AIMS@JCU NEWSLETTER

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Stress in Tropical Marine Systems Program Update

Darren Coker: Since commencement in 2008, Darren has undertaken many field trips to Lizard Island enabling him to complete one chapter of his thesis and provide some results for the other four chapters. Darren has presented his confirmation seminar, published two papers from his completed chapter and a review in Nature News. This month, he will be back in the field to collect data for two chapters. Darren aims to publish another two papers this year.

Vivian Cumbo: Vivian began her PhD in 2006. She has been to Taiwan to learn techniques of analysis of some of her experiments and is currently writing up the remainder of her thesis on 'Understanding the initial establishment of symbiosis in corals'.

Jessica Haapkyla: Having started her PhD in 2007 on impacts and drivers of coral diseases in the Indo-Pacific, Jessica has conducted fieldwork in the Wakatobi Marine National Park, Indonesia, and on Magnetic Island and Heron Island on the GBR. She ran an aquarium-based study on drivers of coral disease at MARFU. In 2009, Jessica published two papers and has submitted one in 2010.

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About the AIMS@JCU Newsletter:

This newsletter is produced quarterly and distributed by e mail to all 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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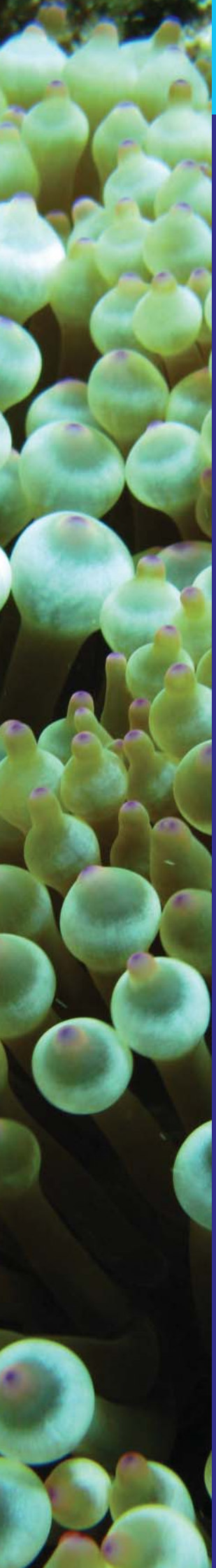

Emily Howells: Since she commenced her PhD in 2008, Emily has been undertaking field and laboratory work to investigate factors that contribute to the resilience of *Symbiodinium* populations to rising sea temperatures. Currently she is completing laboratory work on the acclimatization potential of *Symbiodinium* in a long-term study of transplanted corals. Emily has presented her PhD results to research groups in Mexico and Taiwan as well as at the Australian Coral Reef Society conference in 2009.

Charlotte Johansson: During 2009, one of our most recent AIMS@JCU PhD students, Charlotte, has undertaken two field trips. She has one manuscript in review in a scientific journal and has attended three seminars during the year in Brisbane and Western Australia.

Raechel Littman: Since 2007, Raechel has published four papers. Raechel is currently working on two more studies, a transplantation experiment and a metagenomics paper which are due to finish in the next few months.

Heidi Luter: Since Heidi's project commenced in 2008, she has completed disease prevalence surveys in Torres Strait and the Palm Islands and written the corresponding manuscript. The manuscript incorporating results from further work is currently being reviewed in Applied and Environmental Microbiology. Having completed a temperature stress experiment in December 2009 and a sediment stress experiment in March 2010, Heidi is busy processing samples and hopes to start some gene expression work in the next few months.

Adrian Lutz: Having begun his project in 2007, Adrian is now in the final stages of his PhD. He refined the methodology of measurements of Coenzyme Q and plastquinones in corals. Publication of the technique is in preparation with only some last gaps to be filled. Adrian's major priority at this stage is writing up the results of experiments conducted in 2009 and analysing a last four week coral bleaching experiment conducted in collaboration with Jean-Baptiste Raina in May 2010.

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Eneour Puill-Stephan: Now nearing the end of his PhD, Eneour has completed his field and laboratory studies and is currently finishing the writing up of the thesis, which will be submitted for review in early June. The manuscript of one chapter has been recently published in PLoS ONE and two others are very close to submission.

Jean-Baptiste Raina: JB began his PhD in March 2009 and presented his confirmation seminar in October. He recently received some additional funding from the "PhD mobility program" to use state-of the art equipment at the University of Western Australia (UWA). He just finished an experiment investigating the effect of thermal stress on the coral-bacteria association and will go to Perth early July to start working on this new microscopy technique.

Gergely Torda: As another of our most recent scholarship students, Greg has finalised and submitted his literature review, and has successfully given a confirmation seminar at JCU for his PhD candidature. Greg has been carrying out his research experiments on Lizard and Palm Islands. He has recently presented the first results of his project on spatial and temporal recruitment patterns of pocilloporid species on Lizard and the Palm Islands at the MTSRF 2010 conference.

Patricia Warner: Having begun her project in 2008, Patricia completed all of her fieldwork, experimental work, and sample collection for the project at the end of 2009. Completing lab work components is Patricia's priority for 2010. Sample processing is scheduled to be completed by November 2010. Data analysis and writing will follow as well as concurrent to completion of lab work.

AIMS@JCU 2010 Student Seminar Day

Our 2010 AIMS@JCU Student Seminar Day was another great success. A total of 21 speakers were involved in the day as well as 12 posters being presented. Presentations were all of excellent quality, making the prize judging very difficult.

Research Director, Michelle Heupel, opening the seminar day

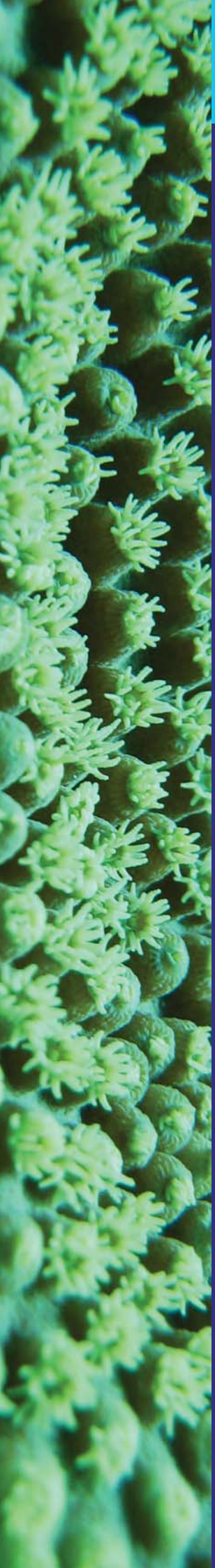
First place talk ($2,000 towards conference travel) was awarded to Emily Howells for her talk entitled: 'Genetic resilience of *Symbiodinium* populations: The role of coral endosymbionts in adaptation to climate change'.

Emily Howells giving her award winning presentation

Due to extremely high placement of Heidi Luter and Raechel Littman for both the second place talk prize and the poster award, these prizes were combined and $1,000 was awarded to each as a combined Best Poster/ Second place talk award. Heidi's presented her talk: 'Microorganisms are not responsible for the disease-like syndrome affecting the marine sponge *Ianthella basta*' and poster: 'Prevalence of disease in *Ianthella basta* populations from the Palm Islands and Torres Strait'. Raechel presented her talk: 'Responses of the coral holobiont to heat stress' and poster: 'Bacterial communities of juvenile corals infected with different *Symbiodinium* (dinoflagellate) clades'.

Heidi Luter (left) and Raechel Littman (right) giving their award winning talks

This event is an important source of funds for students and an excellent chance for them to showcase their results, thank you to everyone involved in making it such a successful day.



AIMS@JCU 2010 Scholarship Student

Benjamin Gordon

Ben completed a BChemSc (Hons) at La Trobe University, Melbourne in 2008. His honours year research involved a proof of concept study into the metabolome of *Ricinus communis* (the plant that produces castor oil but in context, the highly toxic plant protein, ricin) for forensic applications in collaboration with the Defence Science and Technology Organisation (DSTO), the Australian Federal Police (AFP) and the Department of Primary Industries (DPI). Upon completing his degree he was offered a 12-month contract with the Australian Institute of Marine Science (AIMS) in Townsville where he was employed as a natural products chemist with the Sustainable Supply of Bioresources team during 2009. He was awarded an Australian Post-graduate Award to undertake his PhD in 2010.

Ben's PhD aims to compare the metabolome of diverse phylotypes of *Symbiodinium* in select scleractinian corals under differing geographical and environmental stressors. Currently, *Symbiodinium* are classified into eight separate clades (A-H) based solely upon genotypic markers and Ben suspects that metabolomics can provide valuable information about the functional and ecological differentiation of the eight separate clades and some 150 different phylotypes. It is of the utmost importance to determine the extent to which various *Symbiodinium* phylotypes can acclimatize and survive in increasing water temperatures brought on by climate change and he strives to provide a better understanding of their interaction with the environment.

Environmental metabolomics aims to characterise the metabolic responses of an organism to both natural and anthropogenic stressors that can occur in its environment. It is the newest of the fingerprinting 'omics' approaches and its value to Ben's project lies in its ability to analyse and address relevant elements of symbiont/holobiont metabolism and genome function in response to selective pressures. Metabolomics attempts to analyse the entire metabolome and thus, it differs substantially from traditional biochemical methods that typically detect only one or a few metabolites. As a result, metabolomics is a particularly powerful approach for discovering biomarker profiles of stress responses and phenotypes, and for identifying the metabolic pathways involved in such processes.

The project will utilise metabolomics and the concept of an "ecotype", along with Liquid Chromatography Mass Spectrometry (LCMS) and Nuclear Magnetic Resonance (NMR) analytical techniques, to characterise the changes in the metabolome of a diverse group of *Symbiodinium* strains under different environmental conditions. The results from this study will provide valuable information and an insight into the ecological relevance of different *Symbiodinium* strains to the intact coral-algal symbiotic relationship. Moreover, the project should provide a valuable insight into the metabolic pathways associated with the different phylotypes and increased stress levels of *Symbiodinium.*

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Ingrid Cripps

Ingrid grew up in Melbourne and completed her BSc in Marine Biology at James Cook University in 2009. She is currently enrolled in an Honours research project, working with Philip Munday (JCU), Mark McCormick (JCU) and Andrew Negri (AIMS). Her project focuses on the effects of ocean acidification on predator-prey interactions in reef fish.

Ocean acidification, a major threat to marine ecosystems and coral reefs, is already detectable due to a 0.1 unit reduction in surface ocean pH. Should global carbon dioxide emissions, due to anthropogenic activities, continue to increase on the present carbon-dioxide emissions trajectory, average pH of the oceans could fall by approximately 0.5 units by 2100. Ocean acidification is predicted to negatively impact marine biodiversity, in particular marine calcifying organisms; however, research on its influence on reef fish populations has only just commenced using predicted values. Recent research has indicated that the olfactory sensory abilities of coral reef fish can be severely affected by elevated dissolved carbon dioxide (CO_2). Pre-settlement larvae are unable to distinguish between the smell of predators and non-predators, with preferences switching to attraction to the smell of their predators, at levels of CO_2 predicted to occur within the next century.

Through this project, Ingrid hopes to establish whether these effects continue after larvae settle on the reef and whether the sight of predators could compensate for the change in behaviour. She will also be investigating the extent to which the olfactory abilities of the predators of these larval fish may also be affected by ocean acidification. Changes in predator-prey interactions, potentially induced by a reduction in oceanic pH, could have implications for the transfer of energy to higher order trophic levels on reefs. Prediction of the magnitude of impacts ocean acidification may have on reef trophodynamics is valuable for managing and protecting coral reef biodiversity. She was awarded an AIMS@JCU Honours scholarship for 2010 and will be completing her project in October. Ingrid plans to go travelling overseas next year before returning to potentially start a PhD.

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Emily Chick

With the help of her AIMS@JCU Honours Student Support grant, Emily is doing an Honours in Aquaculture, with dual supervision between Guy Carton at JCU and Sven Uthicke at AIMS. Emily is from Boyne Island (near Gladstone) on the Central Queensland Coast and originally started out doing Marine Biology here at JCU. Emily worked at a Barramundi Hatchery in Gladstone before coming to uni, so she eventually made the transition into Aquaculture and has enjoyed it ever since. Her project involves determining whether the waste produced by sea urchins (*Tripneustes gratilla*) is a feasible food source for the tropical sea cucumber, *Holothuria scabra*. The project fits into the area of "Integrated Multi-Trophic Aquaculture." The sea urchins are fed different algal diets, which in turn gives different food types for the sea cucumbers. Emily is developing energy budgets for each food type, where she will look at things such as ingestion/egestion rates, ammonia excretion, energy assimilation and metabolic rates to see which food type gives the *H. scabra* the greatest amount of energy for growth.

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Research Director's Report

The AIMS@JCU office has now reached its new permanent home in the Math Building. Thanks for your patience with all of our shuffling over the last couple of years. We are now located in the Math Building (room 63) in the hallway with all of the Science Faculty offices. Please feel free to drop by and say hello or if you need anything.

We have now hosted another successful Seminar Day and I would like to thank all of the students for the very high quality of presentations and posters on the day. It was an exceptional showing and a great display of the breadth and talent of AIMS@JCU student members. You should all be very proud of your achievements and contributions to both AIMS and JCU. I am certain you are all enhancing the reputation of AIMS@JCU through conference presentations and look forward to continued updates from conferences you are attending.

We have also completed a successful round of funding applications with nine students receiving travel support and two Honours projects supported. Congratulations to all of those students and welcome to new student members. Once again, Joe Baker generously supported AIMS@JCU students to become members of AMSA and participate in the annual conference. I would like to encourage you all to consider the benefits of society membership and remember to thank Joe for his support. Finally, announcements about what types of scholarships will be on offer for 2011 will be posted soon.

Thanks to all of our members for your continued support.

Michelle

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Photographs in this publication were submitted by AIMS@JCU students/staff or have been sourced from the AIMS Long Term Monitoring Team.