

July 2021

VOLUME 17, ISSUE 2

AIMS@JCU Awards: Round 1 for 2021

Congratulations to all of the students who were successful in their applications for the following awards:

Science Communication Awards

Ramona Brunner, Stella Fulton, Emma Marangon, Michaela Miller, Rachel Neil, Mikaela Nordborg, Paul O'Brien & Marina Santana

Pilot Research Awards (\$1,000 each)

Stella Fulton, Bethan Lang, Josephine Nielsen, Callaway Thatcher, Taylor Whitman & Geoffrey Yau

Look out for summaries of their travel and research in future newsletters.

Snakes alive!

Congratulations to AIMS@JCU PhD candidate Blanche d'Anastasi and her colleagues on the recent 're-discovery' of the short-nosed sea snake! No wonder it was thought to be locally extinct - researchers (aboard the Schmidt Ocean Institute R/V Falkor) had to venture into the twilight zone at Ashmore reef, an extraordinary 67 m below the ocean surface, to catch a glimpse. Blanche (excitedly!) is keen to understand if this sighting represents a previously undetected breeding population, or if they are a different species to the coastal ones. See <https://www.aims.gov.au/news-and-media/thought-be-lost-forever-locally-extinct-sea-snake-re-discovered-during-deep-sea-expedition> for more details.

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Photographs in this publication were submitted by AIMS@JCU members unless otherwise stated

About the AIMS@JCU Newsletter:

This newsletter is produced quarterly and distributed by email to AIMS@JCU members, AIMS and JCU staff.

If you'd like to be added to our mailing list, or have a query regarding this newsletter, please contact:

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2021 AIMS@JCU PhD scholarship recipient

Valerie Cornet

Project title - Understanding coral reef thermal dynamics through innovative remote sensing applications



Valerie Cornet recently completed her Masters in Marine Biology at James Cook University, focusing her final research project in the field of remote sensing. She used remotely sensed data from drones to map out coral reefs using spectral unmixing techniques. Prior to this, she completed her Bachelor of Science (Honours) in Biology at Imperial College London, but felt compelled to move closer to the warm, tropical Great Barrier Reef to pursue research in the field of marine science. On top of this, Valerie has worked at various non-profits such as the Schmidt Ocean Institute, Reef Check Indonesia, and the Misool Foundation, where she focused her work in various fields such as coral restoration and deep-sea research as a research diver or as a science crew member.

Now, combining the computational and theoretical skills gained from her previous degrees, she will focus her research on coral reef thermal dynamics, aiming to improve and expand upon current bleaching models to provide better management tools to predict and understand future coral bleaching events. She begins her candidature with an AIMS@JCU scholarship under the supervision of JCU supervisors Prof Scott Heron (primary), Dr Karen Joyce (secondary), and AIMS supervisors Dr Neal Cantin and Dr Jonathan Kok. Her project aims to better understand how coral reefs respond to global warming and climate change. Although the relationship between increasing sea surface temperatures and bleaching is proven, there still exists various unresolved hypotheses on coral bleaching history and its effect on adaptation and sensitivity of corals (ie. the effect of winter characteristics on adaptation). Using satellite-derived temperature and in situ bleaching data, trends in bleaching behaviour will be identified and quantified, concerning long- and short-term adaptation and tolerance. High resolution remotely-sensed data from drones may also be used in combination with broad scale data from satellites to achieve the extent and resolution needed to effectively study the global history of coral bleaching processes. Identifying these trends will then serve in shaping better bleaching alert models that will provide more realistic bleaching predictions and therefore more reliable management tools.

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2021 AIMS@JCU PhD scholarship recipient

Martina Burgo

Project title: Effects of macroalgae on coral recruitment, growth and mortality across space and time

Martina completed her Integrated Master's degree (MSci) in Biodiversity and Conservation at University College London, UK. For her Master's research project, she worked with Dr. Alex Pigot and looked at seagrass response to heat stress. The project analysed available data from laboratory experiments on seagrass thermal tolerance and combined it with biogeographical data to develop a predictive model of species' response to marine heatwaves. Before moving to Australia, she worked for Archelon, a non-profit association protecting sea turtles and their habitats in Greece through monitoring, research and rescue programs.



Martina started her PhD at JCU under the supervision of Prof. Andrew Hoey, Dr. Katharina Fabricius and Prof. Morgan Pratchett. Her research will explore the effects of different macroalgal functional groups on coral life stages across space and time. Understanding coral-algal dynamics is becoming increasingly important as coral cover is declining worldwide. Coral loss is often accompanied by increases in algal assemblages that compete with corals for space. Consequently, reef resilience depends on coral ability to re-establish in macroalgal-dominated habitats and specifically on coral larval supply, recruitment success, coral growth and mortality. In particular, the project will explore coral-algal dynamics across different environmental gradients to understand the impact of climate change and anthropogenic pressures on coral-algal competition. To do so, research will involve surveys and field experiments on inshore reefs across the GBR.

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Pilot Research Award report

Master of Philosophy Candidate, Stella Fulton

Project Title: Ecological implications of macroalgal removal for localised inshore reef restoration

Advisory Panel: David Bourne (JCU), Hillary Smith (JCU), Ian McLeod (TropWater JCU), Cathie Page (AIMS)

Short abstract:

The increasing abundance of fleshy macroalgae on many inshore coral reefs is recognised as a threat to ecosystem functioning and the services they provide. Physically removing macroalgae is proposed as one approach to clear space for coral recovery on algal-dominated reefs. This project aims to improve understanding of the ecosystem-wide impacts of macroalgal removal on the fringing reefs of Magnetic Island and determine its potential as a localised restoration strategy for inshore reefs, which are increasingly impacted by anthropogenic stressors. Twenty-four experimental plots (each 25m²) were established on fringing reefs in two eastward-facing bays of Magnetic Island. In each bay, six control plots provide a baseline for benthic composition while the remaining six plots have periodic macroalgal removal. Macroalgae (predominantly *Sargassum* spp.) is removed from the treatment plots twice-yearly, with one removal event timed prior to mass coral spawning (approx. Oct-Nov annually). All sites are monitored every two to three months to assess benthic community composition, macroalgal re-growth, coral recruitment, algal turf height, and sediment deposition. Preliminary results indicate the potential for coral recovery following macroalgal removal by demonstrating significant increases in coral recruitment in plots subjected to macroalgal removal compared to control plots. Data collected from this study will also be used to develop a mathematical model to identify the ecological impacts of macroalgal removal on a longer time scale, to predict if Magnetic Island reef systems will follow a trajectory towards coral recovery and improved resilience whilst maintaining key ecological functions. This approach is novel, since model development and validation on inshore reefs of the GBR has not been investigated to date, and will have widespread applications in management and conservation. It is expected this project will help inform decision making by end-users and assist in developing science-based best-practices for coral restoration on the Great Barrier Reef.

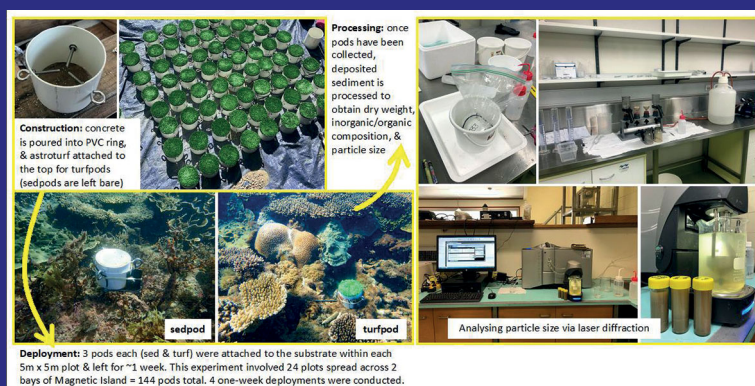
Nick Barrett

Pilot Research Award report

continued

Summary of how AIMS@JCU Pilot Research Award funds were used:

In 2020 I was awarded a \$1,000 AIMS@JCU Pilot Research Grant which enabled me to purchase materials required to collect and process marine sediment samples as part of my Master of Philosophy research project. My project is focused on investigating the impact of macroalgal removal on inshore reef ecology. Specifically, I am quantifying the impact on benthic community composition, sediment deposition and algal turf dynamics. A large part of my project involved collecting sediment samples. The methodology I used required me to construct 144 sedpods and turfpods, which are instruments designed to measure net sediment deposition and resuspension. These pods were deployed four times for approximately one week at a time, after which they were collected and the deposited sediment analysed. Processing of sediment samples involved calculating dry weight, organic and inorganic composition, as well as particle size. The AIMS@JCU Pilot Research Grant was put towards costs for pod construction, field work costs for pod deployment, and purchase of laboratory consumables for sediment sample processing. Each round of pod deployment required at least 3 days of field work (2 days to deploy, 1 day to collect), and 3-4 weeks of laboratory processing. Receiving AIMS@JCU funds allowed me to successfully conduct four deployment rounds, resulting in an extensive dataset which will allow for a rigorous investigation into inshore reef sediment dynamics associated with macroalgal removal at Magnetic Island.



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Nick Barrett

Viruses and AIMS@JCU

Dr Cherie Motti, AIMS@JCU Assistant Research Director

A virus is defined as

'an infectious agent of small size and simple composition that can multiply only in living cells of animals, plants, or bacteria.' (source: Britannica)

AIMS has a large research initiative under way to understand the critical roles that viruses associated with corals and sponges play in health, disease and adaptation to climate change. Over the past decade AIMS@JCU students have and continue to play a pivotal role in addressing this. For example, Patrick Buerger's research has developed techniques for screening for pathogens of coral disease [1] and identifying drivers of coral bleaching [2], and Cecília Pascelli's research has developed methods to visualise viruses in marine sponges [3].

However, we have all become intimately aware of the other side of viruses – their potential to lead to pandemics with real impacts on how we live and work. A pandemic is defined as

'an outbreak of infectious disease that occurs over a wide geographical area and that is of high prevalence, generally affecting a significant proportion of the world's population, usually over the course of several months.' (source: Britannica)

Sadly, as a result of this virus many of you have experienced significant delays, hardship, serious health issues and personal loss. AIMS@JCU wishes to acknowledge this and will continue to offer assistance to each and every one of you. We urge you to stay engaged with AIMS@JCU.

But can COVID-19 teach us anything about doing a PhD? The global pandemic has forced us collectively to critically evaluate the situation, modify our goals and adapt our thinking and actions. Together, the international science community has risen to the challenge, combining knowledge, skills and resources, to produce and implement novel, effective and safe technologies and practices to combat the virus. Governments and health bodies have developed pipelines to allow for the controlled and ethical delivery of technologies across the globe. Industry and workplaces have devised and implemented safe work practices to reduce the impact of the virus at a local level. Together these actions are now delivering real world solutions. These are all guiding principles that underpin any PhD.

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Viruses and AIMS@JCU

continued

There is, however, another definition of a virus,

'a portion of a program code that has been designed to furtively copy itself into other such codes or computer files.' (source: Britannica)

Over the past several months there have been reports of students experiencing difficulties associated with access to AIMS IT systems. We thank you for raising your concerns and encourage you to continue the conversation no matter how trivial the issue may be. With more and more of our work being conducted in the 'virtual world' it is important we find workable solutions. Towards this, AIMS@JCU and a number of AIMS@JCU students are now working closely with AIMS IT, and if necessary, will extend this to include JCU IT.

The fight against COVID-19 and cyber viruses is continuing, and these viruses are "here to stay". Please reach out to your AIMS@JCU family (including supervisors, fellow students, AIMS@JCU staff, AIMS and JCU HSE and IT staff), we are here to support you and advocate for your needs.

[1] K.D. Weynberg, C.R. Voolstra, M.J. Neave, P. Buerger, M.J. van Oppen, From cholera to corals: Viruses as drivers of virulence in a major coral bacterial pathogen, *Scientific reports* 5 (2015) 17889.

[2] P. Buerger, M.J. van Oppen, Viruses in corals: hidden drivers of coral bleaching and disease?, *Microbiology Australia* 39 (2018) 9-12.

[3] C. Pascelli, P.W. Laffy, M. Kupresanin, T. Ravasi, N.S. Webster, Morphological characterization of virus-like particles in coral reef sponges, *PeerJ* 6 (2018) e5625.

Research Director Report

It's mid-2021 and we are all still feeling the impact of COVID-19. However, together we are finding innovative ways to continue our research and stay engaged with each other. The past four months has seen a re-emergence of face-to-face engagement (albeit under new social distancing rules), but recent weeks have been a stark reminder that we have to remain vigilant while being flexible and adaptable. We urge you to maintain regular contact with your supervisory team to ensure you remain safe and (perhaps annoyingly) remind you to complete all COVID-19 related paperwork and most importantly your JCU progress reports. These records help us to help you. Remember you can also pick up the phone and call or zoom any of the AIMS@JCU staff if you aren't

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sure what to do, if you need advice – or even just want to chat.

Under such adverse conditions AIMS@JCU has continued to deliver the weekly Pomodoro sessions, the annual writing retreat on Magnetic Island, and several Science Communication and Pilot Research awards. Keep an eye out for details of the next round of Science Communication and Pilot Research awards, our R-Course with Murray Logan which commences on 9th August and for an announcement regarding the annual AIMS@JCU seminar day. We are currently working behind the scenes to make this happen and are aiming for an October date, hopefully (fingers and toes crossed) to be held in person. In addition, AIMS@JCU has become an active member on the JCU Research Education Sub-Committee (RESC), and we are now working more closely with the AIMS Research Office, putting us in a better position to assist and support our student cohort – YOU!

The great news is that our student and staff membership base continues to grow, and we warmly welcome our most recent AIMS@JCU PhD scholarship recipient Tiny Remmers, and supervisory staff Simone Bloomberg, Rachel Groom, Andrew Hoey, Stephen Lewis and Carly Randall. Our alumni network has now reached an impressive 163 researchers, and while it is always a little bit sad to say goodbye, it is also exciting to see people launch and develop their careers. Congratulations to previous AIMS@JCU Staff member, Professor Nicole Webster on her appointment as Chief Scientist of the Australian Antarctic Division. Nicole completed her PhD at AIMS and JCU, and a joint postdoc between AIMS, the University of Canterbury and Gateway Antarctica, before accepting a research position at AIMS, and adjunct positions at JCU and the University of Queensland. This has proven to be a fantastic platform and has since seen her develop an extensive research network and impressive publication rate. Nicole was an active member of AIMS@JCU and we wish her well in her new role.

We are always thinking of ways to update and improve our services to support you towards completion, so please, email, phone, or come see us (always happy for a coffee!) if you have any suggestions on how we can enhance your PhD experience.

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