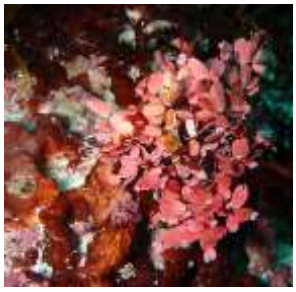
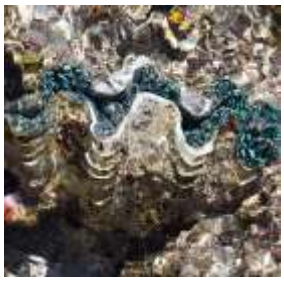
MARINE PROJECT PORTFOLIO
LEVELS 4 and 5

Projects suitable for:

HONOURS in MARINE SCIENCE
MASTERS in GEOSCIENCE
MASTERS in MARINE BIOLOGY (Biological Science)
MASTERS in MARINE & COASTAL MANAGEMENT (Environmental Science)
2018





FACULTY OF SCIENCE
The University of Western Australia
35 Stirling Highway
PERTH WA 6009

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

At UWA, a major in Marine Science is offered within the Bachelor of Science, taught across three schools in the Faculty of Science: the School of Biological Sciences, the School of Earth Sciences and the School of Agriculture and Environment. This is a three year degree with the possibility of a fourth, research focused year, Honours, for high performing students. Up to this point, the degree is broad and covers both biological and physical aspects of the marine environment.

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 Biological Science, with the Marine Biology specialization, 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, student must attain an average of 65% over 4 core subjects at either Level 3 or 4. The availability of projects will depend very much on the areas in which staff are currently working and the funding they have available for research. Often, students are asked to join a research group and work on data already collected. Alternatively, students may 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 it is best to 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 2019. Most are biological topics and students seeking additional topics in oceanography or coastal management should enquire to the School of Earth Sciences or Agriculture and Environment (see contact details below). 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.

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 of Masters coordinators who are **Jane Prince** (jane.prince@uwa.edu.au) for Marine Science Honours and the Master of Biological Science (Marine Biology), **Jeff Hansen** (jeff.hansen@uwa.edu.au) for Ocean Systems projects and the Master of Geoscience or **Julian Clifton** (julian.clifton@uwa.edu.au) for the Master of Environmental Science (Marine and Coastal Management).

RESEARCH PROJECTS AVAILABLE FOR MARINE STUDENTS IN 2019

A. Projects in the School of Earth Sciences

Project	**Response of Western Australia's coastline to non-tidal sea level variations**
Level	Honours in Marine Science or Geophysics, Masters in Geoscience
Supervisors	Jeff Hansen (jeff.hansen@uwa.edu.au), Ryan Lowe
Description	The coastline of Western Australia (WA) is unique in that it features a poleward flowing warm water current, the Leeuwin Current (typically warm water currents occur on the eastern side of continents). The strength of the Leeuwin Current fluctuates seasonally and this fluctuation results in increases and decreases in the sea level along WA that can reach +/- 0.25 m and last for several weeks. These non-tidal sea level variations can be as large as the tide in many parts of Southwest WA. Analysis of seven years of shoreline positions collected at Garden Island, SW of Perth indicate that the shoreline responds more strongly to these non-tidal sea level variations than to seasonal variations in wave height (which typically drive seasonal shoreline changes). The aim of this project is to extend these results to a number of other beaches in WA and compare the shoreline response due to non-tidal sea level fluctuations between reef-fringed and sandy beaches. Shorelines will be extracted from high-resolution aerial photos taken approximately bi-monthly and available from 2009 onwards.
Project	**Do "representative" coastal sites exists?**
Level	Honours in Marine Science or Geophysics, Masters in Geoscience
Supervisors	Jeff Hansen (jeff.hansen@uwa.edu.au), Ryan Lowe
Description	In order to mitigate the coastal hazards associated with climate change, including rising sea levels and potentially increasing storm intensity, we first need to understand how the present day beach responds to storms and seasonal variations in wave energy. Typically, coastal response is measured using a variety of intensive field or remote sensing techniques. However, it is not feasible to measure large swaths of coast without considerable cost and effort, and it may indeed be unnecessary. The objective of this project is to investigate the idea of a "representative" coastal site. A number of researchers have suggested that in many locations beaches along stretches of coastline extending 10s of km or more respond in a similar manner to storms and seasonal variations in wave energy. Thus, detailed observation may only need to be collected at a single site, with these observations being representative of the coastal response some distance away. The project will test this hypothesis by quantifying beach changes from a number of storm events along the WA coastline at different locations using exiting high-resolution aerial photography.

Project	**Measuring the variability of the southwestern Australian coastline from aerial imagery**
Level	Honours in Marine Science or Geophysics, Masters in Geoscience
Supervisors	Jeff Hansen (jeff.hansen@uwa.edu.au), Ryan Lowe, Michael Cuttler
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 in winter. 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 limited access and typical survey methods are unable to be used. 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 3 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 variability of this coastline.
Project	**Drivers of coastal erosion and accretion along the Coral Bay Coast**
Level	Honours in Marine Science or Geophysics, Masters in Geoscience
Supervisors	Jeff Hansen (jeff.hansen@uwa.edu.au), Mick O'Leary
Description	The Coral Bay Coast is home to some of Western Australia's most iconic beaches. They are typically comprised of carbonate sediments that were produced within the nearshore reef system and transported cross and/or along shore under the prevailing coastal hydrodynamic regime. However, there is increasing evidence to show that many of the beaches along the Coral Bay coast are currently experiencing a regime of net sediment loss and erosion. The aim of the project is the investigate the historical trends in shoreline position along the Coral Bay Coast using historical aerial photography, and using recently acquired bathymetric Lidar for the region develop a hydrodynamic model to map current movement and sediment transport and identify whether recent coastal infrastructure or increased coral cover along the Coral Bay coast have resulted in the impounding or trapping of sediment, limiting supply to the beach.

B. Projects in the School of Biological Sciences

A project from the Centre for Evolutionary Biology (http://www.ceb.uwa.edu.au/)

Project	**Can ocean pH influence gamete signalling mechanism in broadcast spawning marine invertebrates?**
Level	Honours in Marine Science or Zoology, Masters in Marine Biology or Zoology
Supervisors	A/Prof Jon Evans and Dr Rowan Lymbery (rowan.lymbery@uwa.edu.au)
Description	Mussels have proved to be superb models for understanding the role that egg chemoattractants (chemical cues realised by eggs to attract sperm) play in moderating gamete interactions. Evidence from our lab has shown that in M. galloprovincialis egg chemoattractants selectively attract sperm from genetically compatible males, a process we term 'differential sperm chemotaxis'. However, the efficacy of egg chemoattractants to effectively exert this form of 'gamete choice' may depend on the chemical environment in which sperm chemotaxis occurs. In this project, you will determine whether seawater pH (acidity) influences gamete signalling processes in mussels, and thus evaluate the extent to which predicted changes in ocean chemistry may disrupt critical processes that moderate reproduction in marine invertebrates.

Projects in Neuroscience and eco-physiology

Project	**Risk assessment and decision making in fiddler crabs**
Level	Honours in Marine Science or Zoology, Masters in Marine Biology or Zoology
Supervisors	Dr Jan Hemmi (jan.hemmi@uwa.edu.au), Dr Zahra Bagheri, Mr Callum Donohue
	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.
Project	**Taking the pulse of crustaceans – monitoring heart rate in response to environmental changes**
Level	Honours in Marine Science or Zoology, Masters in Marine Biology or Zoology
Supervisors	Dr Jan Hemmi (jan.hemmi@uwa.edu.au), Dr Tim Langlois, Dr Huon Clark, Mr Callum Donohue
	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).

Project	**Diurnal modulation of colour vision in fiddler crabs**
Level	Honours in Marine Science or Zoology, Masters in Marine Biology or Zoology
Supervisors	Dr Jan Hemmi (jan.hemmi@uwa.edu.au), Dr Zahra Bagheri, A/Professor Julian Partridge, Miss Anna-Lee Jessop
Description	Unlike in humans, the colour vision of fiddler crabs has been shown to involve a shift in spectral sensitivity towards longer wavelengths over the course of each day, making them more sensitive to 'red' light in the late afternoon. At night their eyes reset to have more shortwave 'blue' sensitivity once again. We assume that coloured 'screening' pigments that move within the eye are responsible for this shift, but this has never been shown. This project will use Electron Microscopy to examine the position of these screening pigments within the crabs' eyes at different times of the day and will correlate their position with physiological measurements of the crabs' spectral sensitivities. The results will show how these animals adjust their perception of colour and light sensitivity throughout each day.
Project	**Reaction of marine invertebrates to sound**
Level	Honours in Marine Science or Zoology, Masters in Marine Biology or Zoology
Supervisors	Dr Jan Hemmi (jan.hemmi@uwa.edu.au) and Professor Shaun Collin
Description	Sound travels well underwater and underwater sounds is increasingly recognised as a form of pollution that has impacts on a wide range of animals. Little is known, however, about the effect of sound on marine and estuarine invertebrates. This project will investigate the reaction of marine invertebrates such as crustaceans and aquatic insect larvae to sound. Experiments will include analyses of in situ natural sound recorded with hydrophones in the Swan River, observations of invertebrate behaviours in reaction to these sounds, and sound play-back experiments.
Project	**The function of the lobula plate in crustaceans**
Level	Honours in Marine Science or Zoology, Masters in Marine Biology or Zoology
Supervisors	Dr Jan Hemmi (jan.hemmi@uwa.edu.au) , A/Prof Julian Partridge, Miss Anna-Lee Jessop
Description	The lobula plate is an optic neuropil (part of the brain) found in many species of arthropods. It has been extensively studied in dipterous insects such as blowflies, where its role is to process large-field motion information used for controlling gaze (optomotor responses). Blowflies use this information to stabilize themselves when moving, especially in flight. However, the functional significance of the lobula plate in crustaceans remains unknown. This study will aim to further understand the relationship between the lobula plate and the optomotor behaviour in crustaceans, by comparing behavioural measurements of eye stabilisation and Micro-CT (x-ray) measurements of the lobula plate structure in a range of crustacean species.
Project	**The importance of fiddler crab burrows**
Level	Honours in Marine Science or Zoology, Masters in Marine Biology or Zoology
Supervisors	Dr Jan Hemmi (jan.hemmi@uwa.edu.au) and Dr Huon Clark
Description	Fiddler crabs have intricate mating behaviours designed to lure potential partners to mate. Some species mate in the male burrow, while others employ a tactic known as surface mating, whereby the female returns to her own burrow. In some species the males search for a partner, in others, the females do. Different species have different burrow structures and there are differences between male and female burrows in at least some species. Are burrow structures linked to mating tactics? How do mixed species populations partition the mudflat into territories and what impact does this have on sediment structure and population dynamics? By taking burrow casts of multiple species we can answer some or all of these questions.

Projects from the Seagrass Research Lab (https://www.seagrassresearch.net/)

Project	**Seagrass adaptation and acclimation responses to extreme climatic events: genomics and gene expression**
Level	Honours in Marine Science, Masters in Marine Biology
Supervisors	Professor Gary Kendrick and Dr Elizabeth Sinclair
Description	Extreme climatic events are predicted to become more frequent and severe, causing rapid ecosystem change, the scale of which is likely to be greater than that caused by a gradually changing climate. This project takes an interdisciplinary approach that incorporates whole plant growth, physiology and gene expression responses to explore interactions of multiple stressors to extreme events under predicted climate change scenarios.
Project	**Laying cables; uncovering the relationship between beneficial cable bacteria in seagrasses and meadow health**
Level	Honours in Marine Science, Masters in Marine Biology
Supervisors	Belinda Martin (belinda.martin@research.uwa.edu.au) , Matthew Fraser, Jeremy Bougoure (CMCA)
Description	Recently, we have found filamentous sulphide oxidising cable bacteria living in the roots of seagrasses. These bacteria have the potential to protect seagrasses from sulphide toxicity. We do not yet know the extent or abundance of these bacteria in seagrass meadows, particularly in relation to those areas impacted by high levels of sulphide. This project will use state of the art confocal scanning laser microscopy combined with fluorescence in situ hybridisation (to be conducted at UWA's CMCA) to examine and quantify the occurrence of beneficial cable bacteria in seagrass roots in the Swan River, the Leschenault estuary and in Cockburn Sound in relation to seagrass meadow health. This project will be predominantly lab based, but with the potential for additional field work for the suitable candidate. The outcomes of this project will be to contribute towards understanding drivers of seagrass dieback and limits to recruitment. The results of this project will also inform future experiments on developing the use of cable bacteria as potential inoculants to enhance seedling survival in seed based restoration practices.
Project	**Alfred Cove Eutrophication (ACE) investigation; assessing eutrophication impacts on seagrass degradation at Alfred Cove**
Level	Honours in Marine Science, Masters in Marine Biology
Supervisors	Belinda Martin (belinda.martin@research.uwa.edu.au) , Matthew Fraser
Description	The Alfred Cove Swan Estuary Marine Park (ACSEMP) is a 200 ha area encompassing mudflats, seagrass meadows and intertidal vegetation, which provides habitats for a variety of animals including internationally important migratory wading birds. Data generated from the Department of Water and Environmental Regulation (DWER) suggests that the dominant seagrass meadows (*Halophila ovalis*) at Alfred Cove are in relatively poor condition compared to other areas of the Swan estuary. High nitrogen % combined with elevated $\delta^{15}N$ values in seagrass tissue at Alfred Cove suggest a potential nitrogen enrichment in this area which may be contributing to the poor condition of the seagrass meadows as well as macroalgal overgrowth. Therefore, this project will aim to investigate potential N sources and degree of eutrophication in Alfred Cove and compare this with seagrasses in surrounding areas of the estuary as well as understand the roles of elevated eutrophication signals in influencing the productivity of seagrass. This project is in collaboration with DBCA and will involve both field work in the Swan River (to be conducted sometime in February 2019, no diving qualifications are required) and lab work.

A project from the Western Rock Lobster Group (https://uwamegfisheries.github.io/)

Project	**Historical comparison of invertebrate assemblages at two locations on Australia's Mid West Coast**
Level	Honours in Marine Science, Honours or Masters in Zoology or Conservation Biology, Masters in Marine Biology
Supervisors	Tim Langlois (timothy.langlois@uwa.edu.su), Michael Brooker (michael.brooker@research.uwa.edu.au), Graham Edgar
Description	Work done by Graham Edgar in the 1980 identified a significant difference in the abundance and composition of invertebrates associated various habitats (seagrasses, reef and sediments) at two sites, Seven Mile Beach and Cliff Head (approximately 30 km apart). The difference in invertebrate assemblages have implications for the growth, abundance and survival of juvenile and sub-legal western rock lobsters (Panulirus cygnus). Since these initial surveys were conducted there have been several changes including a marine heat wave, changes in the management of the fishery and the presence of a zone of reduced catches. Thus this project intends to revisit these sites and conduct a comparison of historical and current invertebrate assemblages to assess whether changes have occurred and what the differences are between the sites. Work for this project will include several field trips to collect samples along with the associated laboratory work to sort through the samples. This project is best suited for a Masters student with a first semester start. The fieldwork for this project will require the student to be registered on the university's field work and risk assessment system, RiskTeq and be a competent snorkeler and/or SCUBA diver.

Projects from the Centre for Marine Futures (http://www.meeuwig.org/)

Project	**Changes in scale of coral bleaching in the British Indian Ocean Territory.**
Level	Honours in Marine Science, Conservation Biology or Zoology
Supervisors	Professor Jessica Meeuwig (jessica.meeuwig@uwa.edu.au)
Description	The 2016 El Nino swept the world's oceans causing unprecedented rates of coral bleaching globally. Reports in October 2016 suggest that 80% of corals in the northern Great Barrier Reef are dead as a result of this warming event. Some evidence suggests that corals recover from bleaching faster when in fully protected marine protected areas (MPA). As part of a fish survey using baited remote underwater video systems (BRUVS) we have habitat data from the British Indian Ocean Territory MPA pre and post the 2016 bleaching event. This project would examine (1) whether BRUVS be used to detect bleaching and (2) the chance in incidence rate of bleaching pre event and at two points post bleaching
Project	**Detecting coral bleaching from baited remote underwater visual imagery**
Level	Masters in Marine Biology, Conservation Biology or Zoology
Supervisors	Professor Jessica Meeuwig (jessica.meeuwig@uwa.edu.au)
Description	Assessment of coral bleaching largely relies on either aerial surveys of in situ underwater visual census. Our large data set of baited remote underwater video systems (BRUVS) provides an opportunity to score the scale of bleaching globally and also through time at key locations. This project involves developing a new technique for quantifying bleaching based on BRUVS and analysing spatial and temporal patterns.

Project	**Cross-shelf patterns in fish biodiversity at Bremer Basin.**
Level	Masters in Marine Biology, Conservation Biology or Zoology
Supervisors	Professor Jessica Meeuwig (jessica.meeuwig@uwa.edu.au), Professor Christine Erbe (Curtin)
Description	The Bremer Basin has been identified as a "hotspot" of diversity, supporting an iconic aggregation of orcas. The degree to which this area also is a hotspot for area is a fish hotspot is however unknown. Towed video imagery has been collected at numerous locations in the area and this project will focus on (1) assessing the information generated by towed video and (2) interpreting this in terms of regional diversity.

Projects at the KIMBERLEY MARINE RESEARCH STATION at CYGNET BAY

The KMRS is a research facility attached to the Cygnet Bay Pearl farm on the Dampier Peninsula. They support a residential intern program for new university graduates allowing them to live and work on the pearl farm and become involved in the day to day operations as well as the many monitoring projects in progress at the farm. Students undertaking research at KMRS would spend 50% of their time on intern duties and 50% on their own research project. These projects will require a long stay at the Kimberley Marine Research Station, interactions with volunteer interns and, in some circumstances, with traditional owners.

Level	All projects are suitable for honours in Marine Science, Conservation Biology or Zoology or Masters in Marine Biology, Conservation Biology or Zoology.
Supervisors	Dr Jane Prince (jane.prince@uwa.edu.au)
Project	**1. Survival of oyster spat following settlement**
Description	This project aims to understand the survival of oyster spat in the weeks following settlement and how this is influenced by the surrounding conditions, including the presence of its own and other species.
Project	**2. Structure of the biofouling community on pearl oyster panels**
Description	The objective of this project is to understand the nature of the biofouling assemblage that develops on the shells of pearl oysters. This will enable detection of potentially harmful invasive species and may provide insights into a possible commercial use for this by-product of the industry.
Project	**3. The effect of monsoonal inundation on the intertidal infauna**
Description	The project will follow seasonal changes in intertidal infauna at different tidal heights with varying sediment composition. How do these species survive the change in salinity and do we see a regular pattern of change in species composition from dry to wet to dry seasons.
Project	**4. The development of a monitoring program for intertidal fauna**
Description	This project would build on previous studies of the invertebrates on rocky intertidal shores near Cape Levique with the aim of developing a monitoring program for interns and/or local indigenous rangers

Intertidal projects in collaboration with the Karijarri Indigenous Rangers

Description	A unique opportunity to engage with the indigenous custodians of the shore between Roebuck Bay and 80 mile beach. This ongoing project incorporates aspects of citizen science and science communication. At its inception, the project aimed to 1. Initiate activities to gain baseline biodiversity data on Karajarri sea country – primarily intertidal reefs (but also interested in mangroves, seagrass and intertidal creek systems). 2. Build capacity of rangers and community members to undertake these activities, and 3. Establish a monitoring program that could detect changes due to natural and anthropogenic events. To date we have: Established a baseline for biodiversity on intertidal rock platforms, Produced a draft photographic guide to intertidal species Assessed changes due to a direct hit by a tropical cyclone Established plots to measure growth and survival of giant clams Forged links between ranger groups with respect to intertidal monitoring Future projects will include: Ongoing monitoring and the refinement of the species guide. Habitat mapping and the link between habitat and assemblage structure Population dynamics of harvested species, including clams, trumpet shells Comparing biodiversity and management practices at other locations in the West Kimberley
Level	All projects are suitable for honours in Marine Science, Conservation Biology or Zoology or Masters in Marine Biology, Conservation Biology or Zoology.
Supervisors	Dr Jane Prince (jane.prince@uwa.edu.au), Dr Renae Hovey (renae.hovey@uwa.edu.au)

Projects from the Wernberg Lab (https://wernberglab.org/)

Project	**Blue Carbon: determining the sequestration potential of seaweed detritus**
Level	Honours in Marine Science or Conservation Biology, Masters in Marine Biology or Conservation Biology
Supervisors	Thomas Wernberg (thomas.wernberg@uwa.edu.au) and Albert Pessarrodona (albert.pessarrodona@research.uwa.edu.au)
Description	Vegetated coastal habitats (e.g. mangrove forests, salt marshes, seagrass meadows etc.) are extremely productive ecosystems that play an important role in the oceanic carbon cycle and act as carbon sinks. Macroalgal beds are by far the most productive of the coastal vegetated ecosystems, and it has recently been suggested that they could contribute to natural carbon sequestration. Its role as carbon sinks is still hotly debated however, as macroalgal detritus decomposes much quicker than that of other vegetation. This project will investigate the capacity of macroalgal carbon to remain buried in sediments once it is exported from macroalgal beds. Detritus from different seaweed species will be buried in marine sediments at different depths and in beach sand. The project can be designed to involve either (or both) extensive field experiments (scuba/non-scuba) and laboratory assays.

Project	**Living at the cold edge: can tropical fishes maintain their functionality within temperate reefs?**
Level	Honours in Marine Science, Zoology or Conservation Biology, Masters in Marine Biology, Zoology or Conservation Biology
Supervisors	Thomas Wernberg (thomas.wernberg@uwa.edu.au) and Nestor Bosch (nestor.bosch@research.uwa.edu.au)
Description	The biogeographic shift of tropical fish species associated with ocean warming is modifying consumer-producer dynamics in temperate reefs, with drastic consequences for the resilience of valuable ecosystems such as kelp forests. Yet, we still have a limited understanding of the factors affecting the distribution and performance of tropical fishes beyond their native range. In this project, we will explore the extent to which two tropical herbivorous parrotfishes (Scarus ghobban and Scarus schlegeli) are able to maintain the rate of ecological processes distinctive of their 'natural' tropical environments. These species play a key role in coral reef systems by maintaining the reef substratum in a cropped state, which allows corals to outcompete macroalgae. Field observations and laboratory analysis will be undertaken to answer the following questions: i) does the grazing/scraping activity change from tropical to temperate regions?, ii) to what extent is this change related to external abiotic factors (e.g. temperature and habitat availability), iii) does individual variation in morphological attributes influence grazing/scraping performance?, and iv) do these species change their diets to adjust for differences in food resources and habitat availability?. Understanding to what extent parrotfishes maintain or changes its functional role in 'tropicalized' temperate reefs will allow us to better manage temperate reefs under rapid tropicalisation

Project	**Sex in the sea: uncovering reproductive mechanisms in underwater forests**
Level	Honours in Marine Science or Conservation Biology, Masters in Marine Biology or Conservation Biology
Supervisors	Thomas Wernberg (thomas.wernberg@uwa.edu.au), Nahlah Alsuwaiyan (nahlah.alsuwaiyan@research.uwa.edu.au) and Sofie Vranken (sofie.vranken@research.uwa.edu.au)
Description	Sex is necessary for the long term persistence of species through changing environmental conditions. In some species, however, both sexual and asexual reproduction is common and dependent on prevailing environmental conditions. The common kelp, *Ecklonia radiata*, predominately reproduces sexually, but in some locations (Cape Leeuwin), displays both sexual and asexual ecotypes growing side-by-side. The aim of this research project is to gain fundamental understanding of the lifecycle and ecology these unique ecotypes. Through controlled breeding experiments you will uncover knowledge that is critically needed to assess this ecotype's vulnerability and the development of suited management guidelines. This multifaceted project will include laboratory and aquarium work and can also include field sampling (scuba diving).

A project in Fisheries Management: Sea Around Us (www.seaaroundus.org)

Project	**Fisheries in Indian Ocean Rim countries**
Level	Honours, in Marine Science, Conservation Biology or Zoology, Masters in Marine Biology, Conservation Biology or Zoology, PhD.
Supervisors	Professor Dirk Zeller
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 and policy at the national and regional level, as they are often dominated by marginalized small-scale fisheries. As part of the international Sea Around Us - Indian Ocean research initiative (www.seaaroundus-io.org), students will engage in country-level or ocean-basin scale aspects of fisheries science. These types of projects could be especially interesting for students that have links to or interests in specific countries in the Indian Ocean basin, or have non-English language skills (any language may be useful), or are excited by the concept of big-data science or meta-analysis in an interdisciplinary and highly collaborative setting. The Sea Around Us – Indian Ocean collaborates closely with the global Sea Around Us initiative (www.seaaroundus.org) and the interdisciplinary Global Fisheries Cluster (http://global-fc.oceans.ubc.ca/) at the University of British Columbia in Vancouver, Canada, and with FishBase (www.fishbase.org) and SeaLifeBase (www.sealifebase.org) hosted in the Philippines. Most Sea Around Us research does not involve field-based data collection, as we emphasize the utility of pre-existing large databases for enhancement through data gap assessments and large-scale meta-analyses. An open, keen and critical mind and a curiosity about fisheries science and marine conservation at the grand scale is all that is required, but if you also happen to have meta-analysis, Bayesian statistical or computer coding skills…. all the better.