



ARC RESEARCH HUB FOR
**Supercharging
Tropical Aquaculture**
THROUGH GENETIC SOLUTIONS



**ARC Research Hub for
Supercharging Tropical
Aquaculture through
Genetic Solutions**

**Hons/MSc/PhD
Opportunities**

Industry Partners

MainStream AQUACULTURE



seafarms


CYGNET BAY
PEARL FARM

 **agrf**

Background

The ARC Research Hub for Supercharging Tropical Aquaculture through Genetic Solutions will involve work with five species (pearl oysters, barramundi, prawns, seaweed, and grouper) with the aim to apply various genetic and technological approaches to boost productivity of farming, improve breeding outcomes and lower risks associated with disease with key industry partners:

[Mainstream Aquaculture](#)
[The Company One](#)
[Sea Forest](#)
[Seafarms](#)
[Cygnet Bay Pearls](#)
[AGRF](#)

The Research Hub is seeking expressions of interests from highly motivated prospective students to fill 10+ Hons/MSc/PhD Projects through competitive research applications. The projects will be aligned with strategic aquaculture industry stakeholders and focused on key research priorities of the Research Hub to boost productivity of the target culture species. The projects will deliver outcomes that include selection of genetic lines for fast growth, product quality and pathogen tolerance, improve hatchery breeding processes, improve biosecurity and lower threat of disease, plus delivering on farm solutions to better understand how the farm environment interacts with the culture species to boost productivity outcomes.



The training environment

The positions will be based either at James Cook University (JCU) in Townsville, Australia – a world-renowned research institution for tropical marine science, or the University of Queensland in Brisbane, Australia – a research intensive institution ranked in the top 50 Universities globally. *While these projects are fully funded, student financial support is not included, thus the successful candidates are expected to apply for a competitive Postgraduate Research Scholarship offered through James Cook University or the University of Queensland.* Potential candidates preferably should have at least one peer-reviewed scientific publication and demonstrate a high level of academic achievement. Candidates should also demonstrate an interest in aquaculture systems with knowledge and skills in areas such as microbiology, genetic or genomic approaches, animal nutrition, bioinformatics, or artificial intelligence and machine learning applications to biological systems. The positions are open to both Australian and non-Australian citizens, though due to current Covid border closures only candidates already residing within Australia will be considered in the present round. Please send inquiries and expressions of interest (cover letter and CV) to Sandra Hughes (sandra.hughes@jcu.edu.au) by 16th September 2021.

Themes of Research



Hons/MSc/PhD Theme 1 - Breeding for Productivity. This theme will develop the quantitative genetic and genomic framework for partner companies to instigate world-leading breeding programs for their species, resulting in elite genetic lines selected for increased growth, disease tolerance, product quality and/or bioactives. It will work with companies to refine and develop new advanced genomic, reproductive and hatchery technologies, relevant to breeding programs that ensure reliable control of seedstock production, rapid genetic gains and maintenance of genetic diversity. For more information (aquaculture@jcu.edu.au).

Project topic areas

- Establishment of genetic parameters for commercially-relevant growth, disease and bioactive traits. This project will apply quantitative genetic statistical approaches to determine the heritability and genetic correlations of traits important to selective breeding programs

- Genomic prediction approaches to increase genetic gains in breeding programs. This project will develop genomic prediction models for one or more species and evaluate their applicability to selection of disease traits
- Advanced reproduction and nutrition. This project will investigate the links between diet, maturation and larval quality to improve hatchery breeding processes

Hons/MSc/PhD Theme 2 - Improved Aquatic Animal Health. This theme will create foundational knowledge to improve the management of diseases caused by targeted bacteria, viruses and ectoparasites in marine aquaculture systems. The theme will develop industrial-scale challenge trial methodologies for relevant pathogens to aid in the development of tolerant genetic lines, as well as produce and implement new diagnostic environmental DNA (eDNA) technologies and approaches to detect and monitor pathogens on-farm and to link to host susceptibility with pathogen loads in the environment. Candidates should demonstrate knowledge and skills in disease diagnosis focussing on aquatic animal health. For more information contact aquaculture@jcu.edu.au

Project topic areas

- Development of environmental DNA/protein-based technologies for pathogen monitoring. This project will develop validated assays to quantitatively detect the presence of a number of target pathogens from aquaculture sourced samples and investigate how pathogen quantity correlates with disease outbreaks.
- Understanding the interplay of host genetics, pathogen presence, microbiomes, diet and/or environment on disease outbreaks in marine aquaculture systems. This project will track the quantity of target pathogens within a system and examine impacts of host genetics, microbes, diet and environmental factors on farm disease outbreaks.
- Establishing standardised challenge models to investigate disease expression in marine aquaculture systems. This project will establish standardised disease challenge models for pathogens, of priority to industry partners, to enable controlled experimental investigation that measures the impact of host-pathogen-environmental parameters on disease expression.

Hons/MSc/PhD Theme 3 - Unpacking Production Environments and Microbiomes. This theme will deliver new knowledge on the interplay of bacterial microbiomes on the productivity and health of farmed species, how microbiomes link to hatchery and production environments, pathogens prevalence and management practices. It aims to penultimately develop on-farm decision support applications based on artificial intelligence and machine learning that integrate all relevant data streams. For more information contact aquaculture@jcu.edu.au

Project topic areas

- Prediction of production outcomes using AI/machine learning. This project aims to develop an AI/ML framework that equips aquaculture farms with decision support tools and techniques to predict productivity and disease
- Role of microbiomes in aquaculture species survival and links to disease. This project will track the development of the microbiome in aquaculture production systems and how they change with production phase and correlate with disease
- Identifying the microbial functions that influence aquaculture production systems. This project will use 'omic' based approaches to correlate the microbial functions that underpin host health and improve production system.

