota to identify threshold levels associated with significant changes in biodiversity composition in Wheatbelt streams.	**Honours** **Masters**	

Dr Barbara Cook barbara.cook@uwa.edu.au	**Assessing the effectiveness of revegetation projects** There has been significant investment in the revegetation of cleared land aimed at increasing the extent of native vegetation in Australia. Although the degree to which this service has been delivered is well reported, a lack of follow-up to determine the effectiveness of these plantings makes it difficult to (ii) quantify success, (ii) identify failure and ways to improve the implementation of plantings to rectify this, and (iii) apply what has been learnt from individual sites to other areas. In this research, you will evaluate the response of selected taxa such as mammals, birds or invertebrates to revegetation in southwestern Australia.	**Honours** **Masters** **PhD**	
Dr Barbara Cook barbara.cook@uwa.edu.au **Dr Sarah Barrett**	**Pollination biology of the critically endangered Banksia montana** The critically endangered Stirling Range endemic Banksia montana is known from eight mature individuals in the wild but has been successfully translocated to a seed orchard south of the Stirling Range. However, little is known of the pollination biology of this species. This project will identify pollinators and will investigate their behaviour and visitation rates in ex-situ populations. The study will determine whether pollination or other factors are limiting reproductive success and whether the species is self-compatible.	**Honours** **Masters**	
Prof Erik Veneklaas erik.veneklaas@uwa.edu.au **Dr Mark Dobrowolski** Mark.Dobrowolski@iluka.com **Assoc Prof Matthias Leopold** matthias.leopold@uwa.edu.au	**Enhancing seedling survival in kwongan restoration** Land imprinting in combination with an artificial soil crust has proven effective in establishing kwongan species from seed. The reasons for its effectiveness are not fully understood. It should increase infiltration and reduce run-off to increase water availability for establishing seedlings. Formation of preferential pathways for infiltrating rainfall may also be key to its success. It may also reduce wind shear in creating a boundary layer, which reduces transpiration. Using a variety of plant physiological and soil physical methods you will test hypotheses around the possible mechanisms of action of land imprinting. Unsaturated zone modeling may also be used to generate data to validate against field observations. This work involves working directly on a project to improve mine rehabilitation and will require mine site inductions and field work away from Perth.	**Honours** **Masters**	
Prof Dave Edwards dave.edwards@uwa.edu.au **Dr Richard Edwards** rich.edwards@uwa.edu.au	**Marine vertebrate reference genomes and comparative genomics** The Minderoo OceanOmics Centre at UWA is a multidisciplinary team of fish biologists, bioinformaticians and ecologists, using genomics to address pressing challenges in marine conservation. The Ocean Genomes Laboratory is equipped with the latest high-throughput sequencing technology and computational biology facilities. In collaboration with global partners, we are generating a comprehensive library of high-quality marine vertebrate reference genome assemblies. Projects are available throughout the process of assembling, annotating, curating and interpreting reference genomes. These include developing automated workflows, advancing methods for assembly curation through comparative genomics, developing data visualising/sharing dashboards, and detailed curation of individual reference genomes. Candidates from a range of biological or computational backgrounds are welcome. Co-supervisor: Dave Edwards or other SBS academic dependent on project.	**Honours** **Masters**	
Prof Dave Edwards dave.edwards@uwa.edu.au **Dr Richard Edwards** rich.edwards@uwa.edu.au	**Environmental DNA for better ocean health conservation** Oceans are suffering from human-made pressures such as overfishing and climate change. Monitoring of fish populations relies on expert surveys and underwater cameras (BRUVs), approaches which do not scale well across marine park areas (MPAs). Environmental DNA (eDNA) sampled from ocean water offers a chance to improve scalability of ocean health assessments. A wide range of projects are also available in collaboration with Minderoo scientists working with the Minderoo OceanOmics Centre at UWA. Projects include (1) Analysis, comparison, and interpretation of eDNA data from expeditions to Australian MPAs, (2) Implementing analysis workflows to streamline and automate large scale processing of eDNA data and (3) Implementing novel ML or AI approaches to analyse eDNA data. Candidates will learn how to work with multiple types of biological data and experience working in a cross-disciplinary team composed of fish biologists, bioinformaticians and ecologists. Co-supervisor: Renae Hovey or other SBS academic dependent on project; Philipp Bayer (Minderoo).	**Honours** **Masters**	
Assoc Prof Amanda Ridley amanda.ridley@uwa.edu.au **Grace Blackburn** grace.blackburn@research.uwa.edu.au	**The impacts of anthropogenic stressors on animal behaviour and communication** Many animals species have adapted well to urban life, however there are some stressors associated with this adaptation. Magpies are an iconic Australian bird species that are often seen in our urban parklands. We have two main study populations: one near the airport (very noisy) and one in Crawley (not as noisy). Our recent research has revealed big impacts of anthropogenic noise on these magpies, much bigger than expected. We (my collaborator Grace Blackburn and I) are therefore expanding on this research to better understand the impact of anthropogenic noise both in the short and longer term on magpie behaviour and reproductive success. Students joining this project can expect to be involved in fieldwork, including experimental playbacks (for some, but not all potential projects). Please contact me direct for further project details.	**Honours** **Masters** **PhD**	

Prof Stephen D. Hopper AC steve.hopper@uwa.edu.au **Dr Margaret Byrne** margaret.byrne@dbca.wa.gov.au **Dr Rachel Binks** rachel.binks@dbca.wa.gov.au	**Floristic surveys of Walpole Wilderness peat swamps and assessing their endangerment** There is an urgent need to document the range of flora found in peat swamps across the Walpole Wilderness region to tie in with large scale geomorphological, hydrological and fauna surveys under Noongar Elder guidance. Collectively, this research will better inform conservation strategies and help identify the rarest and most threatened floristic peat communities. DNA studies of key threatened species may be undertaken to document population level patterns of divergence and hybridization.	**Honours** **Masters** **PhD**	
Prof Stephen D. Hopper AC steve.hopper@uwa.edu.au	**Ethnobiology studies with Noongar people** A series of projects is on offer, tailored to your skills and interests exploring Traditional Ecological Knowledge (TEK) with Elders on the South Coast and or at Dryandra near Narrogin. The aim is to capture TEK through oral history interviews on country, and test hypotheses derived from such investigations, before elders pass on. Culturally important plants, animals and ways of caring for country are the focus.	**Honours** **Masters** **PhD**	
Assoc Prof Greg Skrzypek grzegorz.skrzypek@uwa.edu.au **Prof Pauline Grierson** pauline.grierson@uwa.edu.au **A/Prof Huade Guan** huade.guan@flinders.edu.au	**Plant community distributions on a semiarid flood plain as a response to flood depth and frequency** This project is located in Pilbara and focuses on native bush and riparian communities. It would involve some fieldwork and botanical surveys along transects, analysing drone pictures to assess plant distribution and analysing leaves for d13C and d15N to understand water stress. The main research question is how topography, soil type, and water depth shape the zonation of plant communities with respect to water use efficiency.	**Honours** **Masters**	
Dr Renee Firman renee.firman@uwa.edu.au **Dr Jen Kelley** jennifer.kelley@uwa.edu.au	**Why did the numbat get its stripes?** The numbat is an endangered marsupial native to Western Australia. Only two remnant populations remain in the wild, although the species also persists in multiple predator-free sanctuaries across Australia. The numbat is under threat from habitat loss and invasive predators. The numbat is an aesthetically beautiful animal with characteristic markings, including a black stripe running from the tip of the muzzle through the eyes to the base of the small, round-tipped ears and white stripes across the lower back. Surprisingly, there have been no dedicated investigations into the adaptive significance of these markings. This project will provide baseline data in an assessment as whether these markings have evolved as a response to predators (aerial and/or land-based). The project will involve camera trapping numbats and specialised predator visualisation modeling.	**Honours** **Masters**	
Dr Renee Firman renee.firman@uwa.edu.au	**The use of hair steroid analysis to quantify social rank in pebble mound mice** The pebble mound mouse is endemic to the Pilbara region of Western Australia. Pebble mound mice live in social groups and exhibit the intriguing behaviour of building permanent pebble-mounds above a subterranean burrow system. Individuals of high social rank within social groups typically have greater ability to access resources and therefore often accumulate benefits that promote health and survival, as well as reproduction. However, compared to low ranked individuals, individuals of high social rank tend to engage more frequently in physical conflict, increasing the risk of injury and potentially reducing longevity. This project will combine information derived from "competitive phenotype" assays (e.g. stress and testosterone hormone levels, body size relative to other group members) with reproductive status (active vs. inactive) to characterise the relative social rank of individuals (dominant vs. subordinate) within social groups.	**Honours** **Masters**	
Dr Renee Firman renee.firman@uwa.edu.au	**Night song in willie wagtails** Nocturnal song in typically diurnal passerine species is not well understood, and has been formally explored in only a handful of Northern Hemisphere species. The willie wagtail is a small, diurnal songbird native to Australia, Papua New Guinea, the Solomon Islands, and Eastern Indonesia. Willie wagtails thrive in both rural and suburban habitats, residing in open woodlands and urban gardens. Both male and female willie wagtails sing during daylight hours, while nocturnal songs are only perfomred by males in bouts (series of songs sang at a high rate, interspersed with long silent periods) during the breeding season. Different functions have been ascribed to the willie wagtail nightsong. One hypothesis is that nightsinging is a product of sexual selection, due to male-male competition (territory exclusion) and/or mate attraction. This project will test the former idea by recording night songs in willie wagtails and assessing different call characteristics in relation to proximity to other males and male density within the area, as well as environmental parameters.	**Honours** **Masters**	

Prof Jacqui Batley jacqueline.batley@uwa.edu.au	**Quantitative resistance (QR) against blackleg** Blackleg, caused by the fungal pathogen *Leptosphaeria maculans* , remains a highly destructive disease that significantly impacts canola production. Although several qualitative resistance genes, also known as major R genes, have been identified and cloned, their long-term effectiveness in the field is limited due to the potential for resistance breakdown. To achieve more sustainable disease control, a promising strategy involves combining qualitative and quantitative resistance (QR) in one genetic background. Quantitative resistance is controlled by multiple genes and is a more complex form of resistance compared to qualitative resistance. This project will employ a multi-omics approach to unravel the genetic mechanisms underlying QR. The ultimate objective is to identify genetic markers associated with QR that can be utilized to further enhance blackleg resistance in canola cultivars.	**Honours** **Masters** **PhD**	
Prof Jacqui Batley jacqueline.batley@uwa.edu.au	**Genome-editing for durable disease resistance in crops** The deployment of genetic resistance, mediated by resistance genes, is the most sustainable management strategy to prevent disease epidemics. Combining multiple resistance genes in one cultivar has been considered an effective strategy to maintain their effectiveness, leading to durable disease resistance. However, current approaches for creating durable disease resistance in crops are hindered by practical and biological limitations. This project will employ genome editing using CRISPR-Cas systems to overcome these challenges in engineering disease resistance in plants. A recent advancement in this technology, called multiplex CRISPR-Cas, allows for the simultaneous editing of different genes, which has the potential to improve disease resistance. This project has the potential to accelerate the development of durable disease-resistant crop varieties as a key sustainable strategy to prevent disease epidemics, thereby enhancing crop production. Moreover, the knowledge gained from this project will contribute to a better understanding of the mechanisms involved in disease resistance, enabling crop scientists to design better cultivars to meet the requirements of the growing population.	**Honours** **Masters** **PhD**	
Dr Matt Navarro matthew.navarro@uwa.edu.au **Dr Joe Christensen** joseph.christensen@uwa.edu.au	**Historic changes in recreational fishing (1900-2010) from Western Australian newspaper records** Fisheries management often suffers from a lack of historic baselines from which to understand current stock status. Newspaper records of fishing reports represent a novel historic dataset that may be useful for understanding these baselines, and changes that have occured in coastal fisheries over time. This project will build on an existing database of newspaper fish catch and size reports to explore likely changes in fish populations in the Perth Metropolitan Area. Through the newspaper record database there is scope to examine a range of changes including: changes in fish composition reported, changes in fish lengths reported, and changes in sentments towards management. In doing so this project will enrich our understanding of the historic contexts that gave rise to current fish populations, and support sustainable fisheries management.	**Honours** **Masters**	
Dr Renee Catullo renee.catullo@uwa.edu.au **Dr Jason Kennington** jason.kennington@uwa.edu.au **Dr Kym Ottewell** kym.ottewell@dbca.wa.gov.au	**Reconstructing the demographic history of the critically endangered Margaret River hairy marron and its competitor, the smooth marron** The critically endangered Margaret River hairy marron (Cherax tenuimanus) is a large freshwater crayfish endemic to the Margaret River. The species has undergone catastrophic decline and is now considered extinct in the wild with only ~30 individuals held in captivity. Competition and hybridisation with the smooth marron (Cherax cainii) have been major causes of the species decline. Using genome-wide SNP data and a recent genome assembly for hairy marron, the project will use coalescent modelling approaches to reconstruct historical and contemporary effective population size of hairy marron in comparison to the smooth marron. The project will assess whether the observed low population size in hairy marron has persisted throughout its evolutionary history or if the detectable genetic bottleneck is a more recent phenomenon, including an investigation into the timing of this bottleneck event. Comparative analyses in the smooth marron will assess whether a coincident signal of population expansion is detected.	**Honors** **Masters**	
Dr Renee Catullo renee.catullo@uwa.edu.au	**Systematics of the pallid rocket frog (Litoria pallida)** The pallid rocket frog is currently considered a single widespread species across all of Northern Australia. However, genetic data suggests it is likely 2-3 species. For this project you would use genetic, morphological, and frog call data to assess species status and describe any new species in the complex. This project is co-supervised with Jodi Rowley (Herpetology Curator at the Australian Museum) and Paul Doughty (Herpetology Curator at the WA Museum).	**Honours** **Masters**	
Dr Kate Sprogis Kate.sprogis@uwa.edu.au **Dr Barbara Cook** barbara.cook@uwa.edu.au	**Investigation into the health, group composition and relative abundance of long-finned pilot whales** Long-finned pilot whales are a common species to mass strand in Australia. Investigating potential causes of mass strandings is difficult when scientists do not have baseline data of pilot whales. Therefore, this project aims to investigate the health, group composition and relative abundance of presumably healthy free-ranging pilot whales off Western Australia. Photo-identification and blow sample data will be collected in the field, and analysed in the lab. The project is a collaborative project with supervisors from UWA, the WA Government and Nord University (Norway). The results from this research will provide baseline data for understanding the group composition and relative abundance of pilot whales, and for comparison to biological samples collected during mass strandings. Student is to be UWA Albany campus based.	**PhD** **Masters**	

Dr Kate Sprogis Kate.sprogis@uwa.edu.au **Dr Barbara Cook** barbara.cook@uwa.edu.au	**Humpback whale calves on the south coast** A breeding population of humpback whales (stock D) migrate annually from Antarctic feeding grounds (group IV) to northwestern Australia breeding grounds. Humpback whales were once decimated from whaling, and their numbers have since recovered. Their main breeding grounds for mating, calving and nursing have been described off the Kimberley region, with important areas for young calves off Ningaloo Reef and Exmouth Gulf. As the population of humpback whales increases it is important to understand the extent of calving on the south coast of Australia. This project examines the number of humpback whale calves off the south coast of Western Australia. The student will compile and analyse historic and current data. The student will be based at the UWA Albany campus.	**Honours (part-time) Masters**	
Dr Kate Sprogis Kate.sprogis@uwa.edu.au **Dr Barbara Cook** barbara.cook@uwa.edu.au	**Investigating the effects of different rope colour on the entanglement rate of humpback whales** Off Western Australia, humpback whales migrate annually along the Western Australian coastline. During this time, humpback whales may become entangled in fisheries gear (e.g., rope, line) from different fisheries types (i.e., the rock lobster, pearl, octopus fisheries). Humpback whales are the most commonly entangled baleen whale off Western Australia, and this project examines the different coloured ropes (i.e., yellow vs white) and how colour may contribute to entanglement rates. The student can either be based at the UWA Albany campus, or at DPIRD Fisheries in Perth. The project will involve boat-based fieldwork, and analyses of fisheries data. The project is a collaboration with DPIRD, DBCA and UWA Albany.	**Honours**	
Dr Jessica Kolbusz jess.kolbusz@uwa.edu.au **Prof Alan Jamieson** alan.j.jamieson@uwa.edu.au	**Environmental conditions and water movement through hadal trenches** This project focuses on the 3D physical and biological oceanographic modelling of trench systems at multiple scales. Given the collection of high-resolution bathymetry and physical oceanographic data over 6000 m in these trench environments on Research Vessel Dagon by the MUSDRC, the candidate will have the opportunity to execute and validate an oceanographic model within the Western Pacific trench environments. This project is driven by the frequent omission of depths over 6000 m in global and regional models, such as ECCO or ACCESS, respectively. This will involve computing language skills such as MATLAB and Python and likely use of High-Performance Computing to run the model. The successful candidate may participate in sea-going expeditions and, in between, be based in the Deep-Sea centre in Perth, Australia. This will be in conjunction with the Oceans Graduate School. This project can be done at multiple scales to suit different levels.	**Honours Masters PhD**	
Dr Jessica Kolbusz jess.kolbusz@uwa.edu.au **Prof Alan Jamieson** alan.j.jamieson@uwa.edu.au	**Environmental conditions of the deep-sea off Western Australia** This project involves utilising physical oceanographic data collected by observatories deployed by the MUDSRC, funded by Marine Parks Australia. Positioned strategically in ~5000 m within the Gascoyne Marine Park and the Perth Canyon Marine Park, these observatories provide an invaluable dataset, including measurements from current sensors for studying ocean currents, as well as temperature, oxygen, and salinity profiles. Furthermore, the observatories also include sediment traps, therefore there is the potential to investigate the biogeochemical cycle of the deep ocean. By delving into this dataset, the student has the opportunity to explore diverse research directions while contributing to the validation of existing ocean models in the region, leveraging unique seafloor data from the southeast Indian Ocean. This project will not only advances scientific understanding but also allows the student to make significant contributions to the field of oceanography. This project can be done at multiple scales to suit different levels.	**Honours Masters PhD**	
Dr Tai Loureiro tai.loureiro@uwa.edu.au	**Dynamics of fouling assemblages across spatial and temporal scales** This project aims to understand the dynamics of fouling assemblages across spatial and temporal scales. Fouling species colonize submerged surfaces and significantly influence the health and functioning of coastal habitats. Understanding their composition, diversity, and temporal changes is essential for effective management and conservation strategies. While some fouling species, particularly exotic species, can have detrimental impacts, many others play vital roles by contributing to nutrient cycling, habitat complexity, and biodiversity. The study will involve systematic sampling and analysis of environmental variables and fouling assemblages on diverse submerged surfaces, utilizing both traditional field methods and advanced statistical analyses to assess species composition and abundance across spatial and temporal scales. The project will be divided into two tiers: one focusing on Frenchman Bay for Albany-based students and the other focusing on the Swan River for Perth-based students. The study will contribute to understanding how anthropogenic factors influence fouling assemblages and provide recommendations for managing biofouling in marine and estuarine environments.	**Honours Masters**	
Dr Tai Loureiro tai.loureiro@uwa.edu.au	**Integrating Blue Carbon into Nationally Determined Contributions: challenges and opportunities** This project will explore the challenges and opportunities of integrating marine ecosystem conservation and restoration into Nationally Determined Contributions (NDCs) under the Paris Agreement. Despite recognising some marine ecosystems (e.g., mangroves, seagrasses, and salt marshes) for their significant carbon sequestration potential and co-benefits like coastal protection and biodiversity conservation, their inclusion in NDCs remains limited and uneven across countries. This research will analyse existing literature and case studies, particularly focusing on successful integrations to identify barriers and enabling factors. The project will involve a comprehensive review of policy documents, stakeholder interviews, and the development of recommendations for enhancing BCE integration into NDCs.	**Honours Masters**	

Dr Tai Loureiro tai.loureiro@uwa.edu.au	**Mapping and Assessing Cultural Ecosystem Services in Coastal Ecosystems: Mixed Methods Approaches and Equity Considerations** This project aims to map and assess the cultural ecosystem services (CES) provided by local coastal ecosystems through a mixed-methods approach, combining traditional data collection with innovative social media data analysis. Cultural ecosystem services, such as recreational, aesthetic, educational, and spiritual benefits, play a crucial role in human well-being and are increasingly recognized for their importance in ecosystem management and conservation strategies. The research will involve a comprehensive review of existing methodologies for measuring CES and will apply these methods to selected coastal sites, both within and outside protected areas, to evaluate the distribution and value of CES. Additionally, it will assess the Cultural Ecosystem Services Utilization Equity (CUE) to ensure fair access and benefits across different social groups. A significant focus will be on aspects of equity and justice, exploring how CES can support sustainable livelihoods and social inclusion. By integrating various data sources and considering social justice, this project will provide a holistic understanding of the cultural value of coastal ecosystems and inform more equitable and effective conservation policies.	**Honours** **Masters** **PhD**	
Prof Dirk Zeller dirk.zeller@uwa.edu.au **Dr Wanja Nyingi** wanja.nyingi@uwa.edu.au	**African freshwater fish biodiversity mapping** The distribution of freshwater fish in Africa and the changes in these distributions remain largely unknown. In recent decades, many species have gone extinct, while new species are still being discovered. Given the critical role of fish species in the region's economy and food security, their conservation and management are paramount. The project aligns with the new Freshwater Hub in the Sea Around Us - Indian Ocean research initiative (www.seaaroundus-io.org), and will derive data from international museum databases and collections, and the National Museums of Kenya from fish collection surveys encompassing all inland basins of Kenya over the past 30 to 40 years. This dataset consists of taxonomic and locality information based on curated fish specimens from diverse surveys. Historical baseline data from colonial-era fisheries department surveys on East African species will establish benchmarks for endemic species occurrences and species introductions. Additionally, data from the IUCN Red List on threatened species will provide further insights into spatial and temporal species threats. The study will develop maps of the geographical distribution of fish species using GIS tools to analyze changes in endemic species distribution over time, identify patterns of species introductions and track the spread of invasive freshwater aquatic species. Based on comparisons with historical baselines, this project will also identify trends in species distribution and status. Information from the study will support evidence-driven monitoring and response to threats to freshwater species in the region.	**Honours** **Masters**	
Assoc Prof Nicki Mitchell nicola.mitchell@uwa.edu.au **Dr Emily Hoffmann** emily.hoffmann@uwa.edu.au	**Automating acoustic monitoring of Endangered sunset frogs** The sunset frog (*Spicospina flammocaerulea*), listed as Endangered by the IUCN, is restricted to a small area of peatlands in southwest Western Australia. One of the primary challenges for studying and conserving this species is its detection. This project aims to address these challenges by developing an automated method to identify sunset frog calls using recognition software. The project will involve a fieldwork component, deploying acoustic recorders across known sunset frog sites and potential new locations, as well as a substantial analytical component focused on developing and testing a workflow for automated analysis of acoustic files to detect sunset frogs. The outcomes of this project will have significant applications for future monitoring of the species.	**Honours** **Masters**	
Prof Thomas Wernberg thomas.wernberg@uwa.edu.au **Shinae Montie** shinae.Montie@uwa.edu.au **Mads Thomsen (external)**	**Forgotten biodiversity in seagrass beds: do ecotones and epiphytes matter?** Scientists know that biodiversity differs between marine habitats, like between sandflats, reefs or seagrass beds. However, little is known about if biodiversity varies within a habitat, like within monotonous seagrass beds. This project will study how biodiversity varies within such seagrass beds: (i) across 'ecotones', i.e., habitat with different distances to nearby rocky reefs, that provide shelter for fish and larvae of small animals, and (ii) with different levels of seagrass-attached epiphytes, that provide shelter from predators for small animals, like amphipods and micro-gastropods. Biodiversity will be measured on fish, quantified from video transects, seagrass-epiphytes, quantified from photos, and small animals, by collecting seagrass samples to be processed in the laboratory. The student will need to obtain minimum UWA SCUBA qualifications to undertake this project. This project aims to better understand biodiversity of seagrass beds, and ultimately improve conservation of these crucial habitats.	**Honours** **Masters**