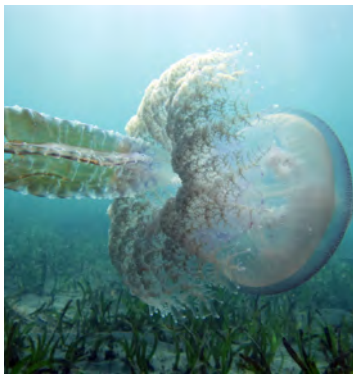
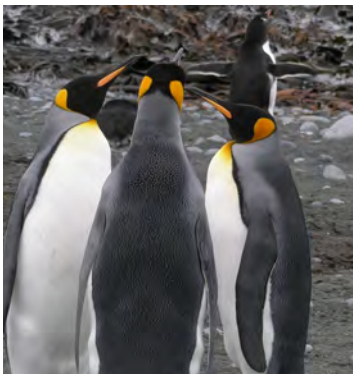
THE SCHOOL OF BIOLOGICAL SCIENCES

Highlights

1 July to 31 December 2020

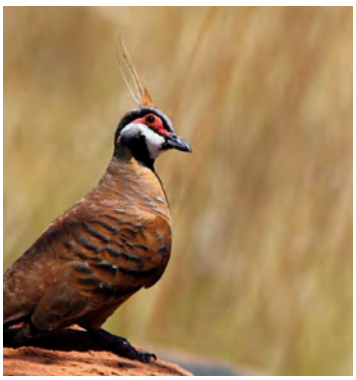















THE UNIVERSITY OF WESTERN AUSTRALIA

ACKNOWLEDGEMENTS

This report was prepared by the School of Biological Sciences, University of Western Australia.

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The UWA School of Biological Sciences respectfully acknowledge the Traditional Owners of the land on which we work and learn, the Noongar people, and pay respect to their elders, past, present and future.

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THE SCHOOL OF BIOLOGICAL SCIENCES

OUR VISION

Biology without borders

OUR MISSION

Investigating Earth's biodiversity and natural environments to ensure sustainable futures through effective engagement

The School of Biological Sciences is a large, multidisciplinary School with research and teaching focused on understanding and conserving life on Earth. Understanding and communicating the vulnerabilities, adaptability and resilience of plants and animals on land and in our rivers and oceans helps to better value and protect the biodiversity around us. As biologists, we are passionate about understanding how all forms of life – microorganisms, fungi, plants and animals – grow, acclimate, sense the world around them, communicate, defend themselves, reproduce and evolve. We study how species and ecosystems can be managed, conserved and restored. Our work also provides knowledge to advance sustainability, food production, plant and animal disease management, environmental management, climate science, medical science and science communication.

CONTENTS

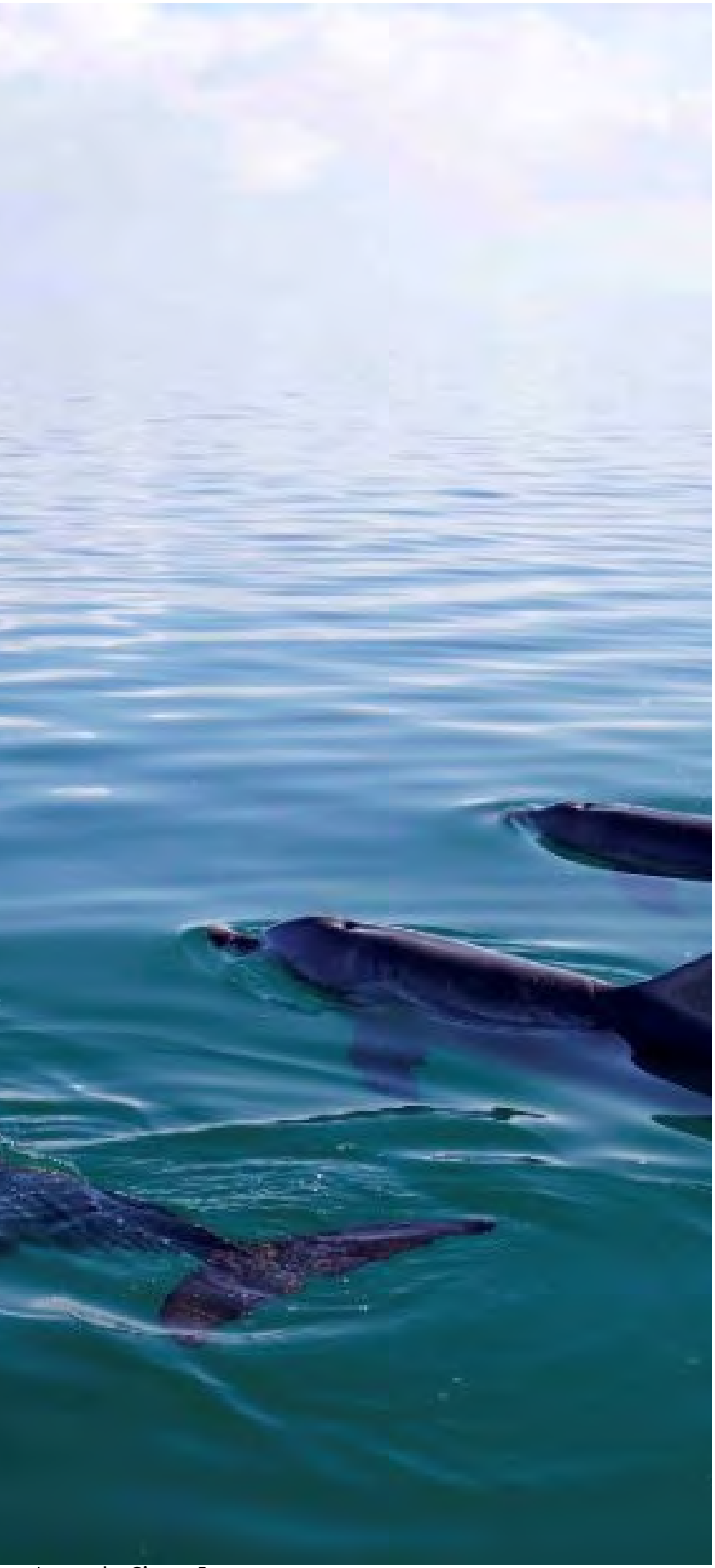


Image by Simon Jarman

HEAD OF SCHOOL

Welcome and it is with pleasure that we showcase our activities and efforts in teaching, research and service to the community for the last 6 months of 2020.

We have a team of dynamic and committed academic and professional staff in the School of Biological Sciences. 2020 was challenging but we stepped up and have produced some amazing outcomes and I hope you enjoy our stories.

Our research in the School of Biological Sciences has been diverse and impactful. These activities are summarized in little vignettes from researchers and research groups.

Professor Leigh Simmons and Professor David Edwards were recognised nationally for their leadership in Evolutionary Biology and Agricultural Genomics, respectively. We will also be leading research for Marine and Terrestrial Conservation nationally through the commonwealth Department of Agriculture Water and Environment NESP programs for the next 6 years.

A big congratulations to Professor Michael Douglas and Associate Professor Samantha Setterfield and their team for securing the Resilient Landscapes National Environmental Science Program for 2021 – 2027. This is arguably the largest single grant for Conservation and Threatened species research in Australia, in my memory.

Also, Dr Tim Langlois, Professor Gary Kendrick, Professor Julian Partridge and the Ocean Institute team secured a Western Node in the Marine and Coastal National Environmental Science Program.

We have also redesigned the course offerings for 2021 which is highlighted in our report.

Overall, I am proud and somewhat in awe of my staffs commitment and dedication to cutting edge and impactful science and the influence that has on Australian society and the conservation and management of our biodiversity and natural environments.

Gary Kendrick

PROFESSOR, HEAD OF SCHOOL

EDUCATION

Our teaching supports undergraduate majors in botany, conservation biology, marine biology, marine science, neuroscience, wildlife conservation and zoology, as well as minors in science communication and ecology. At the Masters level, we deliver specialisations in bioinformatics, conservation biology, ecology marine biology and zoology within the Master of Biological Sciences, as well as a Master of Science Communication.

The last year has been one of immense change but also an opportunity for reshaping our offerings to undergraduate and Masters by Coursework students. Undergraduate students will soon have further choice beyond our current majors (Botany, Zoology, Conservation Biology, Marine Biology) that can be taken singly or in combination. New Extended Majors in Biodiversity and Evolution, and in Plant Biology in 2022 will provide students with greater depth and more focus in selected subject areas. Minors also have been introduced to give students recognition for focused study they do in an area outside of their major. We now also offer an accelerated pathway to a Master's degree via the new Combined Bachelor's and Master's degree (the 'CBM'). A CBM allows students to complete an extended major in two and a half years, followed by three semesters of postgraduate study, culminating in the award of both a Bachelor's degree and a Master's degree.

EDUCATION

The School continued to be agile in our response to the COVID-19 pandemic. Having successfully moved our units to full online mode early in semester one, we were pleased to have local students back on campus for semester two. We missed the personal link with our interstate and international students, but engaged many of them in active learning via Zoom, including students in the USA and China, so that they were in the same classes as our face-to-face students. Only one unit could not be delivered in semester two, and was withdrawn from offer in 2020. Finally, three fully online graduate certificates were made available to cater to students who found extra time on their hands.

Below is a summary of the changes implemented in 2020, or that will be implemented in 2021, with our plans for further courses in 2022. While we hope that our 2021 teaching will largely be face to face, thanks to Covid-19 we have learnt an enormous amount about teaching our disciplines online, and we are now far better positioned to teach online should this become necessary at short notice.

EDUCATION

New Courses offered in Semester 2 2020

- Online Graduate Certificate in Science

New Courses to be offered from 2021

- Minor in Science Communication
- Minor in Ecology
- Minor in Science and Society
- Minor in Environmental Biology
- Major in Marine Biology
- Extended major in Marine Science
- Extended major in Wildlife Conservation
- Combined Bachelors Masters ('CBM') in Wildlife Conservation
- Combined Bachelors Masters ('CBM') in Marine Biology
- Masters in Bioinformatics

Minor in Science Communication

- To sit alongside any major, the minor provides essential and necessary skills in communicating science effectively to both peers and the wider community

Minor in Ecology

- This minor provides students with the principles underlying ecological processes necessary to understand and appreciate the impacts of threatening processes, such as global climate change, on life on Earth.

Major in Marine Biology

- This new major consolidates what was the Marine Biology stream in the Marine Science major into a major in its own right. This allows the inclusion of more general background in biology together with a specialist unit in Fisheries Science.

EDUCATION

Minor in Science and Society

- This interdisciplinary minor provides a focal point for our understanding of how scientific endeavours contribute to human society. In doing so, it explores how to critically evaluate scientific evidence, the global impact of Darwin's theory of natural selection, and the neurological basis of human behaviour.

Minor in Environmental Biology

- The Environmental Biology minor is designed specifically to introduce non-STEM students to core STEM skills that both complements the skills they will obtain through their major, as well as engage their interests in environmental issues. The minor includes a foundational unit in environmental science, a unit that delivers key knowledge on animals, plants and fungi, a unit providing a broad overview of organism genetics, and culminates in a unit focused on the effects of climate change on biodiversity.

Extended Major in Marine Science

- This combines both of the existing streams in marine science: Marine Biology and Coastal and Ocean Processes into a single major to provide the complete breadth of the marine discipline together with a more in-depth treatment of each specialty.

Extended Major in Wildlife Conservation

- A major that consolidates our current Conservation Biology and Zoology majors into a single package offering both depth and focus on the theory and application of knowledge in Wildlife Conservation.

CBMs in Marine Science and Wildlife Conservation

- Extends the Marine Biology major and the Wildlife Conservation extended major to the Masters level

Masters in Bioinformatics

- Caters to students interested in combining computational and statistical skills to provide applied biological outcomes with a focus on skills to manage and interpret the recent flood of biological information.

EDUCATION

Plans in development for 2022

To be housed in School of Biological Sciences

- Extended major in Biodiversity and Evolution (in collaboration with the School of Molecular Sciences)
- Extended major in Plant Biology (in collaboration with the School of Molecular Sciences)
- CBM in Biodiversity and Evolution (in collaboration with the School of Molecular Sciences)
- CBM combining a science major with Master of Science Communication
- CBM combining majors offered by SBS with the Master of Education

New Degrees with contributions from the School of Biological Sciences

- Major in Science, Technology and Society (School of Humanities)
- Extended major in Environmental Science and Ecology (UWA School of Agriculture and Environment)

Maintaining the COVID-readiness of our degrees

- All lectures are available online
- All practicals and workshops can be offered online
- Most units have an online mode to accommodate students who cannot travel to Perth
- Final exams offered through our online learning environment
- Units offering field trips to remote WA locations are developing local options to avoid segmented travel restrictions within WA
- Recognition that we need to be flexible in allowing unit substitutions, due to some units we were forced to cancel in 2020, and the inability of some students to be in Perth.

Research

Computational Biology

Ecology & Conservation

Evolutionary Biology

Neuroscience

Science Communication

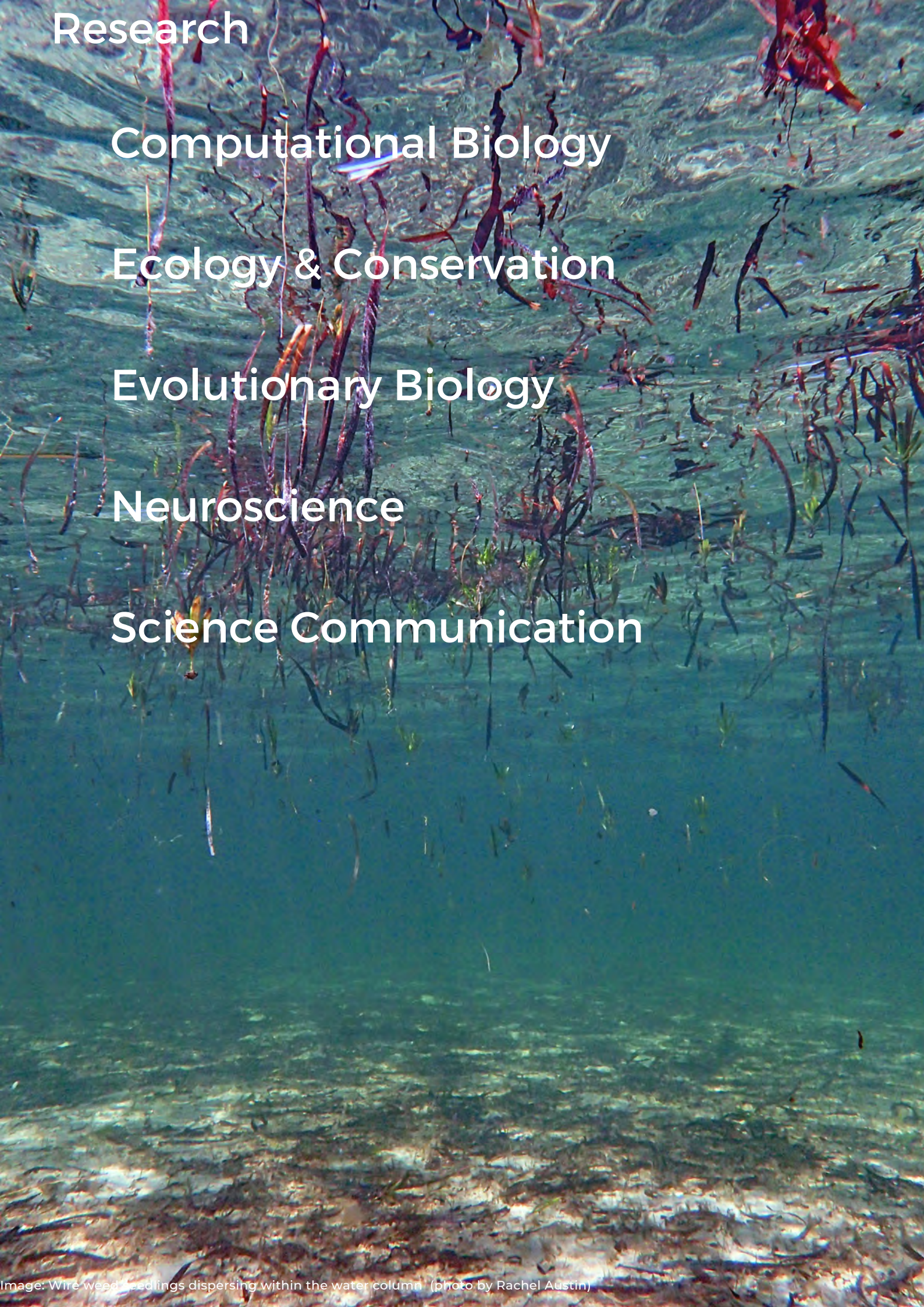


Image: Wire weed seedlings dispersing within the water column (photo by Rachel Austin)

RESEARCH

Our researchers tackle challenges in laboratories and at field sites across the world, studying plants and animals and their habitats in both natural and managed environments. We use techniques ranging from molecular and genetic analyses to novel and cutting-edge techniques like genomics and environmental DNA and big-data synthesis to assess and monitor whole populations, communities and ecosystems both regionally and globally.

We are committed to engaging with diverse communities through innovative, inclusive, and evidence-based practice.

383

Papers published from July to December 2020

582

Total papers published for 2020

UWA Profiles and Research Repository

West Australian Biogeochemistry Centre

The School of Biological Sciences is home to the West Australian Biogeochemistry Centre (WABC), a world-class laboratory using state-of-the-art equipment and techniques to analyse stable isotope compositions of H, C, N, O, and S in a wide range of substrates. The WABC provides a research and analytical service for a diverse group of researchers, students and collaborators at UWA , as well as for universities, industry and government across Australia and internationally, including the International Atomic Energy Agency (IAEA). Stable isotope analyses are broadly applied to ecological, physiological, and biogeochemical studies of plants and animals in all environments. Stable isotope approaches are fundamental to tracing food webs, nutrient uptake studies, hydrological studies, investigating animal migration patterns, investigating carbon assimilation and plant water use .....and many others!

Check out our website at www.wabc.uwa.edu.au to find out more. Contact our team to discuss your ideas and see if stable isotopes could be helpful for your project.

Pictured: Dr Grzegorz Skrzypek

Associate Professor Samantha Setterfield
Caroline Canham, Fiona Freestone

NATIONAL ENVIRONMENTAL SCIENCE PROGRAM (NESP)

Assessing methods of monitoring riparian vegetation

On-ground data collection methods are predominantly favoured to monitor the health of riparian vegetation, but there is increasing interest in using remote sensing methods. Researchers from the NESP Northern Australia Environmental Resources Hub are assessing the feasibility of using different technologies to answer management questions around riparian tree health. Using the Fitzroy River in Northern WA as a case study and working with Traditional Owners, our team collected tree health data in September 2020. We collected data with drone imagery, laser scanning, satellite imagery, on ground rapid assessments and on-ground targeted assessments. The outcomes of this research will assist water managers and other stakeholders involved in choosing methods to monitor riparian vegetation health.

Pictured: testing the feasibility of using drone imagery (01) and laser scanning (02) to monitor riparian vegetation.
Pictured: (03) Dan Dixon (UWA PhD candidate) sharing drone data collection methods with Yi-martuwarra Traditional Owners; Christine (left) and Josephine Forrest (right).

RESEARCH

PhD Thiaggo de Castro Tayer
Professor Michael Douglas, Dr Sarah Bourke
Adjunct Professor Don McFarlane, Dr Leah Beesley
Dr Karina Meredithpek

NATIONAL ENVIRONMENTAL SCIENCE PROGRAM (NESP)

Groundwater exchanges with main-channel pools in a tropical intermittent river and their ecological implications

For the development of intermittent rivers to be sustainable, it is essential to improve the understanding of the relationship between groundwater and surface waters and to understand the importance of groundwater in ecological processes. This project aims to fill this gap by studying local hydrogeology and groundwater fluxes and examining the role of groundwater, especially from shallow and deep aquifers, in river food webs. For that, we are investigating how groundwater exchange influences the food webs in main channel pools of the Fitzroy River (WA) during the dry season. We sampled four main channel pools, two piezometers and one spring in September/ October to build on information collected in a pilot study in 2019. We collected samples for water, algae, charophytes, snails and fish. This information will improve our understanding of groundwater and main-channel pool interactions and assist in the development of water planning policy.

Figure captions
(Right) Measuring radon in situ
(Above) Fitzroy River near Noonkanbah waterfall

RESEARCH

Dr Ana Martins Sequeira

MARINE MEGAFAUNA MOVEMENT

Marine megafauna species including seabirds, whales and sharks can be impacted by human activities such as fisheries, plastic pollution and shipping. However, as our understanding of their movements is limited, the true extent of such impacts is largely unknown. To fill this gap, I am spearheading MegaMove with a group of experts in marine movement ecology and through a collaboration with > 300 marine ecologists from around the world to advance the long-term conservation of marine megafauna by strategically mitigating the threats they face on a global scale. To date, MegaMove has > 10,000 tracks of over 100 species from marine mammals, sharks and tunas to turtles, seabirds and penguins. The Sequeira Lab is also working on several projects closer to home, including mapping shark distributions within the Australian Exclusive Economic Zone, understanding ecological links between coastal habitats such as seagrass and marine megafauna in the WA coast, and working with Traditional Owners in Gathaagudu (Shark Bay) to discover more about the movement and habitat use of dugongs, turtles, and tiger sharks.

Pictured above: Sequeira Lab Group

RESEARCH

Professor Dirk Zeller

SEA AROUND US

In 2020, the UWA Sea Around Us – Indian Ocean deepened its international network by strengthened its collaborations with fisheries departments and academic institutions in East Africa. On a national level, we collaborated with the Minderoo Foundation's Flourishing Oceans initiative on a global project. Among the numerous papers published with and by our partners, we emphasize here "Illicit trade in marine fish catch and its effects on ecosystems and people worldwide" (Sumaila, Zeller et al., Science Advances, DOI: 0.1126/sciadv.aaz3801). We analysed catch losses for 143 countries and showed that at least 8-14 million tonnes of unreported fish catches (worth $9-$17 billion) are traded illicitly every year around the world. These catches are taken out of the local food supply system of many countries, impacting the nutritional food security and livelihoods of millions.

Pictured: Field work" Sea Around Us style? Engaging in big-data science on global fisheries.

Associate Professor Amanda Ridley

ECOLOGY

Hot droughts compromise interannual survival across all group sizes in a cooperatively breeding bird

Current theory suggests that species which breed cooperatively could be buffered from some of the effects of climate change, because individuals in cooperative groups can share the workload of finding food and defending young against predators - thereby buffering the impacts of harsh environmental conditions on group members. However, we found no support for this theory: using a 16-yr dataset, we show that group size does not buffer the strong negative impacts of high temperature and drought on survival in southern pied babblers. The combination of drought and high temperatures is particularly lethal, with these conditions resulting in low interannual survival even in established breeding adults, with serious implications for population persistence under climate change. This research was produced by PhD student Amanda Bourne, with her supervisors Amanda Ridley, Susie Cunningham and Claire Spottiswoode, and represents an ongoing collaboration between researchers at UWA and the University of Cape Town.

RESEARCH

Dr Elizabeth Sinclair, Dr John Statton, Professor Gary Kendrick

SEAGRASS RESTORATION

The Shark Bay World Heritage Site known as ‘Gathaagudu’ (two waters) to Malgana Traditional Owners experienced an unprecedented heat wave in the summer of 2010–2011, resulting in more than 1300 km2 of dense seagrass meadows being lost or damaged. This widespread loss of food and habitat caused declines in many species, including culturally significant species: turtles (buyungurra), dugong (wuthuga), cormorants (wanamalu) and bottlenose dolphins (irrabuga). Two large temperate seagrasses (wirriya jalyanu): Amphibolis antarctica (wire weed) and Posidonia australis (ribbon weed) tend to recover slowly and this prompted efforts for assistance. Elizabeth Sinclair, John Statton and Gary Kendrick have been collaborating with the Malgana Aboriginal Corporation by training new Malgana Rangers to assist the natural recovery of seagrasses in Shark Bay, supported by funding through the National Environmental Science Program’s Marine Biodiversity Hub. The final of four workshops, conducted in August 2020, focused on wire weed recovery, as July to September is the peak dispersal time for seedlings. The seedlings look like smaller versions of adult plants and spend several weeks to months floating with the currents and tides, before eventually sinking to the seafloor and attaching to something to grow on. A wire weed seedling-retention technique involving ‘seagrass snaggers’ was trialled. These long hessian socks were filled with local beach sand and deployed at two locations, close to existing meadows. This method is simple, cheap, easy, and plastic-free, but timing is critical. The snaggers must be in place before the peak release of seedlings begins. Ongoing work by Malgana Rangers means snaggers can be deployed in coming seasons. The snaggers should last about 18 months: long enough for new seedlings to establish.

Full story available here

Pictured: Seagrass snagger being deployed by Malgana Ranger Nick Pedrocchi and John Statton (photo by Gary Kendrick)

RESEARCH

Dr Jennifer Kelley

BEHAVIOURAL ECOLOGY/MARINE BIOLOGY / EVOLUTIONARY BIOLOGY

Global Antipredator Colouration (GAC) Network

How can we explain the incredible diversity of animal colour patterns observed in nature? Why have some animals evolved cryptic colouration that serves for camouflage, while others have high-contrast patterns that may function as a warning signal? In a global project led by Dr William Allen (University of Swansea, UK) and Iliana Medina (University of Melbourne), researchers from over 18 locations worldwide are addressing these questions, performing the first antipredator colouration experiment on a global scale. Identical experiments are being replicated around the globe, with experiments for the WA GAC hub being conducted during the mid-semester break. Data for hubs in the northern hemisphere are yet to be collected, but we expect this global collaborative project will provide unique insights into how biogeographical processes influence the evolution of animal patterning.

Dr Renee Catullo

GENETIC ASSESSMENT OF BUSHFIRE AFFECTED MAMMALS, BIRDS, REPTILES, AND AMPHIBIANS

The 2019-2020 bushfires were catastrophic for many already threatened vertebrate species. Actions to promote recovery from large-scale events such as these fires require two particular forms of biodiversity information: what was impacted, and how well it can rebound. In particular, recovery plans need to incorporate information on genetic diversity in order to ensure the long-term persistence of the species. To provide this information to conservation managers in the state and federal governments, I lead a project providing genetic assessments of the vertebrate species identified by agencies as bushfire priorities. Our assessments of species diversity and their genetic health have been used to prioritise recovery actions and in the re-assessment of conservation listing status in many species. These data will improve the conservation outcomes for many iconic Australian animals.

Professor Simon Jarman

MARINE BIOLOGY

A DNA methylation age predictor for zebrafish

Age is a fundamental aspects of an animal biology. Age determines whether an animal can breed and how effectively, how many relatives it has and what sort, and how long it is likely to continue living. For many animal species, we cannot tell how old random individuals in the wild are. The biological ageing process is controlled and coordinated by epigenetic changes. This means that the genome of animals are used in a different way at different stages of their lives. We can now measure many of these changes quite accurately, particularly the epigenetic changes involving methylation of DNA. CSIRO postdoc Ben Mayne, working with Simon Jarman and others, has produced the first DNA methylation-based method for determining how old fish are. This method uses a small amount of the fin of a fish, so it is non-lethal. The zebra fish is a “genetic model organism” with a genome is understood in great detail and is a model for work on other fish species. This “epigenetic clock” for zebra fish works on other fish as well. This new genomic tool will allow endangered fish populations to be better protected, and fishery populations to be harvested sustainably.”

Pictured: Zebra Fish, Simon Jarman

RESEARCH

Associate Professor Jan Hemmi, Dr Zahra Bagheri

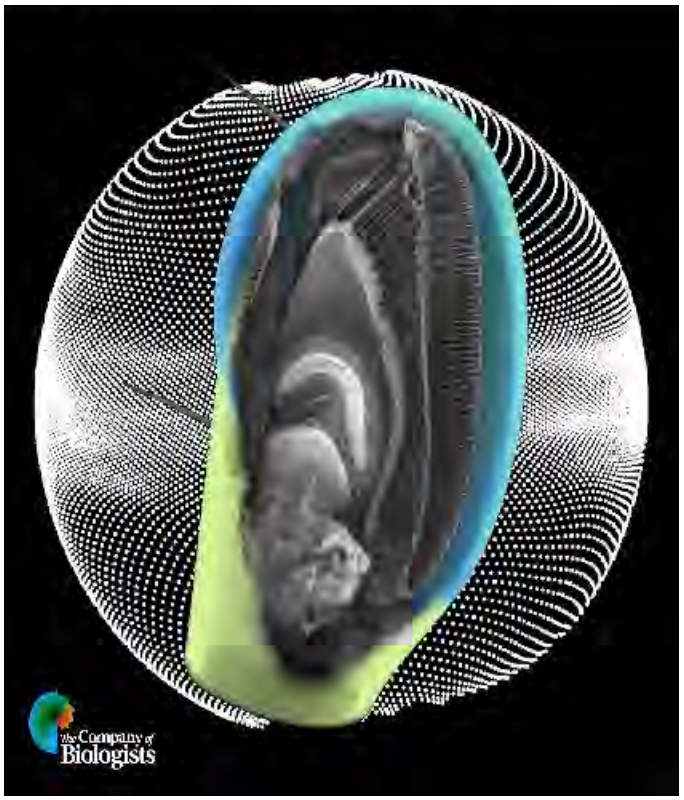
ZOOLOGY, VISION, NEUROECOLOGY

A new method for mapping spatial resolution in compound eyes suggests two visual streaks in fiddler crabs.

How animals see the world has always intrigued scientists, not least because their eyes and visual systems are often notably different from ours. To understand how animals make decisions in response to visual cues, and how this relates to their ecology and behaviour, therefore depends on identifying the visual information that is available to animals. This paper presents a new method for estimating the spatial resolution and visual field of compound eyes, using the 3D Micro-CT images of preserved specimens. Using this method, we are able to build topographic representations of what these animals can see, irrespective of the shape or size of the eye. The proof-of-concept study highlighted the exquisite detail that can be achieved with this new technique. The approach can be used on preserved specimens, opening up museum collections to functional research.

This paper was shortlisted by the journal for the outstanding paper prize in 2020.

Pictured: Journal of Experimental Biology, Cover



RESEARCH

Dr Matthew Fraser, Dr Ana Sequeira, Dr Belinda Martin

MARINE BIOLOGY

Shark Bay (Gathaagudu) is one of two marine World Heritage Areas in Western Australian, and has massive ecological, cultural and economic significance. However, Shark Bay also face 'catastrophic' risk from climate change, underpinned by large declines in temperate seagrass habitats following the 2011 marine heatwave. As such, Shark Bay has been highlighted as a hotspot area in need of future research. Fortunately, 2020 has been a highly successful year for research funding in Shark Bay. This includes an ARC Linkage Project to investigate the likely impacts of seagrass loss on nutrient budgets and productivity in adjacent seascapes, and the Gathaagudu Animal Tracking Project, which aims to examine the likely impacts of habitat loss on iconic megafauna species (green turtles, dugongs and tiger sharks) using a combination of satellite tagging and environmental DNA analysis. Research in Shark Bay has also been bolstered by the support of UWA's Indian Ocean Marine Research Centre (IOMRC) partners (AIMS, CSIRO and DPIRD), who have collectively funded a collaborative project (the ICoAST project) that will contribute to a greater understanding of the effects of climate change on marine habitats across WA with Shark Bay as a major study area. Collectively, these projects will provide environmental analyses that will help management decision making in this threatened World Heritage Area.

Photo credit: Rachel Austin

RESEARCH

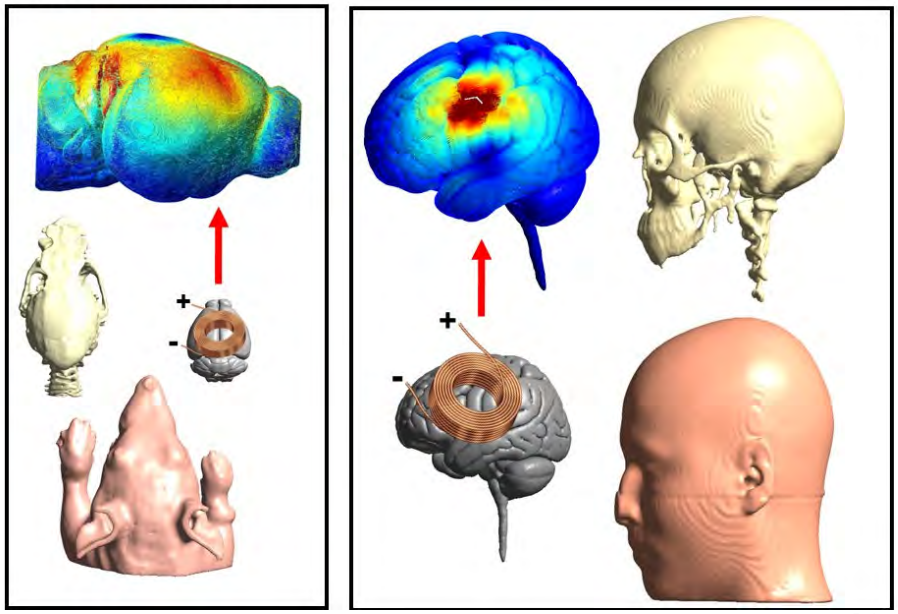
Dr Lauren Hennessy, Dr Kerry Leggett
Associate Professor Jenny Rodger

NEUROSCIENCE

Clinical Trial: In collaboration with the Mental health unit, Sir Charles Gardiner Hospital

Depression is one of the most prevalent and costly medical conditions worldwide (WHO, 2012). Although antidepressant medication is effective for many patients, up to 40% remain drug-resistant. Non invasive brain stimulation in the form of repetitive transcranial magnetic stimulation (rTMS) is an FDA-approved treatment for depression with response rates of up to 60%. However, outcomes are variable both within and between individuals, suggesting that treatment protocols remain suboptimal. This variability is not surprising because non-invasive brain stimulation techniques were first developed in humans with no systematic “bench-to-bedside” evaluation of protocols, resulting in poorly defined clinical guidelines. Our lab has compared a range of brain stimulation protocols in preclinical animal models and have shown that rTMS delivered at a 150mT intensity matches the behavioural effects obtained with rTMS delivered at 1000mT intensity (used in human patients). However our 150mT protocol has additional benefits: it causes structural changes in the brain, leading to long lasting improvements in mood and cognition. We have started recruiting patients in a world first clinical trial testing preclinically validated parameters. The trial is an exciting first step in building a translational pipeline for tailored rTMS treatments for neurological conditions.

Image: Translating induced electric fields from mouse brain to human brain



RESEARCH

Associate Professor Jan Hemmi, Dr Zahra Bagheri

ZOOLOGY, VISION, NEUROECOLOGY

Evidence of predictive selective attention in fiddler crabs during escape in the natural environment

We have all experienced attention overload. Dividing our attention can leave us confused and ruderless. But how do you decide what to prioritise? Prey animals are often exposed to multiple simultaneous threats, which significantly complicates the decision making process. So how do animals that are facing several simultaneous threats decide which one they need to take seriously? We studied attention in the context of escape responses in a natural environment. We investigated how fiddler crabs decide which stimulus to prioitise by comparing their responses when faced with either a single or two simultaneously, approaching dummy predators. The results showed that the crabs completely disregard the less dangerous threat, focusing exclusively on the one that is approaching most directly. This suggests that the crabs do not perceive, or do not respond to, the increased risk of depredation posed by two simultaneous predators. Given their small brain, dividing their attention does not appear to be a successful strategy for these animals, so they focus on just one thing at a time – even if that thing is coming to eat them.

This paper was shortlisted by the journal for the outstanding paper prize in 2020.

Image: from Journal of Experimental Biology, 223(21), jeb.234963

RESEARCH

Dr Hans Lambers

EMERITUS PROFESSOR

Published in Science, Vol. 369, Issue 6508, pp. 1245-1248

"Plants sustain the terrestrial silicon cycle during ecosystem retrogression"

The biogeochemical silicon cycle influences global primary productivity and carbon cycling, yet changes in silicon sources and cycling during long-term development of terrestrial ecosystems remain poorly understood. Here, we show that terrestrial silicon cycling shifts from pedological to biological control during long-term ecosystem development along 2-million-year soil chronosequences in Western Australia. Silicon availability is determined by pedogenic silicon in young soils and recycling of plantderived silicon in old soils as pedogenic pools become depleted. Unlike concentrations of major nutrients, which decline markedly in strongly weathered soils, foliar silicon concentrations increase continuously as soils age. Our findings show that the retention of silicon by plants during ecosystem retrogression sustains its terrestrial cycling, suggesting important plant benefits associated with this element in nutrient-poor environments.

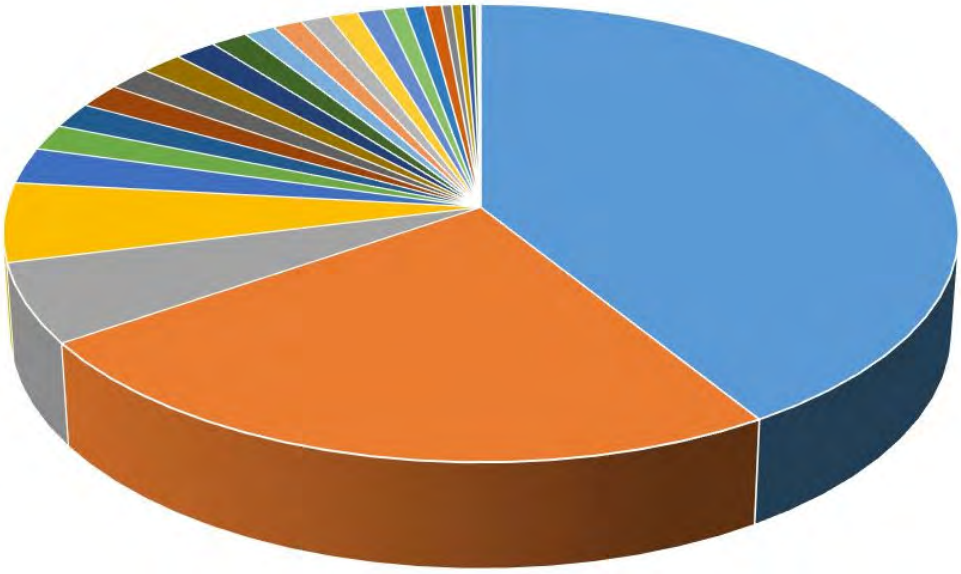
Photo: Emeritus Professor Hans Lambers

GRANTS

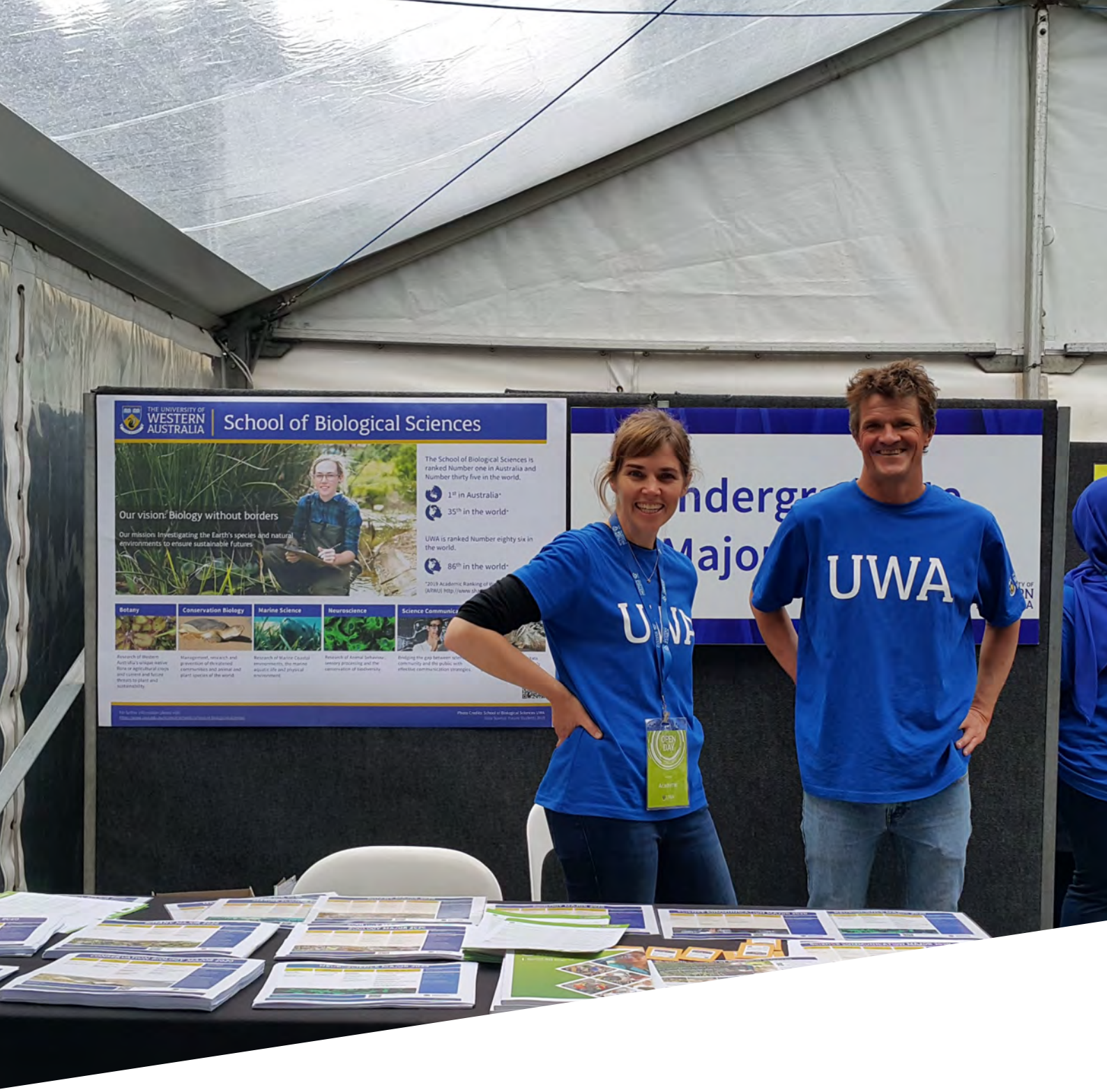
July 2020 to December 2020

Successful Grants

$12,163,023



- Metro Mining
- Australian Research Council ARC
- Fisheries Research & Development Corporation
- BHP Billiton Group
- Grains Research & Development Corporation (GRDC)
- Pew Charitable Trusts
- Department of Agriculture, Water and the Environment
- Pilbara Blue Carbon Co
- Minderoo Foundation
- Neurotrauma Research Program (NRP)
- Raine Priming Grants
- O'Kane Consultants Pty Ltd
- Forrest Research Foundation
- University of Tasmania
- RPS Environment Pty Ltd
- Woodside Energy Ltd
- Guangzhou Debai AgroTech Co. Ltd.
- Yingkou Magnesite Chemical Ind Group Co. Ltd
- University of Technology Sydney
- Smithsonian Institution
- Ecological Society of Australia Holsworth Wildlife Research Endowment
- WA Department of Biodiversity Conservation and Attractions DBCA
- University of Western Australia
- Agribusiness Yarra Valley
- South West Catchments Council (NHT)
- Wettenhall Environmental Trust
- University of Minnesota
- Scitech Discovery Centre



STUDENTS AND STAFF

Pictured: Dr Nicola Mitchell, Dr Jason Kennington - UWA Open Day, 2019

POSTGRADUATE STUDENTS

Overview for 2020

New Master Students

25

New Honour Students

11

Current Postgraduates

134

New Postgraduates

31

Completed Postgraduates

24

Completed Honours & Master Students

31

POSTGRADUATES REPRESENTATIVES

Our postgraduate representative's come from a diverse range of backgrounds, ensuring representation in each of the biological sciences schools: botany, conservation biology, marine science, neuroscience and zoology. The post graduate representatives are responsible for a wide variety of tasks including, running weekly student seminars, organizing science outreach and social activities, and speaking on behalf of the students in regards to university matters

Isobel Sewell

MARINE BIOLOGY, PHD STUDENT

Jessica Moretti

NEUROSCIENCE, PHD STUDENT

Katarina Doughty

BIOLOGY, PHD STUDENT

Paige Maroni

WESTERN AUSTRALIAN MUSEUM AND THE CENTRE FOR EVOLUTIONARY BIOLOGY

Calum Irvine

ZOOLOGY, PHD STUDENT

Robyn Anderson

PHD STUDENT STUDYING CROP IMPROVEMENT

POSTGRADUATES

Harri Davies

POSTGRADUATE STUDENT, MARINE BIOLOGY

Listening to Sea Country: Blending Traditional Knowledge with Contemporary Science to Advance Marine Management Solutions

Weaving the traditional ecological knowledge of Australia's First Nations people and their cultural methods of managing Sea Country together with the latest science stands to significantly improve marine management outcomes. Harri's PhD research has led to the creation of a culturally appropriate and scientifically robust participatory mapping methodology that can be used by Traditional Owners, Indigenous Rangers, fisheries and conservation agencies to inform marine management decisions. The methodology was first developed with the Anindilyakwa people of Groote Eylandt in the NT to create benthic habitat maps. Through a collaboration with the Bardi Jawi and Mayala Traditional Owners in the Western Kimberley, Harri applied and expanded the methodology to support the creation of Australia's first co-designed and Indigenous-led marine protected area which was announced by the state government in December 2020 and is currently open for public submission.

Paper is available here
Marine Park Information available here

Pictured below: Harri Davies with the Bardi Jawi Rangers

POSTGRADUATES

Boikhutso Lerato Rapalai

MASTERS STUDENT, CONSERVATION BIOLOGY

The focus of my research was on Digitonthophagus gazella, an African dung beetle introduced into Australia in the 1960s for cleaning pastures and controlling flies. As with other biological invasions, a species translocated outside its native range goes through evolutionary processes that may ether allow it to thrive or render it vulnerable to extirpation. This study employed molecular studies and geometric morphometrics to investigate morphological variation and population structure underlying a successful translocation and test for evidence of local adaptation in D. gazella across its Australian range. Since the genus Digitonthophagus is now known to consist of cryptic species, it was also important to confirm if a single species was introduced into Australia. Molecular analysis confirms a single Digitonthophagus species being introduced into Australia. Further, there is significant genetic divergences between populations, with evidence of genetic drift and restricted gene flow between populations. Geometric morphometric analyses further reveal significant divergence between populations in the shape of the foretibia, a trait important for tunnelling in soil and dung. Moreover, phenotypic divergence was significantly higher than genetic differentiation, suggesting that directional selection is causing phenotypic divergence among populations. These findings demonstrate the importance of introduced species having sufficient genetic variation to colonise new areas.

Pictured: Boikhutso Lerato Rapalai

ADJUNCTS / HONORARY

Dr Simon Allen

ADJUNCT RESEARCH FELLOW

Dr. Simon Allen is an SBS Adjunct Research Fellow working on the impact of fisheries, tourism and global change on marine megafauna, and a PI at the long-running www.sharkbaydolphins.org. Highlights in 2020 included scoring the cover shot for a paper in Proceedings of the Royal Society B, and then a report in Current Biology on the first quantification of a horizontally learned foraging tactic in toothed whales. The latter rocketed to an Altmetric score of 2288 and was one of the 5 most popular scientific papers of August in the Nature Index journals. Check out the video abstract here

Far outweighing anything strictly academic, however, was the opportunity to escape the UK and spend 3 months in Shark Bay, building on established connections with locals, including the Malgana Aboriginal Corporation, collecting more data on the fascinating dolphin population and saving the odd ungrateful monotreme from being road kill.

Pictured: Dr Simon Allen

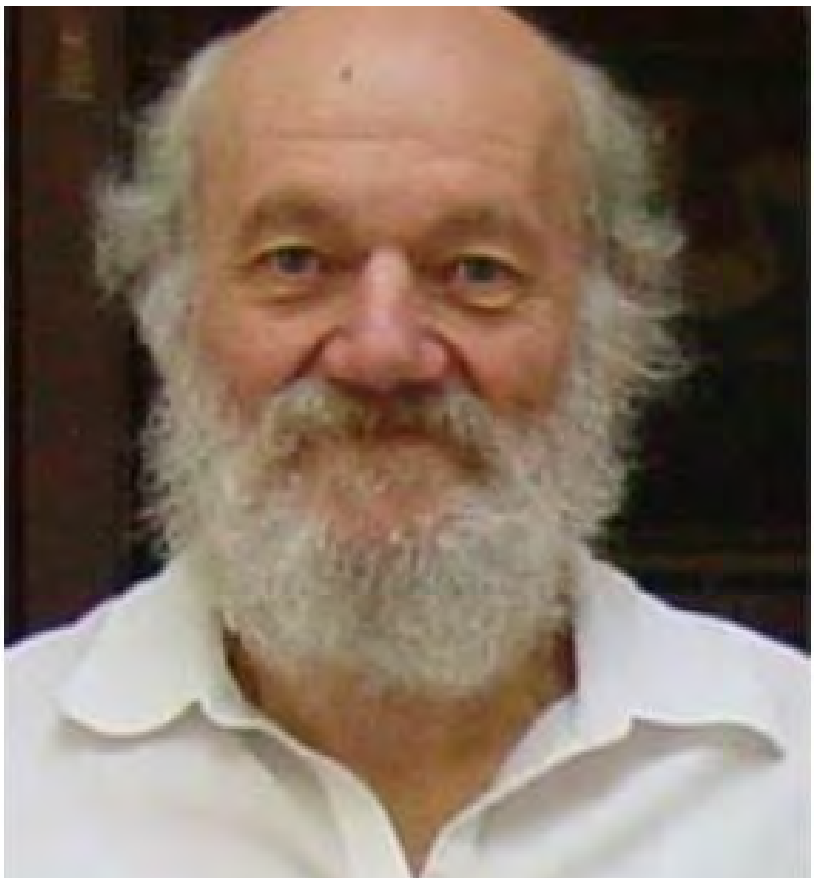
ADJUNCTS / HONORARY

Dr John Raven

ADJUNCT RESEARCH FELLOW

Dr. John Raven is an SBS Adjunct Research Fellow, one of my research topics is the oxygenation of the atmosphere over the last 2 billon years, with major increases at the Global Oxidation Event ~ 2.4-2.5 billion years ago and the Neoproterozoic Oxidation Event ~ 600-800 million years ago, Oxygenation requires a source of oxygen, by oxygenic photosynthetic organisms, and geological processes that bury a fraction of the organic carbon produced in photosynthesis, thus preventing the oxygen consumption that would otherwise be consumed in organic carbon oxidation. My work, with colleagues, relates the evolution of photosynthetic organisms (cyanobacteria, eukaryotic algae, and embryophytic plants on land), and their habitats (land including freshwater, coastal, and open ocean) over time to changes in the oxygen content of the biosphere

Paper: Determinants, and implications, of the shape and size of thylakoids and cristae



Pictured: Dr John Raven

ADJUNCTS / HONORARY

Dr Marion Cambridge

HONORARY RESEARCH FELLOW

Dr. Marion Cambridge specializes in the ecology of temperate seagrasses from the southern half of Australia, particularly the effects of human pressures on seagrasses (Cockburn Sound and Albany Harbours) and the repair of damaged seagrass systems through habitat restoration and natural recovery. Recent work has included effects of high salinity on seagrass physiology in relation to discharge of desalination brines into seagrass environments in Geographe Bay. I am also the Southern Oceans regional leader for the IUCN seagrass redlist status updates, which includes documenting declines and recovery of seagrass globally.

Pictured: Dr Marion Cambridge

Greg Cawthray

SENIOR SCIENTIFIC OFFICER

Greg provides research support primarily in areas of analytical chemistry and plant ecophysiology. He curates a range of equipment for lab &/or field use and provides support and advice in chemical sampling and analytical procedures as well as plant ecophysiology field based instrumentation. Greg offers training courses for staff and students to then make use of certain equipment themselves or offers a service based arrangement for analytical chemistry analyses using liquid and gas chromatography.

- Analytical Chemistry – chiefly organic analyte based
  - Service provision, maintenance and support for
    - Liquid Chromatography (HPLC) with various detectors
- Gas Chromatography with Flame Ionisation Detection (GC-FID)

<u>Plant Ecophysiology equipment:</u>

- Providing training, maintenance, loan and support

<u>Lab and field equipment:</u>

For example:

Freeze dryer for sample drying using sublimation & Dry shippers for cryo shipment and field collections

Pictured above: Greg Cawthray

PLANT GROWTH FACILITY

Robert Creasy

MANAGER

The Plant Growth Facilities (PGF) support the controlled-environment plant growth needs of the undergraduate teaching, postgraduate research training, and research activities in the School of Biological Science, and also the broader University of Western Australia community. At any time there are between 200 and 500 separate experiments running across 19 greenhouses, 8 phytotrons, 28 plant growth rooms, 8 plant growth cabinets, a shadehouse and net enclosed plot area.

The team of Robert Creasy and Bill Piasini take great pride in helping the University staff and students achieve successful project outcomes across a broad range of disciplines requiring controlled environment plant growth facilities.

Pictured: Robert Creasy & Aerial view of the School of Biological Science, Plant Growth Facility located on the Crawley campus of The University of Western Australia.

PRIZES AND AWARDS

Pictured:: Premier's Science Awards, Todd Bond

PRIZES AND AWARDS

Fulbright Future Scholarship (funded by The Kinghorn Foundation)

Anastazja Gorecki

NEUROSCIENCE

Alumni Association Recognition Award, Jamie received the 'Rising Star' category from the Christian Brothers College in Fremantle

Jamie Beros

NEUROSCIENCE

Raine Collaboration Award: Alex Tang was awarded the award to work with Professor John Reyneolds (Uni of Otago)

Alex Tang

NEUROSCIENCE

Samuel was awarded Research Fellowship with Forrest Foundation for his research topic 'Use the biology of ant colonies, and their reliance on internally produced neuropeptides, to disrupt/destroy them from inside'

Samuel Lymbery

EVOLUTIONARY BIOLOGY

Received recommendation for 3R's achievement in animal ethics for the 'The Neuroecology of crustacean vision'

Associate Professor Jan Hemmi

ZOOLOGY, EVOLUTIONARY BIOLOGY, BEHAVIOURAL BIOLOGY

PRIZES AND AWARDS

Received high commendation for 3R's achievement in animal ethics for the 'Shark aggregations underpin conservation but where are they and when do they occur?'

Naima Andrea López

MARINE

Received Robson and Roberston Awards which provide opportunities for outstanding Higher Degree by Research candidates to undertake important and innovative marine research.

Matilda Murley, Maria Jung, Isobel Sewell, Abinaya Meenakshisundaram

Todd was awarded join ExxonMobil Student Scientist of the Year!

Todd Bond

MARINE

Awarded Graduate Women of Western Australia (GWWA) Mary and Elsie Stevens Scholarship

Anna-Sheree Krige

MARINE

Third Place Winner at the Rising Stars 2020 with his development of a robotic fish to control invasive mosquitofish

Dr Giovanni Polverino

FORREST POSTDOCTORAL RESEARCH FELLOW

PRIZES AND AWARDS

Awarded Life Sciences & Earth Sciences Australian's Research Field Leader in Agronomy & Crop Science

Professor David Edwards

BOTANY, ECOLOGY AND FUNCTIONAL BIOLOGY

Awarded Life Sciences & Earth Sciences Australian's Research Field Leader in Animal Behavious & Ethology

Professor Leigh Simmons

ZOOLOGY, EVOLUTIONARY AND BEHAVIOURAL BIOLOGY

Awarded Life Sciences & Earth Sciences Australian's Research Field Leader as an Institution (UWA) for Botany.

AWARDED TO BOTANY, ECOLOGY AND FUNCTIONAL BIOLOGY

Awarded UWA Friends of the Grounds Award to carry out a short research project on the decline of some of the Norfolk Island pines at Somerville Auditorium

Dr Felipe Albornoz

POSTDOCTORAL , BOTANY

Awarded UWA Student Guild's Students Choice for teaching SCOM1101 in Semester 1, 2020.

Dr Jamie Tedeschi

SCIENCE COMMUNICATION

DEAN'S LIST
HONOURABLE MENTION

To receive an Honourable Mention is decided by the Board of the Graduate Research School. This is a rare award made to only a fraction of theses classified as Passed by this University.

Anna Cresswell

MARINE

Title of Thesis:
Exploring resilience to disturbances in coral reef ecosystems, with case studies from Ningaloo Reef, Western Australia

Dr Michael Kelly

ZOOLOGY

Title of Thesis:
An investigation into sleep
in sharks: behavioural and electrophysiological approaches

Dr Juliana Pille Arnold

ECOLOGY

Title of Thesis:
Modulating effects of the surrounding landscape matrix on plant-pollinator networks within remnant habitat

COMMUNITY OUTREACH

Community Engagement undertaken from July 2020 to December 2020

26 Staff from the School of Biological Sciences participated in community events

54 times The School of Biological Sciences appeared in the Media

27 times The School of Biological Sciences participated internal university, industry, international, or other events

https://twitter.com/BiolSci_UWA

https://www.facebook.com/BiolSciUWA

https://www.uwa.edu.au/science/schools/school-of-biological-sciences

COMMUNITY OUTREACH

Angela Rossen

ARTIST AND BIODIVERSITY EDUCATOR
HONORARY RESEARCH ASSOCIATE

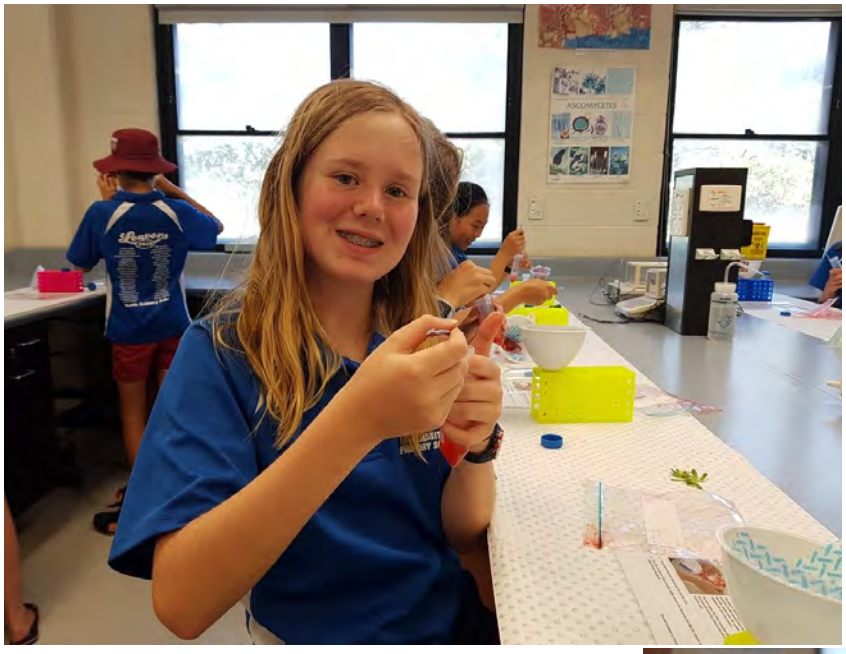
Angela Rossen was invited to join the Deep Sea Coral and Canyon REV Falkor expedition as Artist and Communicator. During the expedition Angela Rossen presented two Ship to Shore Classroom broadcasts with Applecross Primary School students and teacher Auriol Heary. Dr Greg Skrzypek and Dr Aleksey Sardakov, engineer Russell Coffield the ROV Team Leader and Deborah Smith Senior Technologist overseeing mapping data collation, joined these sessions. Students who had been following the expedition online were able to ask questions in real time about methods and discoveries. It was invigorating to be able to connect students in their classroom with frontier science as it was happening.

Pictured: Angela Rossen

COMMUNITY OUTREACH

Professor Jacqueline Batley and Professor David Edwards

Prof Jacqueline and Prof David invited school students to have their first taste of working with DNA. The students, from Dalkeith Primary School and Corrigin District High School, extracted DNA from strawberries and observed cell division in onion under the microscope. They were fascinated by how much DNA can be isolated from a single strawberry. Some curious students felt the DNA between their fingertips only to find that it disintegrated due to the enzymes on their skin. The visits were a huge success and we hope that the students continue to explore science and return to UWA in the future.



Photos taken by Prof Jacqueline Batley

COMMUNITY OUTREACH

Tim Langlois, Jane Prince & Masters student Charlotte Aston

MARINE

In late September Tim Langlois, Jane Prince and Masters student Charlotte Aston gave a public talk on the science of marine reserves at the Whale Bone Pub Exmouth in collaboration with DBCA and Parks Australia. The talk was attended by an enthusiastic crowd of ~170 people who may have been there for the beer and pizza but left with more marine knowledge!

Dr Renae Hovey

MARINE

In September, SBS was approached by UWA School Engagement Team to do some biology related science activities with a group of Years 7 to 10 Science students from Corrigin District High School. On the day, we had 19 students and 2 teachers participate in 3 activities. One of the activities had the students sorting through clumps of mussels in lab trays, looking at the variety of animals living amongst the mussels. This was a very exciting experience for the students, as most of them have not had the chance to interact with marine animals. Overall, the students enjoyed the sessions and found the activities supported their learning journey.

Pictured: Renae Hovey