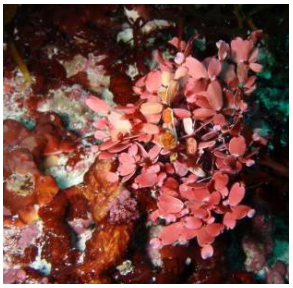
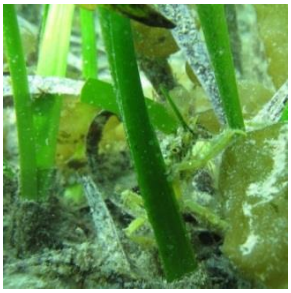
MARINE PROJECT PORTFOLIO
LEVELS 4 and 5

Projects suitable for:
Honours in Marine Science, Marine Biology or Marine and Coastal Processes,
Masters in Marine Biology, Oceanography, Geoscience, or Environmental Science
2023-2024








Schools of Biological Sciences, Earth Sciences, Agriculture & Environment and Oceans Graduate School

The University of Western Australia
35 Stirling Highway
PERTH WA 6009

Marine Science, Marine Biology, Oceanography, Geoscience and Marine and Coastal Management at UWA

At UWA, majors in Marine Biology and Marine & Coastal Processes are offered within the Bachelor of Science and taught across three schools: the School of Biological Sciences, the School of Earth Sciences and the School of Agriculture and Environment. An extended major and degree in Marine Science is also available. All three are three-year degrees with the possibility of a fourth, research focused year, Honours, for high performing students who are aiming to progress to a PhD.

An increasingly popular alternative to completing an honours year is a masters by coursework which may include a research project identical to an honours project, but which also involves additional coursework units. At this level, the degrees become specialized. Marine students can choose between the Master of Marine Biology, the Master of Oceanography, the Master of Geoscience and the Master of Environmental Science with the Marine and Coastal Management specialization.

To be eligible for Honours or to do a research project within the Masters degree, students must attain an average of 65% over 4 core subjects at either Level 3 or 4. The availability of projects will depend on the areas in which staff are currently working and the funding they have for research. Students may be asked to join a research group and work on data already collected or be able to design their own project, set up the experiments and/or observations.

Students should seek a project well in advance of their start date. Research projects generally run over 1 year, so have your project settled before the year starts so you can hit the ground running on Day 1.

This booklet contains a list of potential projects for level 4 and 5 students available for 2024. It is important to realise that this list is not exhaustive; many of the projects are flexible and can be adjusted to your interests. We strongly suggest you use this booklet as a guide and contact potential supervisors to discuss the projects and your interests. In particular, students seeking additional topics in oceanography or coastal processes should enquireto the Schools of Earth Sciences or Agriculture and Environment (see contact details below).

Use the provided projects to:

1) **Gain an idea of the scope of appropriate projects**
2) **Be introduced to potential supervisors and their fields of study**
3) **Stimulate ideas about other projects that interest you**

If you have further questions, please contact your Honours or Masters coordinators who are **Jane Prince** (jane.prince@uwa.edu.au) and Renae Hovey (renae.hovey@uwa.edu.au) for Marine Science Honours and the Master of Marine Biology, **Jeff Hansen** (jeff.hansen@uwa.edu.au) for Marine and Coastal Processes projects and the Master of Oceanography and Master of Geoscience or **Matthew Hipsey** (matt.hipsey@uwa.edu.au) for the Master of Environmental Science (Marine and Coastal Management).

You will find projects on the following topics beginning on the page indicated (in parenthesis):

RESEARCH PROJECTS FOR MARINE STUDENTS IN 2023/4

A. Projects in Ocean and Coastal Processes

COASTAL PROCESSES

Project title	**Use of natural and nature-based reef structures to mitigate coastal flooding and erosion**
Supervisors	Ryan Lowe, ryan.lowe@uwa.edu.au, Oceans Graduate School and School of Earth Sciences, UWA
Description	Coastal erosion and flooding due to extreme storms and sea level rise poses a major threat to coastal populations and infrastructure. Traditional strategies to mitigate coastal hazards have focused on use of hard ('grey') infrastructure (e.g. seawalls, breakwaters, etc.), which despite being effective, generally have many negative impacts on coastlines (e.g. degrading coastal ecosystems, losses of coastal amenities, etc.). Alternative nature-based forms of coastal protection are increasingly being considered for future use in coastal mitigation and adaptation strategies, which can have many additional benefits due to the range of ecosystem services reefs provide. Within WA, coastal flooding erosion has become particularly severe in a number of locations (e.g., erosion hotspots), with the impacts expected to accelerate with sea level rise. There is thus urgency to develop a range of new coastal protection strategies that will help to mitigate and adapt to future coastal hazards. This project will assess the feasibility of using different types of natural and/or artificial reefs as potential solutions to WA's coastal flooding and erosion problems, including identifying suitable locations, optimum design/placement and assessing likely future shoreline responses. Within the project scope there is the flexibility to develop a specific project around a range of currently funded projects. Examples for specific projects could include: • Investigating the capacity of shellfish reef restoration to mitigate wave-driven flooding and erosion along the Swan River foreshore; • Assessing the capacity of multi-function artificial reef structures to mitigate coastal erosion for Perth metropolitan beaches; • Investigating the potential for coral reef restoration, including hybrid artificial structures, to sustainably protect tropical coastlines.
Start	Feb or July start
Requirements	Comfortable with computer-based data analysis. Optional depending on specific project: modelling, ability to conduct field work.

Project title	**Mass mortality of Exmouth Gulf's fringing reefs; timing, drivers, and future recovery**
Supervisors	Mick O'Leary: mick.oleary@uwa.edu.au, School of Earth Sciences, UWA Nicola Browne, School of Molecular Sciences Curtin University Joe Christensen, School of Humanities, UWA
Description	A low tide reconnaissance along the eastern shores of Cape Range have revealed an extensive fringing reef system comprising almost entirely of dead coral rubble. Given the areal extent of this reef structure, it is highly significant that this reef system is no longer ecologically functional, and the lack of reporting of a mass coral die-off along the eastern shores of Cape Range raises question around the timing of the event, whatwere the possible drivers of ecological decline (e.g., bleaching, cyclones, water quality),and if coral mortality occurred during a single event or if there was a gradual reductionin reef health. There are also questions as to why there has been no recovery of corals following the mass die-off. This project will attempt to answer these questions through a combination of surficial mapping, palaeoecological analysis, and radiometric dating of corals collected from boreholes that will be cored into the reef. In addition, the student has the potential to undertake historical research investigating the observed and written accounts of environmental change in Exmouth Gulf following the first charting of the region during early 19th century and accounts from the pearl divers and pastoralists which settled theregion during the middle and late 19th century.
Start	Feb or July start
Requirements	Reef Coring; Drone Survey; U-Series Dating; Palaeoecology; Historical Research

Project title	**Drones for coral reef monitoring**
Supervisors	Dr Sharyn Hickey (sharyn.hickey@uwa.edu.au ; Dr Ben Radford (AIMS) (b.radford@aims.gov.au
Description	Increasing sea surface temperature (SST) is the single largest threat to coral reefs globally. Advancing remote sensing technological capabilities (e.g., drones) have the potential to provide relatively fine-scale information on a reef flat across a large spatialarea. This project would utilise existing drone and infield data from the Rowley Shoals to model broadscale coral reef communities.
Start	Feb or July start
Requirements	Comfortable with big data, computer use, modelling

Project title	**Remotely monitoring mangroves**
Supervisors	Dr Sharyn Hickey (sharyn.hickey@uwa.edu.au ; Dr Ben Radford (AIMS) (b.radford@aims.gov.au
Description	Mangroves provide an opportunity for climate change mitigation and adaptation through their ability to store and sequester large quantities of carbon, and protect the coast from wave and storm surge, while sustaining fisheries through the provision of habitat. This project will utilise spatial modelling, cloud processing, and remote sensingtechniques to develop a West Australian assessment of mangrove condition.
Start	Feb or July start
Requirements	on-line/remotely (potential for some fieldwork opportunity)

Project title	**Understanding the drivers of coastal morphodynamics in Western Australia usingnovel remote sensing techniques**
Supervisors	Jeff Hansen jeff.hansen@uwa.edu.au, Ryan Lowe ryan.lowe@uwa.edu.au
Description	The coastline of Western Australia (WA) is complex due to its geomorphology (e.g. many coral and rocky reef) and is exposed to a unique range of wave and water level conditions. For example, the south of the state is exposed to large waves and small tides with the opposite occurring in the north of the state. This project aims to developa more detailed understanding of the coastal dynamics at a particular site or region of WA. Historical (1980s- to present) shorelines will be mapped using a combination of satellite imagery and aerial photography. The variability in the mapped shorelines overtime will then be linked to records of waves and water levels to understand the primary drivers of coastal change. For example, during La Niña years, the Leeuwin Current is stronger than normal which causes sea levels to be elevated. Some existing research has suggested the elevated sea level associated with La Niña conditions results in additional beach erosion- but this link needs to be further explored at additional locations. A greater understanding of how the coastline responds to variations in sea level and waves will increase our ability to manage the coast and mitigate the effects of climate change.
Start	Flexible
Requirements	Comfortable with computer analysis

Project title	**Measuring the variability of the southwestern Australian coastline from obliqueaerial imagery**
Supervisors	Jeff Hansen (jeff.hansen@uwa.edu.au), Michael Cuttler, (michael.cuttler@uwa.edu.au)
Description	The Western Australian coastline is well known to exhibit seasonal variability in morphology. For example, WA beaches are typically wider in summer and narrower inwinter. Typical methods for surveying beach morphology require accessing the beach at multiple times throughout the year. However, WA is one of the most remote and rugged coastlines globally. Thus, there are vast stretches of coastline that have limitedaccess which limit the applicability of typical survey methods. Recently, advancement in photogrammetry techniques have allowed aerial photography to be exploited for measuring coastal morphology with cm-scale accuracy. These advancements now provide an opportunity for measuring stretches of coastline previously unmeasurable with typical surveying techniques. UWA has partnered with the Peron-Naturaliste Partnership to capture oblique aerial imagery of the southwestern Australian coastline,from Rockingham to Cape Naturaliste. This project will employ photogrammetry techniques and 4 years of bi-annual oblique aerial photographs to measure coastal morphological change along 250 km of coastline. This large-scale analysis will identify erosion/accretion 'hot spots' and provide value insight into the interannual variabilityof this coastline.
Start	Flexible
Requirements	Comfortable with computer analysis

Project title	**Quantifying coastal morphodynamics through community-sourced imagery**
Supervisors	Jeff Hansen (jeff.hansen@uwa.edu.au), Michael Cuttler, (michael.cuttler@uwa.edu.au)
Description	With the proliferation of smart phones and social media, capturing and sharing imagesof the coast has never been easier. A new coastal monitoring program, CoastSnap, hasrecently been created to analyse community-sourced imagery to provide quantitative data on coastal morphology. CoastSnap was recently established at nine sites along WA's south west (between Rockingham and Busselton, see facebook.com/coastsnapwa). This project will involve analysing the imagery from each of the new CoastSnap WA sites to examine a range of coastal dynamics questions (e.g. magnitude of shoreline change) and social science questions (e.g. who is taking photos,what social media platform is the photo from, etc.).
Start	Flexible
Requirements	Comfortable with computer analysis

Project title	**Wave runup and rock fisher safety along the Great Southern coastline**
Supervisors	Jeff Hansen (jeff.hansen@uwa.edu.au), Michael Cuttler, (michael.cuttler@uwa.edu.au)
Description	The Great Southern region of WA is renowned for its rugged coastline, with commontourist attractions included locations such as 'The Gap and Natural Bridge'. A popular activity amongst locals and visitors to the Great Southern is rock fishing. However, thisactivity puts fishers in direct contact with the large Southern Ocean swells that are prolific along this coastline. When these large waves break, they cause up-rushes of water (wave runup) that surge over the rock platforms where fishers are located. In the worst cases, anglers can be knocked over, pulled into the sea, and drown. Furthermore, the remoteness of the Great Southern means that most common fishingspots are unpatrolled by lifesavers. Thus, there is a need to better understand the physical processes that drive wave runup along this coastline. This project will use video imagery collected at Salmon Holes (near Albany, WA) to develop a quantitative understanding of wave runup at rocky coastlines that will contribute to the development of a warning system for assessing rock fishing risk.
Start	Flexible
Requirements	Ability to go into the field

OCEANOGRAPHY

Project title	**Ocean drifters off Western Australia**
Supervisors	Prof C Pattiaratchi; chari.pattiaratchi@uwa.edu.au
Description	The Coastal Oceanography have deployed more than 50 surface current drifters along the West Australian coast over the past 12 months. Ocean drifters have a GPS locator that transmits their location every 5 minutes and from this information, we can track the paths of the drifters and calculate velocities. Surface drift patterns are used to define ocean circulation at the surface and used to define pathways of buoyant material such as plastics. The student(s) will be able to use selected ocean drifter datato identify and document different flow features in the surface ocean such as eddies and fronts.
Start	Feb or July start
Requirements	Computer literate

Project title	**Analysing fluorescence quenching in ocean glider data**
Supervisors	Prof C Pattiaratchi; chari.pattiaratchi@uwa.edu.au Dr Paul Thomson; paul.thomson@uwa.edu.au
Description	Measurements of chlorophyll as a proxy for phytoplankton biomass uses optical methods such as fluorescence sensors. Here, the sensors emit a light signal in a particular frequency that stimulates the phytoplankton to emit a light signal at a different frequency. Fluorescence quenching occurs when strong sunlight affect the light signals. This results in a diurnal signal in fluorescence and therefore in chlorophyllthat is not correct. This project will use data collected from ocean gliders to develop and implement a methodology to correct the fluorescence quenching.
Start	Feb or July start
Requirements	Computer literate

Project title	**Analysing underwater light climate in Western Australia**
Supervisors	Prof C Pattiaratchi; chari.pattiaratchi@uwa.edu.au Dr Paul Thomson; paul.thomson@uwa.edu.au
Description	Underwater light is a critical parameter for primary productivity in the water column. In Western Australia, due to an absence of large sediment input from land we have very clear water that penetrate to water depths > 150 m. An almost a decade of underwater light data from ocean glider deployments that will allow for the definitionof the light climate at seasonal and inter-annual time scales as well as examining the impacts of different events such as storms, marine heat waves and cold water episodes.
Start	Feb or July start
Requirements	Computer literate

Project title	**A climatology of sea breezes in south west Australia**
Supervisors	Prof C Pattiaratchi; chari.pattiaratchi@uwa.edu.au Dr Jatin Sala; J.Kala@murdoch.edu.au
Description	Sea breezes or the 'Fremantle Doctor' dominates the weather conditions alongsouth-west Australia. It also has a strong influence on the oceanography. This project will analyse a long-term (~30 years) simulation of winds along the WA coast to determine the exact nature of the sea breeze and year-to-year changes.
Start	Feb or July start
Requirements	Computer literate

Project title	**Physical and biological oceanography of the Perth canyon**
Supervisors	Prof C Pattiaratchi; chari.pattiaratchi@uwa.edu.au Dr Paul Thomson; paul.thomson@uwa.edu.au
Description	Perth Canyon, located to the west of Rottnest Island is the largest undersea topographic feature along the WA coast and one of the most productive. Over the last 2 decades a large amount of data on physical and biological oceanography have been collected from different cruises, ocean gliders and oceanographic moorings. This project will analyse data to determine the links between physical processes, nutrients and biological production within the canyon.
Start	Feb or July start
Requirements	Computer literate

Project title	**Tsunami impacts on the Perth Metropolitan coastline**
Supervisors	Prof C Pattiaratchi; chari.pattiaratchi@uwa.edu.au
Description	Tsunamis are extreme events that can have devastating impacts. Western Australia is susceptible tsunamis originating from the Sundra Trench off Indonesia. In this project you will use a web-based tsunami forecasting tool examine the impact of tsunamis in the Perth region – in particular in the Fremantle, Swan River and Cockburn Sound regions. The availability of high resolution bathymetry data allows for detailed impacts to be determined.
Start	Feb or July start
Requirements	Computer literate

Project title	**Long-term changes in coastal currents in Western Australia**
Supervisors	Prof C Pattiaratchi; chari.pattiaratchi@uwa.edu.au Dr Ivica Janekovic; ivica.janekovic@uwa.edu.au
Description	A database that include 3 dimensional currents for the period 2000-2020 and 2050-2070 is being developed. This is a unique opportunity to examine changes in the Leeuwin Current System in the past 2 decades as well as in the future under climate change scenarios.
Start	Feb or July start
Requirements	Computer literate

B. PROJECTS IN MARINE BIOLOGY

MARINE ECOLOGY GROUP – FISHERIES RESEARCH

https://marineecology.io/

This group is led by Dr Tim Langlois (tim.langlois@uwa.edu.au), assisted by post-doctoral fellow Dr Matt Navarro (matthew.navarro@uwa.edu.au) and includes seven PhD students. Their aim is to produce information for the public and decision makers to understand how marine ecosystems can be managed for the benefit of all. The multidisciplinary team works to understand the optimal way that commercial and recreational fisheries can be managed to meet their objectives and maximise the broader benefits of healthy marine ecosystems to society.

Project title	**Monitoring recruitment habitats of the western rock lobster**
Supervisors	Dr Tim Langlois, tim.langlois@uwa.edu.au Dr. Kingsley Griffin: kingsley.griffin@uwa.edu.au Dr Simon de Lestang Simon.deLestang@fish.wa.gov.au Dr Jason How jason.how@fish.wa.gov.au
Description	What are the habitat requirements of juvenile western rock lobster? The western rock lobster fishery is the highest value single species fishery in Australia, worth over $500 Million per annum. An important metric used by fisheries scientists to monitor the health of this resource is the abundance of post-larvae (puerulus) that recruit along thecoast of WA. We have a project to evaluate patterns in settlement, recruitment and habitat change that occurred after the 2010/2011 marine heatwave. This project will include a large amount of time on the water using novel methods to surveys shallow water habitats where juvenile lobster are found.
Start	Feb or July
Requirements	Experience with R programming would be beneficial

Project title	**Monitoring highly targeted mesophotic fish populations: optimising stereo-video monitoring of large offshore no-take marine reserves**
Supervisors	Dr Tim Langlois: (tim.langlois@uwa.edu.au) Dr. Matt Navarro: (matthew.navarro@uwa.edu.au) Dr. Kingsley Griffin: (kingsley.griffin@uwa.edu.au)
Description	Large offshore no-take marine reserves have recently been created around Australia andNew 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.
Start	Feb or July
Requirements	Experience with R programming would be beneficial

Project title	**Designing recreational fishing policies using representative fisher preferences**
Supervisors	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
Description	Whilst recreational fishing policies are designed to meet biological based managementobjectives, 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.
Start	Feb or July
Requirements	Experience with R programming would be beneficial

Project title	**Developing Sea Country management protocols through combining traditional ecological knowledge of Indigenous Australians and Western Science.**
Supervisors	Dr Matt Navarro – matthew.navarro@uwa.edu.au Dr Tim Langlois tim.langlois@uwa.edu.au
Description	Indigenous Australians have a profound connection to nature and a cultural obligation totake 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.
Start	Feb or July
Requirements	Experience with R programming would be beneficial

Project title	**Investigating the economic impacts of no-take marine reserve establishment**
Supervisors	Dr Matt Navarro (matthew.navarro@uwa.edu.au) Dr Tim Langlois (tim.langlois@uwa.edu.au)
Description	The impact of no-take marine reserves creation on local economies is the subject of much debate. Fisheries interest groups often claim these management actions have negative economic impacts due to impacts on fishing whilst some scientists have claimed benefits for local economies due to increased tourism. This study will use existing long term data from the ABS and Tourism Research Australia along with beyondBACI experimental designs to determine the impact the establishment no-take marine reserves in Australia have had on local economies.
Start	Feb or July
Requirements	Experience with R would be beneficial

Project title	**What drives change in size spectra of fish assemblages?**
Supervisors	Dr Tim Langlois (tim.langlois@uwa.edu.au) Dr Jordan Goetze (Jordan.Goetze@dbca.wa.gov.au)
Description	The impact of no-take marine reserves creation on local economies is the subject of much debate. Fisheries interest groups often claim these management actions have negative economic impacts due to impacts on fishing whilst some scientists have claimed benefits for local economies due to increased tourism. This study will use existing long term data from the ABS and Tourism Research Australia along with beyondBACI experimental designs to determine the impact the establishment no-take marine reserves in Australia have had on local economies.
Start	Feb or July
Requirements	Experience with R would be beneficial

SEAGRASS RESEARCH (https://www.seagrassresearch.net/)

Despite the name, this research group is not just about seagrass! Their research expertise and interests are diverse, allowing for work across multiple disciplines and creating truly collaborative projects and outcomes. Their focus has been largely on benthic habitat-forming species including macro-algae, corals and particularly seagrasses. They combine expertise in field ecology, physiology, population genetics and genomics to improve outcomes for management, ecosystem restoration and biodiversity conservation in the face of ever-growing pressures of an expanding human population and economic growth.

The group is led by Professor Gary Kendrick (gary.kendrick@uwa.edu.au) and includes fellow academics Dr Marion Cambridge, Dr Renae Hovey, Dr Elizabeth Sinclair and Dr John Statton and post-doctoral fellow Dr Giulia Ferretto. Please see the lab website for full details of their research.

Project title	**Scaling up seed and shoot based seagrass restoration to ecologically relevant scales in Cockburn Sound**
Supervisors	Prof Gary Kendrick (gary.kendrick@uwa.edu.au) Rachel Austin (rachel.austin@uwa.edu.au)
Description	**Scaling up seed and shoot based seagrass restoration to ecologically relevant scales in Cockburn Sound**Over the past 40 years the majority of seagrass restoration in Cockburn Sound has been done on the small/experimental scale. Whilst this research has provided invaluable information, to carry out restoration on ecologically relevant scales (hectares), methodologies need to be commercialised/industrialised/mechanised to increase the amount of seagrass material that can obtain and used for restoration, and to increase the survival of this material. This project will investigate ways that we could do this including mechanical fruit collection, mechanical seed preparation and benthic modification.
Start	July or February
Requirements	Min. rescue scuba diver and be willing to obtain a medical and pass an in-water assessment, drivers' licence

Project title	**Seagrass contribution to "blue carbon" storage in Shark Bay sediments**.
Supervisors	Prof Gary Kendrick (gary.kendrick@uwa.edu.au) Greg Skrzypek (grzegorz.skrzypek@uwa.edu.au), Mat Fraser (Minderoo)

Description	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.
Start	July or February

Project title	**Reducing invertebrate caused mortality in Posidonia seeds in the Seeds for Snapper program**
Supervisors	Prof Gary Kendrick (gary.kendrick@uwa.edu.au) Rachel Austin (rachel.austin@uwa.edu.au)
Description	The annual Seeds for Snapper program uses volunteers to collect the fruits of Posidonia, these are then stored in tanks until they split open and release the seeds, which are then dispersed at pre-selected restoration sites in Cockburn Sound. However, monitoring has revealed a large portion of seed mortality is to do blue manna crabs, sand dollars and worms in the sediment. This project will conduct a few field experiments to find ways to reduce invertebrate caused mortality in seagrass seeds using fencing, hessian bags and top dressing.
Start	July or February
Requirements	Min. rescue scuba diver and be willing to obtain a medical and pass an in-water assessment, drivers' licence

Project title	**Seagrass restoration genomics**
Supervisors	Dr Elizabeth Sinclair (elizabeth.sinclair@uwa.edu.au) Prof Gary Kendrick (gary.kendrick@uwa.edu.au) Prof Jacqui Batley **(**jacqueline.batley@uwa.edu.au)
Description	The world's largest plant is a seagrass, *Posidonia australis*. This giant polyploid plant lives in Shark Bay, and it's 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.
Start	July or February
Requirements	A background in genetics and/or bioinformatics is strongly recommended. Diving or snorkeling may be helpful, but not necessary.

ALGAL AQUACULTURE

The Seaweed Aquaculture Research and Hatchery (SARaH) Lab at the Watermans Bay marine research facility (UWA) is a new seaweed technology lab run by Dr John Statton, whose research has focused on the restoration ecology of seagrasses and other marine habitats and, more recently, the cultivation of the red seaweed, *Asparagopsis* spp, which has gained significant attention due to its potential to mitigate greenhouse gas emissions, particularly methane, when fed to livestock.

Project title	**Cultivating *Asparagopsis* seaweed under natural light – improving the efficiency of a novel production system**
Supervisors	Dr. John Statton (john.statton@uwa.edu.au) Prof. Gary Kendrick (gary.kendrick@uwa.edu.au)
Description	We 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 enhance growth rates, biomass yield, and overall seaweed quality. 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.
Start	Either July 2023 or Feb 2024

Project title	**Determining nutrient requirements of *Asparagopsis* seaweed within a novel aquaculture production system.**
Supervisors	Dr. John Statton (john.statton@uwa.edu.au) Prof. Gary Kendrick (gary.kendrick@uwa.edu.au)
Description	We 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 enhance growth rates, biomass yield, and overall seaweed quality. 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.
Start	July 2023 or Feb 2024

WERNBERG LAB (https://wernberglab.org/)

The Wernberg lab comprises a group of passionate marine ecologists with a predilection for subtidal seaweed dominated ecosystems. Their **focus is the ecology of shallow subtidal ecosystems,** and they work mostly on large habitat-forming seaweeds because of their ecological importance as foundation species in many communities. **Their approach bridges physiology, ecology and biogeography,** combining surveys of distribution and interactions with laboratory and field experiments, to tease apart the local through global processes of change and drivers of ecological patterns. They work predominantly in the western Great Southern Reef, a magnificent ecosystem and natural laboratory extraordinaire! Prospective students are encouraged to familiarising themselves with the general areas of work and expertise as displayed on the web-site before contacting the group.

This group is led by Professor Thomas Wernberg (thomas.wernberg@uwa.edu.au), assisted by Senior Research Fellow Dr Karen Filbee-Dexter, and seven post-doctoral fellows.

Project title	**Export of blue carbon from kelp forests to deep marine sinks**
Supervisors	Dr. Thomas Wernberg-thomas.wernberg@uwa.edu.au, Dr. Karen Filbee-Dexter-karen.dexter@uwa.edu.au,
Description	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 willbe 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.
Start	Feb or July start, Feb preferred
Requirements	Diving, driving (2WD/4WD)

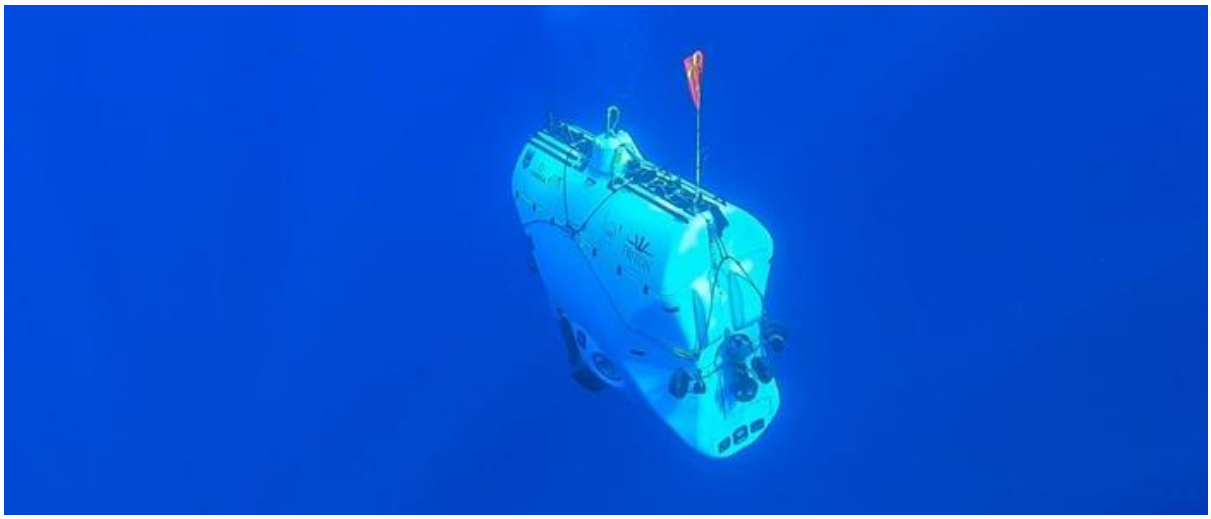
Project title	**Developing a novel restoration tool for threatened kelp forests**
Supervisors	Dr. Thomas Wernberg-thomas.wernberg@uwa.edu.au, Dr. Karen Filbee-Dexter-karen.dexter@uwa.edu.au,
Description	Human-driven impacts on our oceans are intensifying and there is urgent need for novel solutions to combat habitat loss and promote resilience in marine ecosystems. In warmer margins of their range kelp forests are being replaced byalgal turfs. This project will help develop and test a novel restoration tool 'greengravel' and evaluate its ability to restore kelp forests in Australia. Green gravel involves seeding kelp spores onto pebbles, where they grow into small sporophytes that can be scattered across an impacted area. This tool could be effective at overcoming reinforcing feedbacks (propagule and recruitment limitation) that prevent recovery of kelp forests after shifts to turf. This is a collaborative project between UWA and the NSW Department of Primary Industries. This project can be field based or laboratory based. 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.
Start	Feb or July start, Feb preferred
Requirements	Diving, driving (2WD/4WD)

Project title	**Thresholds for kelp forest loss and turf expansion**
Supervisors	Dr. Thomas Wernberg-thomas.wernberg@uwa.edu.au,
Description	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 and aquarium experiments on kelp and turf dynamics 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 acollaborative project between UWA and the NSW Department of Primary Industries. This project can be field based (SCUBA) and/or laboratory based (Aquarium experiments).
Start	Feb or July start, Feb preferred
Requirements	Diving, driving (2WD/4WD)

Project title	**Using strong genotypes to boost resistance or restore threatened kelp forests**
Supervisors	Dr. Thomas Wernberg-thomas.wernberg@uwa.edu.au,
Description	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.
Start	Feb or July start, Feb preferred
Requirements	Diving, driving (2WD/4WD)

Project title	**Historical changes in the distribution and productivity of WA marine forests**
Supervisors	Dr Albert Pessarrodona albert.pessarrodona@research.uwa.edu.au Dr. Thomas Wernberg-thomas.wernberg@uwa.edu.au,
Description	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 anecdotal evidence, and repeat of historical surveys. A background in field ecology would be helpful but is not essential.
Start	Feb or July start, Feb preferred
Requirements	Diving, driving (2WD/4WD)

MINDEROO-UWA Deep-Sea Research Centre



The Deep-Sea Research Centre is a unique multidisciplinary combination of expertise spanning biology, ecology, taxonomy, genetics, geology and subsea technology. This sea-going team will work closely and across disciplines to produce new insight into the deepest parts of our oceans and the life it contains. The Deep Sea Research Centre is committed to expanding our understanding of the deep ocean by discovering new species, assessing marine biodiversity, mapping the ocean floor, and charting deep-sea habitats. They specialise in abyssal (3,000-6,000m) and hadal (6,000-11,000m) depths that represent the deepest 70% of the oceans, the most extreme marine frontiers.

Led by Alan Jamieson (alan.jamieson@uwa.edu.au), this relatively new research group at UWA includes post-doctoral fellows Drs Todd Bond (ecology), Premu Arasu (arts and humanities), Paige Maroni (genetics), Yakup Niyazi (geoscience) and Jess Kolbusz (oceanography).

Project title	**Diversity and dynamics of key Philippine and Mariana Trench species.**
Supervisors	Alan Jamieson: alan.j.jamieson@uwa.edu.au) Todd Bond: todd.bond@uwa.edu.au
Description	The ultra-deep subduction trenches are home to several large key bait-attending species that inhabit depths of 5000 to 8000 m. These are the prawns, snailfish, cusk-eels, and supergiant amphipods. In the last 2 years 30 full ocean depth baited camera deployments have been done in the Philippine and Mariana Trenches, with additional data from the nearby Sui Shin Hole. This project will be video based and will focus on abundances and sizes class of these key species, and how they compare between large geomorphological features, and within partitioned areas of the same features. Evidence for a putative breeding ground of the deep-sea penaeids prawns in the Mariana Trench will also be investigated.
Start	Feb or July start
Requirements	A strong interest in video analysis, ecological statistics, life history.

Please contact Todd Bond for other deep sea projects

STABLE ISOTOPE STUDIES

Project title	**Stable isotope studies of marine food webs**
Supervisors	Greg Skrzypek: grzegorz.skrzypek@uwa.edu.au Mark Meekan
Description	Marine food webs are often very complex, and individual interactions are challenging to detangle. However, tracking particular behaviour, e.g. reasons for changing food web positions, could be very informative for understanding ecological processes occurring. The isotope tracer approach provides an opportunity to better understand who is eating who. Some projects in this research area can be available as part of the ongoing collaboration between UWA and WAMSI.
Start	Feb or July start
Requirements	

CENTRE FOR EVOLUTIONARY BIOLOGY

This is a large research centre within the School of Biological Sciences, delivering excellence in research and research training. Members research a wide range of topics, all related to how species evolve and adapt to their changing environments.

PREDATOR/PREY INTERACTIONS

Project title	**Detection of prey by fish predators**
Supervisors	Jennifer Kelley: jennifer.kelley@uwa.edu.au Jan Hemmi: jan.hemmi@uwa.edu.au
Description	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.
Start	Feb or July start
Requirements	A strong interest in working with fish (note - this is time consuming). Strong analytical skills using platforms such R, Matlab.

Project title	**Decision-making and predator evasion in wild damselfish shoals**
Supervisors	Jennifer Kelley: jennifer.kelley@uwa.edu.au Jan Hemmi: jan.hemmi@uwa.edu.au
Description	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 asnearest-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.
Start	July (note that this project requires animal ethics approval)
Requirements	Snorkelling. Strong analytical skills (e.g. Matlab, R).

Project title	**Selective attention in the context of escape**
Supervisors	Zahra Bagheri: zahra.bagheri@uwa.edu.au Jan Hemmi: jan.hemmi@uwa.edu.au
Description	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.
Start	Feb start

Project title	**Escape responses in fiddler crabs**
Supervisors	Jan Hemmi: jan.hemmi@uwa.edu.au
Description	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.
Start	Feb start

PHYSIOLOGY and VISUAL ECOLOGY

Project title	**Heart rate monitoring of aquatic invertebrates**
Supervisors	Jan Hemmi: jan.hemmi@uwa.edu.au
Description	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).
Start	Feb start

Project title	**Taking the pulse of crustaceans – monitoring heart rate in response to environmental changes**
Supervisors	Jan Hemmi: jan.hemmi@uwa.edu.au Tim Langlois: tim.langlois@uwa.edu.au Callum Donohue: callum.donohue@uwa.edu.au
Description	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).
Start	Feb start
Requirements	

Project title	**How fiddler crabs see the world**
Supervisors	Jan Hemmi: jan.hemmi@uwa.edu.au
Description	This project aims to understand how animals, in particular fiddler crabs, see their world. Using a mix of behavioural, physiological and anatomical experiments, we seek to understand how these animals see colours, patterns and polarisation, and how these visual capabilities influence how these crabs interact with their environment, their predators and conspecifics. Experiments will be conducted using our resident UWA fiddler crab colony, housed in a 4 m2 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.
Start	Feb start
Requirements	

Project title	**Vision in deep sea animals**
Supervisors	Jan Hemmi: jan.hemmi@uwa.edu.au Karen Osborn: osbornk@si.edu Zahra Bagheri: zahra.bagheri@uwa.edu.au
Description	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 reconstruct 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 behavioural tasks have most likely driven the evolution of their eyes. There are projects here for at least three students - any number of 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.
Start	Feb start

Project title	**Sampling the visual world**
Supervisors	Jan Hemmi: jan.hemmi@uwa.edu.au Zahra Bagheri: zahra.bagheri@uwa.edu.au
Description	Visual systems are under strong selection pressure because they are often crucial in guiding the behaviour of animals. Physical constraints mean that an eye of a given size cannot simultaneously maximise both its resolution and sensitivity while maintaining the extent of its visual field. As a consequence, most eyes show distinct regional differences in how they allocate resolution and sensitivity. A new method, based on micro-CT, we have developed, predicts that fiddler crabs, have two parallel streaks of high resolution located just above and below the visual horizon. This is in stark contrast to previous results that such streaks of high resolution, which are very common in flat-world inhabitants, are centred on the horizon. We would like to confirm this exciting result with physiological recordings. You will learn how to measure the visual resolution of fiddler crab in different parts of the eye, using electrical recordings from the surface of the eye.
Start	Feb start
Requirements	

Project title	**The role of polarisation in navigation**
Supervisors	Jan Hemmi: jan.hemmi@uwa.edu.au Zahra Bagheri: zahra.bagheri@uwa.edu.au
Description	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.
Start	Feb start
Requirements	

SEXUAL SELECTION

Project title	**Testing Bateman curves on broadcast spawning marine invertebrates**
Supervisors	Prof. Jon Evans (Jonathan.evans@uwa.edu.au) Dr. Rowan Lymbery (rowan.lymbery@uwa.edu.au) Ms Jessica Hadlow (Jessica.hadlow@uwa.edu.au)
Description	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).
Start	Feb or July start: The start date is negotiable, as mussels commence spawning in late May and typically finish in late September while urchins spawn from March to May. A student working on mussels might therefore commence in either semester, although it is recommended that those who choose semester 2 commence practical work earlier than the scheduled start. Students working on urchins would ideally commence in semester 1.

Project title	**Egg competition in a broadcast spawning marine invertebrate**
Supervisors	Prof. Jon Evans (Jonathan.evans@uwa.edu.au) Dr. Rowan Lymbery (rowan.lymbery@uwa.edu.au) Ms Jessica Hadlow (Jessica.hadlow@uwa.edu.au)
Description	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 spermand 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.
Start	Feb or July start: The start date is negotiable, as mussels commence spawning in late May and typically finish in late September. A studentmight therefore commence in either semester, although it is recommended that students who choose semester 2 commence practical work earlier than the scheduled start.

POPULATION GENETICS

Project title	**Assessing stock structure in nearshore and estuarine finfish.**
Supervisors	Dr Jason Kennington (jason.kennington@uwa.edu.au) and Dr Rodney Diffy (DPIRD).
Description	The catch of nearshore and estuarine finfish from commercial and recreational fisheries in Western Australia is composed of many different species from distinctpopulations and sub-populations. Management of these stocks, and the definitionof what constitutes a stock, is based on information related to movement, biologyand existing fisheries management practices. Traditionally, a number of different techniques have been used to identify stocks, from tagging studies to determine movement and mixing, to various genetic methods. Whilst effective, these methods can prove costly and time consuming, and can lack fine scale resolution. Often these investigations have focussed on species of high value or high abundance caught within a single, or small number of fisheries. Species that are caught by many fisheries, but that don't dominate the catch of any, have been forgotten, despite the overall catch of these species being significant. To address this shortfall, we are interested in understanding stock structure of three finfish species: sea mullet (*Mugil cephalus*), yelloweye mullet (*Aldrichetta forsteri*) and tailor (*Pomatomus saltatrix)* using modern, cost effective techniques (SNPs), that offer fine scale resolution to understand stock structure. The outcome of this workwill be of direct relevance to fisheries management within Western Australia.
Start	Feb 2024. Opportunity to do preliminary sample preparation at DPIRD at end of year
Requirements	None other than an interest in fisheries management and conservation.

Project title	**Assessing stock structure in deep sea crabs**
Supervisors	Dr Jason Kennington (jason.kennington@uwa.edu.au), Dr Jason How (DPIRD) and Dr Simon de Lestang (DPIRD).
Description	Effective management of commercial fisheries requires an accurate delineation of self-sustaining subpopulations or stocks. When information on stock structure is lacking or based on arbitrary anthropogenic boundaries, stocks are susceptible to overexploitation. This can lead to a collapse of the exploited stocks, which may take considerable time to recover. The recent stock assessment of crystal crab in the SCCMF indicated an unacceptable level of stock depletion. Catches in this area have been highly cyclical unlike those on the west coast. This pattern is very similar to that of rock lobster and blue swimmer crab, whereby the main spawning stock resides on the west coast with large and consistent catches, while those on the south coast are sporadic with recruitment only flowing down in strong Leeuwin Current years. These south coast areas are considered a resource sink. Irrespective of the similarities, the south coast deep-sea crab fisheries are still managed conservatively under the assumption of self-recruiting (they are not treated as sink populations). Determination of the recruitment linkages between the west and south coast fisheries will have marked implications on the management arrangement required for both fisheries. Similarly, the WCDSCMF, which retains catch predominantly from 23-29°S, is currently managed as a single stock. However, the boundaries of the fishery extend well beyond this range, and with increasing interest in expanding the fishery, understanding any possible genetic sub-structuring within the fishery is critical to ongoing stock assessment and management. The aim of this project will be to assess stock structure in both species using genetic data generated using a genotype-by-sequencing approach.
Start	February. Opportunity to do preliminary sample preparation at DPIRD at the end of 2023
Requirements	None other than an interest in fisheries management and conservation.

UWA Marine Plastics Group

This relatively new group at UWA is led by Dr Renae Hovey (renae.hovey@uwa.edu.au) with a post-doctoral fellow, and four PhD students. The discovery of plastic in the 20th century revolutionised many human activities, however we are now facing an emerging environmental crisis associated with marine litter and plastic waste across the world. There are a number of people at UWA working on different aspects of our global plastic problem with opportunities for honours and masters students to work with researchers for their thesis project.

Project title	**Marine pollution accumulated in sediments**
Supervisors	Dr. Catarina Serra-Goncalves, The University of Western Australia & Australian Institute of Marine Sciences (anacatarina.serragoncalves@uwa.edu.au) Dr. Ronen Galaiduk, Australian Institute of Marine Sciences (R.Galaiduk@aims.gov.au) Dr. Renae Hovey, UWA (renae.hovey@uwa.edu.au)
Description	Most of the knowledge of coastal marine debris in sediments are based on assessments of the surface layers. The distribution and abundance of marine debris across the sediment profile it is crucial to improve our understanding of the accumulation patterns of coastal marine debris. This project aims to identify the distribution, types and characteristics of debris and their associated accumulation patterns in the different depths of sediment layers (up to 2m) and relate its variability with beach morphologies (e.g., beach slope, orientation, exposure, sediment type). This project will have a field component and the student will be responsible for sampling sediment from multiple depths at different beach locations and compare these findings with the existing data on surface debris. To identify hotspots of marine debris and obtain previous assessments of surface sediment, the is student is expected to engage with possible collaborators (e.g., Tangaroa Blue Foundation, AUSMAP, Plastic Free July)
Start	July 2023 or Feb 2024
Requirements	The student will need strong analytical skills for identifying the types and characteristics of collected debris using Fourier-transform infrared spectrometer (FTIRs).

Project title	**Remote sensing (e.g., satellite and/or Drone) detection and mapping of marine debris (e.g., ghost nets)**
Supervisors	Dr. Catarina Serra-Goncalves, UWA & AIMS (anacatarina.serragoncalves@uwa.edu.au) Dr. Ronen Galaiduk, AIMS (R.Galaiduk@aims.gov.au) Dr. Renae Hovey, UWA (renae.hovey@uwa.edu.au) Dr Sharyn Hickey, UWA (shayrn.hickey@uwa.edu.au)
Description	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.
Start	July 2023 or Feb 2024
Requirements	Good working knowledge of GIS, python programming skills would also be very useful.

Project title	**Changes in root microbiomes in aquatic plants to identify stress associated with plastic contamination in the environment.**
Supervisors	Kautilya Srivastava - Kautilya.srivastava@research.uwa.edu.au Dr Jen Middleton – jen.middleton@uwa.edu.au Dr Bronwyn Campbell - Bronwyn.Campbell@csiro.au
Description	Coastal habitats and wetlands trap plastics from terrestrial and marine sources but the stocks of plastics and their impacts on these ecosystems are poorly known. This project will work alongside a PhD student project, filling gaps in knowledge with regards to the root microbiome of seagrasses or wetland plants that are growing in areas with high plastic contamination.
Start	July 2023 Feb 2024
Requirements	Student will need to be capable of participating in fieldwork in and around aquatic environments. Attention to detail and ability to follow strict lab protocols is necessary. R programming is highly desired.

NEAR SHORE ECOLOGY – the PRINCE-HOVEY LAB

Dr Jane Prince (jane.prince@uwa.edu.au) and Dr Renae Hovey (renae.hovey@uwa.edu.au) specialise in population, community and spatial ecology, focussing on intertidal and shallow sub-tidal habitats, looking at natural and anthropogenic changes to invertebrates, fish, shore birds, algae and seagrasses in space and time. They also collaborate with government agencies, including DBCA, DPIRD and DoT, and first nations ranger groups to promote scientifically rigorous design, execution and analysis of monitoring programs.

Project title	**Geographical variation in the ecology and morphology of gastropod molluscs:**
Supervisors	Jane Prince (jane.prince@uwa.edu.au), Matilda Murley (matilda.murley@research.uwa.edu.au)
Description	Some species of molluscs have an extensive distribution down along the western coast of Western Australia spanning from the Kimberley to the Capes crossing recognised biogeographic regions. Each species could be the topic of a research project. These projects aim to investigate the morphological and ecological characteristics of these species at various points along the coast, looking for natural transitions. Tissue samples will be collected for DNA analysis either in these projects or at a later stage.
Start	Feb start
Requirements	Driving (2WD essential, 4WD desirable), multivariate statistics and the use of other specialist software. This project will require one extended trip to the Kimberley and Pilbara in June and numerous trips closer to home in spring/summer

Project title	**The effect of sampling method on the interpretation of field surveys: implications for citizen science.**
Supervisors	Jane Prince: jane.prince@uwa.edu.au, Matilda Murley: matilda.murley@research.uwa.edu.au
Description	Quadrat sampling to determine the assemblage structure of intertidal invertebrates is a time consuming process that requires considerable expertise. This makes it unsuitable for citizen science projects where participants may be unskilled or have limited time. This project will firstly re-examine data collected over five years by indigenous rangers in the Kimberley to see how different methods of scoring the invertebrates in the quadrats affects the outcome and interpretation of the analysis. The second phase will involve field trials of different methods to gauge efficiency
Start	July or Feb start
Requirements	Driving (2WD essential, 4WD desirable), multivariate statistics and the use of other specialist software. Must be comfortable with computers and willing to "play" with data.

Project title	**Biology and spatial ecology of the "living fossil" *Campanile symbolicum*.**
Supervisors	Jane Prince: jane.prince@uwa.edu.au Renae Hovey: renae.hovey@uwa.edu.au
Description	*Campanile symbolicum* is a gastropod mollusc, endemic to south-western Western Australia, whose range and distribution is threatened by climate change. We believe that its range has contracted significantly since it was first recorded in WA. It persists in high numbers in the Capes Ngari Marine Park and Princess Royal Harbour, Albany. We want to use these populations in an attempt to understand its population biology, mating and breeding behaviours and movements between intertidal and shallow subtidal environments. This will lead to a better understanding of its habitat requirements in the face of environmental change.
Start	July or Feb start.
Requirements	Driving (2WD essential, 4WD desirable), snorkelling required, SCUBA qualifications desirable. This project will involve field work and a project spread over three semesters of a masters.

SEA AROUND US – INDIAN OCEAN NODE (http://www.seaaroundus.org/)

Project title	**Wasted nutrition: the nutritional content of discards in Indian Ocean fisheries**
Supervisors	Dirk Zeller: dirk.zeller@uwa.edu.au Vania Andreoli: vania.andreoli@research.uwa.edu.au
Description	Fisheries discarding, the practice of throwing overboard unwanted fish and other marine life that are too small, damaged, inedible, or have no commercial 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, the student will engage in ocean basin-scale nutritional aspect of fisheries science using big-data analysis
Start	Feb or July start
Requirements	Statistical skills: None, but willingness to learn and adapt. Excel skills, including Lookup and Pivot required R programming: Not required, but an advantage Knowledge of basic fisheries science: required

Project title	**Bait in wild-capture fisheries: an overlooked conservation impact**
Supervisors	Dirk Zeller dirk.zeller@uwa.edu.au Jessica Meeuwig jessica.meeuwig@uwa.edu.au
Description	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 Global Development Index.
Start	Feb or July start
Requirements	Good skills with Excel (including Pivot Table)Good R-programing skills Good literature searching skillsWillingness to read extensively Ability to digest a wide diversity of reading material

Project title	**Fisheries in Indian Ocean Rim countries**
Supervisors	Dirk Zeller: dirk.zeller@uwa.edu.au Jessica Meeuwig: jessica.meeuwig@uwa.edu.au
Description	Science and policy on Indian Ocean fisheries are heavily skewed towards industrial tuna fisheries, yet most Indian Ocean Rim countries gain domestic food security, livelihoods and economic benefits from domestic non-tuna fisheries within their Exclusive Economic Zone waters. These coastal fisheries, however, are often heavily under-valued and under-represented in fisheries science at the national and regional level, as they are often dominated by marginalized small-scale fisheries with substantial data gaps. As part of the international Sea Around Us - Indian Ocean research initiative (www.seaaroundus-io.org), students will engage in country-level or ocean-basin scale aspects of fisheries science using big-data approaches. These types of projects could be especially interesting for students that are excited by data mining and historical ecology or wish to be challenged by big-data approaches in an interdisciplinary setting. The Sea Around Us – Indian Ocean collaborates closely with the global Sea Around Us initiative (www.seaaroundus.org) and the interdisciplinary Global Fisheries Cluster (http://global-fc.oceans.ubc.ca/) at the University of British Columbia in Vancouver, Canada, and with FishBase (www.fishbase.org) and SeaLifeBase (www.sealifebase.org) hosted in the Philippines. Most Sea Around Us research does not involve field-based data collection, as we emphasize the utility of pre-existing secondary data and databases for enhancement through secondary data mining, data harmonization, data gap assessments and large-scale data approaches.
Start	Feb or July start
Requirements	Good basic skills with Excel (including Pivot Table) Good literature searching skills Willingness to read extensively Ability to digest a wide diversity of reading material

Project title	**Australia's freshwater fisheries**
Supervisors	Dirk Zeller dirk.zeller@uwa.edu.au
Description	With is large coastline, much emphasis in Australian scientific and management circles is focused on marine fisheries. Yet Australia's freshwater and estuarine environments provide a distinct fisheries science challenge. Some commercial fisheries exist in freshwater systems, yet the majority of fishing activities in these environments are either recreational or traditional in nature. This makes the scientific and socio-economic understanding of freshwater fisheries a unique challenge in Australia. This research builds on a successful freshwater fisheries science project in 2020 for Kenya, and will link into the current global research collaboration efforts by the international Sea Around Us research initiative to derive advanced and comprehensive global freshwater fisheries data systems. The focus of this project is to create a nation-wide baseline of available data and knowledge, and identify and fill major data gaps. We emphasize the utility of secondary data sets and collaborations with regional and state subject-matter experts for enhancement through data gap analyses.
Start	Feb 2024 or July 2024
Requirements	An open and keen mind, critical thinking skills, self-drive and a curiosity about fisheries science and Australia's freshwater environments is crucial

Project title	**Recreational fishing in Australia: the unmonitored shoreline?**
Supervisors	Prof Dirk Zeller dirk.zeller@uwa.edu.au
Description	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.
Start	Feb or July 2024
Requirements	An open mind, critical thinking skills, team work abilities and above all a curiosity about fisheries science is all that is required.

Project title	**The largest freshwater fishery data challenge in Africa: Lake Victoria**
Supervisors	Dirk Zeller dirk.zeller@uwa.edu.au
Description	Tanzania, Kenya and Uganda are the major stakeholders in the largest freshwater body in Africa, Lake Victoria, which has the biggest freshwater fishery in Africa. Much of the regional food security, domestic livelihoods and local economic benefits are derived from this freshwater fishery, yet it is heavily under-valued and under-represented in fisheries science and policy at the national and regional level, as it is largely dominated by marginalized small-scale fishers that do not feature adequately or accurately in national data used for decision making. As part of the international Sea Around Us - Indian Ocean research initiative (www.seaaroundus-io.org), the student will engage in a fisheries data science project to improve and update the globally available data on freshwater fisheries catches and fishing effort of Lake Victoria's freshwater fisheries. This research builds on a successful freshwater project in 2020 for Kenya, and may directly contribute to and participate in a regional capacity enhancement workshop and training initiative for the Lake Victoria scientific community being held in late 2022 or early 2023. These projects generally do not involve field-based data collection, as we emphasize the utility of pre-existing data sets and close international collaborations with in-country experts for enhancement through data gap assessments and large-scale meta-analyses. Such collaborations require sensitivity and diplomatic interpersonal skills due to the sensitivity associated with the colonial history in East Africa.
Start	Feb or July start
Requirements	Good basic skills with Excel (including Pivot Table) Good literature searching skills Willingness to read extensively Ability to digest a wide diversity of reading material

MARINE FUTURES LAB (https://www.meeuwig.org/)

This lab, directed by Professor Jessica Meeuwig, takes a global approach to studying the resilience of the oceans, having sampled in some of the most remote places on the planet. The focus is primarily on fish conservation, using baited remote underwater video systems (BRUVS) to sample pelagic and benthic assemblages all over the world.

Project title	**Changes in pelagic fish assemblages at Geographe Bay, Geographe Bay Marine Park**
Supervisors	Prof Jessica Meeuwig: jessica.meeuwig@uwa.edu.au
Description	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.
Start	Feb 2024

Project title	**Characterisation of fish assemblages at the Shoalwater Islands Marine Park**
Supervisors	Prof Jessica Meeuwig: jessica.meeuwig@uwa.edu.au Dr Naima Andrea López**:** naima.lopez@research.uwa.edu.au
Description	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 hammerhead abundance. This analysis will feed directly into the current WA State government marine park planning process
Start	Feb 2024

Project title	**Characterisation of scalloped hammerheads aggregations**
Supervisors	Prof Jessica Meeuwig: jessica.meeuwig@uwa.edu.au Dr Naima Andrea López**:** naima.lopez@research.uwa.edu.au
Description	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.
Start	Feb 2024

Project title	**A comparison between marine communities associated with artificial and natural habitats in Northwest Australia**
Supervisors	Prof Jessica Meeuwig: jessica.meeuwig@uwa.edu.au Dr Sean van Elden: sean.vanelden@uwa.edu.au
Description	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 artificial reef. 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.
Start	Feb 2024

Project title	**Investigating the sponge gardens associated with subsea infrastructure in Northwest Australia**
Supervisors	Prof Jessica Meeuwig jessica.meeuwig@uwa.edu.au; Dr Sean van Elden sean.vanelden@uwa.edu.au

Description	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.
Start	Feb 2024

Project title	**Investigating the role of fish scraping behaviour in removing ectoparasites**
Supervisors	Prof Jessica Meeuwig: jessica.meeuwig@uwa.edu.au Dr Chris Thompson: christopher.thompson@uwa.edu.au
Description	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.
Start	Feb 2024

Project title	**What can BRUVS tell us about sea jellies: a big data analysis**
Supervisors	Prof Jessica Meeuwig: jessica.meeuwig@uwa.edu.au Dr Chris Thompson: christopher.thompson@uwa.edu.au
Description	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.
Start	Feb 2024

Project title	**Invertebrate ecology of the Antarctic Peninsula**
Supervisors	Prof Jessica Meeuwig: jessica.meeuwig@uwa.edu.au
Description	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.
Start	Feb 2024 or either

Project title	**Relationships among pilot and host fish, who hangs with who and what does that mean for ecology and distribution of the pilots**
Supervisors	Prof Jessica Meeuwig: jessica.meeuwig@uwa.edu.au Dr Chris Thompson: christopher.thompson@uwa.edu.au
Description	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.
Start	Feb 2024

Project title	**A comparison between sounds in pelagic and benthic environments in Shark Bay & Exmouth**
Supervisors	Prof Jessica Meeuwig: jessica.meeuwig@uwa.edu.au
Description	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
Start	Feb 2024

Project title	**A first assessment of pelagic fish assemblages in the Amirantes Islands - Seychelles**
Supervisors	Prof Jessica Meeuwig: jessica.meeuwig@uwa.edu.au
Description	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 its 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 communitites 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.
Start	Feb 2024

PROJECTS FROM THE ALBANY CAMPUS

RECREATIONAL FISHING

Project title	**Improving rock fishing safety. Has the communication of the dangers of rock fishing been effective?**
Supervisors	Barbara Cook: barbara.cook@uwa.edu.au Paul Close: paul.close@uwa.edu.au
Description	Recreational fishing is a popular activity globally. Although an enjoyable pastime, recreational fishing, particularly rock fishing, can be dangerous, with many deaths recorded in Australia and New Zealand. Although Recfishwest has invested in extensive fishing safety campaigns, knowledge of how much of this communication is accessed by high risk fisher groups is limited. Measurement of the performance of this rock fishing safety strategy is critical. Using intercept surveys, this project will identify what forms of communication are commonly used by fishers, how much of the fishing safety material has been viewed, and how this has affected risk taking behaviours.
Start	Feb or July start
Requirements	This project will be conducted in Albany.

FRESH WATER ECOLOGY

Project title	**Microplastic ingestion by aquatic fauna**
Supervisors	Paul Close: paul.close@uwa.edu.au Barbara Cook: barbara.cook@uwa.edu.au
Description	Pollution of aquatic ecosystems by plastic is a growing worldwide problem. Ingestion of microplastics by freshwater biota can be influenced by feeding strategies and habitat use. This project will examine how microplastic ingestion varies among taxa and functional feeding groups and will target fish and invertebrates such as mussels and crayfish..
Start	Feb or July start
Requirements	The project will involve field sampling in the Albany region

Project title	**Influence of climate change on fish life cycles**
Supervisors	Paul Close: paul.close@uwa.edu.au Barbara Cook: barbara.cook@uwa.edu.au
Description	A study of a freshwater fish that occurs near Albany showed that these animals are capable of shifting the timing of reproduction to match suitable environmental conditions. Over the past 20 years, a period of significant drying, these fish delayed spawning and migration to match stream discharge. There are a number of opportunities for projects aimed at further exploring whether flexibility in life history characteristics in aquatic fauna offers some resilience to changes in climate.
Start	Feb or July start
Requirements	The project will involve field sampling in the Albany region

Project title	**Environmental influence on mussel growth**
Supervisors	Paul Close: paul.close@uwa.edu.au Barbara Cook: barbara.cook@uwa.edu.au
Description	Long-lived species experience variations in environmental conditions over temporal scales ranging from decades to days. In some animals, bone-like structures formed over the animal's entire life contain structure that provide information on age and growth rates. Where historical environmental data exists, these structures can provide detailed information on an animal's response to a chronology of environmental change. This project will use growth structure in the shells of freshwater mussels (*Westralunio carteri*) to investigate environmental influence on growth over the life of animals that span a period of major change in climate.
Start	Feb or July start
Requirements	This project will be conducted at Albany.

Project title	**What eats mussels?**
Supervisors	Paul Close: paul.close@uwa.edu.au Peter Speldewinde: peter.speldewinde@uwa.edu.au
Description	Freshwater mussels can be highly abundant, and exceed the combined biomass of all other benthic aquatic fauna by orders of magnitude. It is possible, where abundances are high, that they contribute substantially to the diet of terrestrial-based predators such as water rats. In turn, they may contribute to broader ecosystem processes by contributing aquatic sourced energy to riparian/terrestrial food webs. This project will use camera traps to identify predators and stable isotope analysis to investigate their contribution to energy flux/foodwebs.
Start	Feb or July start
Requirements	This project will be conducted at Albany

Project title	**Habitat preference of the fresh water mussel *Westralunio carteri***
Supervisors	Paul Close: paul.close@uwa.edu.au Barbara Cook: barbara.cook@uwa.edu.au
Description	An understanding of the habitat requirements for imperilled species can inform conservation and restoration activities. Current knowledge of southwestern Australia's only freshwater mussel (*Westralunio carteri*) is limited, and derived from field survey of habitats where mussels are most abundant. Whether mussels actively select these habitats, or passively accumulate there during periods of high river flow is unclear. This project will investigate the movement capabilities of a freshwater mussel, assess their capacity to actively 'select' spatially distributed microhabitats and identify those habitats likely to support the species
Start	Feb or July start
Requirements	This project will be conducted at Albany