Marine Biology
Marine Science
Mathematical Science

Environmental Science and Management
Geology

Discipline: Aquaculture Science and Technology

Discipline: Marine Biology

Discipline: Aquaculture Science and Technology

Global population genomics of barramundi (Lates calcarifer) based on high-resolution single nucleotide polymorphisms

Summary of Project:

Barramundi is an important aquaculture, f

Discipline: Aquaculture Science and Technology

Assessment of antibacterial activity in mucosal immunity in cultured fish species.

Summary of Project:

Discipline: Aquaculture Science and Technology

Influence of rearing conditions on antibacterial activity in mucosal immunity in cultured fish species.

Summary of Project:

Mucosal immunity is the major front line immune defence of fish against invasion by waterbourne bacterial pathogens. Many fish species have been described to express antibacterial activity in skin mucous however the impact of rearing conditions in aquaculture such as temperature, pH, salinity and exposure to ammonium on mucosal activity are undetermined. Antibacterial activity in the mucous of barramundi or groupers to different fish bacterial pathogens will be measured and potentially characterised. The study will provide fundamental research to support future work to investigate approaches to influence mucosal immunity in aquaculture species including but not limited to climate change, nutrition, genetic selection and microbiome studies.

Townsville, possible for part- time students

Advisor(s) : Kelly Condon, Dean Jerry and Andreas Lopata

https://research.jcu.edu.au/portfolio/dean.jerry/

https://research.jcu.edu.au/portfolio/andreas.lopata/

https://research.jcu.edu.au/portfolio/kelly.condon/

Would suit a student who :

This project will suit a student that has an interest in developing technical laboratory skills and an improved understanding in fish health, fish aquaculture or marine microbiology. Students should

Discipline: Aquaculture Science and Technology

Development of antibacterial activity in mucosal immunity with age in juvenile marine aquaculture fish species.

Summary of Project:

Mucosal immunity is the major front line immune defence of fish against i nvasion by waterbourne bacterial pathogens. Many fish species have been described to express antibacterial activity in skin mucous however the age of onset of mucosal immunity within important aquaculture species (barramundi, giant groupers) has not been established. This study will investigate the age of onset and changes in the activity of mucosal antibacterial action in fish skin mucous with age. The research is fundamental to support future work to investigate approaches to influence mucosal immunity in aquaculture species including but not limited to climate change, nutrition, genetic selection and microbiome studies.

Discipline: Chemistry

Discipline: Physical sciences

Electrochemical Sensors for Aquatic Analysis

Summary of Project:

Portable electrochemical sensors with high performance and low cost are increasingly necessary for aquatic analysis to protect freshwater and marine ecosystems. This project aims to innovatively design

Discipline: Chemistry

Discipline: Physical sciences

Plasma Electrocatalysis for Degradation of Microplastics

Summary of Project:

Millions of tonnes of plastic waste are estimated to enter the oceans annually. In marine environment, plastic breaks up into smaller particles, e.g., an estimated 13% to 32% of the total weight of buoyant plastics in the oceans consists of microplastic particles of 0.3–5 mm in size, which have been reported to affect the health of our marine ecosystem mainly due to microplastic intake by marine organisms (Figure

Discipline: Data Science

Discipline: Ecology, Conservation, Plant Sciences and Zoology

Discipline: Marine Science

Discipline: Mathematical Sciences

Discipline: Physics

Developing topological models for reef conservation

Summary of Project: What factors drive changes to reef biodiversity at local (small) scales? How important is the spatial distribution of species? How do local changes influence the biodiversity and resilience of the whole reef system? What does this mean for reef management policies?

Discipline: Data Science

Mitigate Biases and Promote Fairness in Language Models

Summary of Project:

Bi

Using

Discipline: Data Science

Discipline: Data Science

Identification of personal health experiences on social media using deep learning

Summary of Project:

Public health surveillance from social media relies on being able to separate what people say about their own health from other discussions that use the same keywords for other reasons. Many applied studies in the area have failed to take this into account

Discipline: Data Science

Detecting and Understanding Memes on social media

Summary of Project:

Social media has enabled individuals to freely share content online. While this was a hugely positive development as it enabled free speech, it was also accompanied by the spread of harm and hostility. Hate speech, offensive language, abusive language, propaganda, cyberbullying, cyber aggression, and other kinds of harmful content have become prominent online. Such content can target users, communities (e.g., minority groups), individuals, and companies. Social media have defined various categories of harmful content that they do not allow on their platforms, and various categorizations of such content have also come from the research community. Social media content is often multimodal, combining text, images, and/or videos. In recent years, Internet memes have emerged as a prevalent type of content shared on social media. A meme is "a group of digital items sharing common characteristics of content, form, or stance, which were created by associating them and were circulated, imitated, or transformed via the Internet by many users". Memes typically consist of images containing some text. The design used in memes is typically humorous, but they are often harmful. Students are expected to build on top of previous state-of-the-art methods under the guidance of the supervision team and establish better performance using deep learning and natural language processing.

Discipline: Data Science

Early detection of Mental health issues using social media

Summary of Project:

Mental health is a critical issue in modern society, and mental disorders could sometimes turn to suicidal ideation without adequate treatment. Early detection of mental disorders and suicidal ideation from social content provides a potential way for effective social intervention. The key idea of the project is to leverage the user-generated data on social media to create a usable decision support system that aids in the detection of mental health issues. The

Discipline: Data Science

Identifying Offensive online contents

Summary of Project:

Social media has become one of the main channels for people to access and consume news, due to the rapidness and low cost of news dissemination on it. However, such properties of social of social media also make it a hotbed of hate speech, misinformation, and fact checking, bringing negative impacts on both individuals and society. Therefore, detecting fake news has become a crucial problem attracting tremendous research effort. Depending on interest, in this project the student(s), our aim is to make creating/modify models to achieve improved performance. Students are expected to build on top of previous state-of the-art methods under the guidance of the supervision team (you will not feel that you are alone in this project) and establish better performance using deep learning and natural language processing.

Cairns and/or Townsville, not possible for part-time students

Advisor(s): Usman Naseem

Would suit a student who :

The student(s) should have a basic understanding of data science and deep learning or have equivalent experiences.

Preferred start date

February 2024

Discipline: Data Science

Identifying Toxic Behavior in Online Gaming

Summary of Project:

The problem of toxic behavior in online games and the gaming industry has become increasingly serious. The toxic language used in in-game chat differs significantly from other online platforms like social media or online news. This is mainly due to the shorter length of messages, as players tend to type in-game chat while playing, while longer messages are typically seen in pre- or post-game discussions. Considering this unique nature of in-game chat, it is crucial to understand the slot-level (word token) context in order to detect toxic language. In this project students are expected to collect a new dataset and establish the baselines using existing methods.

Cairns and/or Townsville, not possible for part-time students

Advisor(s): Usman Naseem

Would suit a student who :

The student(s) should have a basic understanding of data science and deep learning or have equivalent experiences.

Preferred start date

February 2024

Discipline: E arth Science

Discipline: Ecology, Conservation, Plant Sciences and Zoology

Discipline: E nvironmental Sciences and Management

Using plants and rock dust to permanently remove carbon dioxide from the atmosphere

Summary of Project:

This project involves studying plant and soil processes to optimise CO_2 removal via enhanced weathering, in the field and/or laboratory. To mitigate climate change we need not only to reduce CO_2 emissions but also to remove CO_2 from the atmosphere and lock the carbon away. Enhanced weathering is rapidly gaining attention as a way of doing that, but there are still important unknowns about how effective it will be. It involves adding basalt rock dust to agricultural soil, which rejuvenates the soil and should also remove CO_2 during weathering. This might be particularly effective in tropical climates and soils. However, many plant, microbial, soil chemical, hydrological and management processes need to align. This project will focus on one of the key questions and can be tailored to suit your interests and background. You will be part of a JCU team running field trials and laboratory analyses, and we are part of the international Leverhulme Centre for Climate Change Mitigation.

Cairns, possible for part -time students

Advisor(s) : Dr Paul Nelson

Discipline: Ecology, Conservation, Plant Sciences and Zoology

Parental care in a changing environment

Parental care in a changing environment

Summary of Project:

Everyone needs a helping hand most when times are tough. Indeed, it has been argued that the distribution and evolution of social species - that live in groups and cooperate - have evolved in harsh environmental conditions, allowing for successful reproduction and survival in environments where pairs alone cannot succeed. This implies that socia l behaviour may moderate the impact of climate change.

In cooperative breeding groups, the presence and number of helpers that assist the breeding pair in raising young can positively impact reproductive success through various mechanisms. Larger groups p rovide more food to offspring, which is crucial for their growth and survival, particularly in environments where food availability is limited. Helpers also alleviate the workload of the breeding pair, leading to better reproductive outcomes. In this proje ct you can analyse recordings of nestling provisioning behaviour of the cooperatively breeding red - winged f airy-wren (*Malurus elegans*) collected from the field. Depending on your interest topics of research can include:

-how birds adapt their parental car e in response to changing weather conditions

-whether larger groups can buffer effects of adverse weather conditions

-the fitness consequences of changes in behaviour

Cairns or Townsville (either), possible for part -time students

Advisor(s) : Lyanne Brouwer (https://research.jcu.edu.au/portfolio/lyanne.brouwer)

Would suit a student who :

Has an interest in behavioural, evolutionary, and global change ecology. The project will

Discipline: Ecology, Conservation, Plant Sciences and Zoology

Bird Acoustics and Environmental Conditions

Summary of Project:

Discipline:

Discipline: Ecology, Conservation, Plant Sciences and Zoology

Discipline: Data Science

What causes the extinction risk of biodiversity to deteriorate or improve? A global analysis of birds, mammals, corals or amphibians

Summary of Project

Humans influence the environment in such a strong way that many species are going extinct, or are in such low numbers that they become endangered. Conservation actions and mitigation of threats help to slow down ongoing increases in extinction risk, and ultimately the aim is to become Nature positive and turn the tide. At the other side of the equation, some changes in the environment (e.g. climate change) are still [illegible] (i)-14.1 (2w)-5.3 (ot

Discipline: Ecology, Conservation, Plant Sciences and Zoology

Discipline: Mathematical Sciences

Cassowary extinction risk

Summary of Project:

Southern cassowary is the iconic species of Northern Queensland, and Australia's largest birds. These birds are an important species in this region because they disperse large seeds of fruits throughout the rainforest. Cassowaries are also an endangered species, and a national species action plan sets out key goals to improve the population viability of this species. However, to be able to determine evidence- based and efficient conservation actions, we first need to be able to determine what the current extinction risk is before we can start assessing what the best way is to improve the population viability of this species. In this project you will collate from the literature all the information on the demography of this species and integrate this into a population model to determine the population viability of this species. Once the model is built there are additional opportunities to determine what conservation actions would best help to increase the population size and viability of this species.

Cairns or Townsville (either), possible for part -time students

Advisor(s) : Martijn van de Pol https://research.jcu.edu.au/portfolio/martijn.vandepol/

Would suit a student who :

e.g. has an interest in ecology and has some basic experience with ecological/mathematical/computer modelling (e.g. done BS5260 or MA3211).

Preferred start date: February (SP1), or September (SP9).

Discipline: Ecology, Conservation, Plant Sciences and Zoology

Discipline: Mathematical Sciences

Discipline: Data/ Statistical Sciences

Various projects at the interface of Ecology, mathematical and statistical modelling

Summary of Project:

Our research is at the interface of ecology (coastal and terrestrial) , mathematical and statistical modelling. Therefore, I am happy to discuss projects to suit students that are interested in one or more of these fields. Topics we are currently working on are :

- Meta-analysis of species differences among wildlife to human disturbance.
- Developing an early warning system for conservation management in arid boom -bust systems (bilbies),
- Statistical tools for robust climate change biology
- Population dynamical responses to climate change on a continental scale.
- Demographic models of the evolution of coopera3 (ol)9 (u)-10 (t)-11 90 ((t)-11 (i)-11 (.96 0 P0.007 Tc

Discipline: Ecology, Conservation, Plant Sciences and Zoology

Diet choice in a changing world

Summary of Project:

Some shorebirds are like Darwin's famous finches: by looking at their bill one can determine what they eat. In oystercatchers, some birds become shellfish specialists and have blunt bills, while other birds are worm specialists and have pointy bills. The abundance of worms and shellfish has changed dramatically over time, either due to shellfisheries or global warming causing cold-loving prey species to decline. Little is known how wildlife can track and adapt to such rapid changes in the environment. In this project you can analyse a dataset of more than 35 years on bill shapes, food stocks and climate change to determine how shorebird's diet specialization responds to a changing environment. Depending on your interest, your Honours project could focus on for example:

- How birds have adapted their diet specialization over the past decades
- How it will change under future climate change scenarios
- Whether the male and female in a pair avoid competition over food by choosing opposite specializations
- How diet specialization develops from an early age and whether it is inherited from their parents, or depends on their natal habitat.

Cairns or Townsville (either), possible for part-time students

Advisor(s) : Martijn van de Pol https://research.jcu.edu.au/portfolio/martijn.vandepoll(ia0Tw 0Td[o)11/l.)]TJ0Tc

Discipline: Ecology, Conservation, Plant Sciences and Zoology

Discipline: E nvironmental Sciences and Management

Ecology and evolution of tropical invasive plants

Summary of Project:

Several projects available, from more theoretical to fully applied, suitable to different interests and backgrounds. Invasive plants pose a major environmental problem that requires applied scientific solutions. However, they are also optimal model systems to study key ecological concepts, providing with unique insights into the evolutionary processes unfolding during colonization and adaptation to newly colonised areas. Projects are available to study direct management approaches, but also to test ecological theories about plant-animal interactions, biogeography, ecology, ecophysiology, reproductive biology, and others.

The Australian Tropical Herbarium (ATH) is located at James Cook University's Cairns campus. Its location in the Wet Tropics, proximity to the Great Barrier Reef, and a variety of diverse habitats, species, and communities, locates it ideally for the development of research on invasive plant biogeography, reproductive ecology, seed biology, plant physiology and chemistry, and plant-animal interactions. The ATH has a dedicated biosecurity group with funding to support several Honours, MSc, and PhD projects to selected candidates. Informal inquiries are welcome, and personal areas of interest will be considered for the planning of projects that fit within the al irT786 (i)T78e(w)(nd)]TJic -0.d*pri

Discipline: E nvironmental Sciences and Management

Discipline: E nvironmental Sciences and Management

Flow monitoring using video cameras

Summary of Project:

The aim of the project is to do flow measurements for an urban drain in Saltwater Creek (Cairns) using innovative camera technology. The student will be trialing out new technology and working with hydrographers from QLD Government. The work involves fieldwork, image analysis and comparison o f results with traditional measurement techniques.

Location: Cairns , full-time student only

Advisor(s) : HanShe Lim

https://research.jcu.edu.au/portfolio/hanshe.lim/

Would suit a student who :

Students who are interested in learning new technology and applying it to environmental measurements, don't mind getting wet and preferably can get to saltwater creek relatively easily on their own at quick notice. Student will preferably need to have their own car and have the flexibility to drive to the site during or soon after rainfall events to measure different flow conditions experienced at the drain.

Preferred start date : February (SP1), or September (SP9).

Discipline: Marine Biology

Age, size at maturity and sexual development in Acanthochromis polyacanthus across the species range on the Great Barrier Reef.

Summary of Project:

Demographic patterns of life-history traits in animal populations can be used to assess the status and allow targeted conservation actions. Variations in traits like growth, maturation, reproductive output, and life span can occur both within and between populations due to environmental conditions. For example, warming

Discipline: Marine Biology

Population genomics of the deadly jellyfish Chironex fleckeri

Summary of Project:

Chironex fleckeri, commonly known as ‘box jellyfish’ or ‘stingers’ are a major threat to swimmers along the coast of Queensland over the summer months. A detailed knowledge of the ecology of this species is required to minimise the risk of envenomation to humans. Historically though, there has been little knowledge of where box jellyfish from a region come from, and more broadly whether populations widely exchange genes. In short, is there no population genetic structure, or is restricted gene flow indicative that jellyfish found in a geographic area are endemic and represent local recruitment. We have found spatial variation in the phenotypes of jellyfish and their elemental chemistry. Furthermore, jellyfish have behaviours, including swimming and obstacle avoidance, that help them remain in localised areas. More recently, we have used environmental 66 (66 (66 (6)l (66 7 (,)-15 (t)-1i2 ha)-6 (v)-13)(nv)-13.1 (i)l)4 (ede)-7 (l)4 ur

Discipline: Data Science
Discipline: Marine Science
Discipline: Mathematical Sciences

Using topological data analysis to find morphological descriptors for staghorn corals

Summary of Project This project aims to develolop new mathematical tools to investigate