AIMS@JCU

AIMS@JCU IS A COLLABORATIVE JOINT VENTURE BETWEEN THE AUSTRALIAN INSTITUTE OF MARINE SCIENCE AND JAMES COOK UNIVERSITY

Volume 4, Issue 3

September 2008

$3,500 to be won at the 2008 Student Seminar Day

The 2008 AIMS@JCU Student Seminar Day will take place on Friday 7th November. Any AIMS@JCU student members who would like to participate are welcome.

We hope that all PhD students 2nd year or above would be available to give an oral presentation, with other students presenting a poster. Presentations are to be 15 minutes, with an additional 5 minutes allocated for questions. Posters can be new productions or posters previously presented at conferences.

Prizes will be contributions to costs of attending either national or international conferences or workshops. Please advise the AIMS@JCU Office prior to 17th October 2008 if you intend to present a paper or poster and submit an abstract of no more than 500 words

In addition, there will be a photography competition with a total of $500 prize money on offer. See page 7 for further information.

The Student Seminar Day will take place in the JCU Halls of Residence 'Endeavour Room'. The seminars and judging will take place between 9am and 5pm with catered morning tea, lunch and afternoon tea, followed by a social event until 7pm.

Students intending to present a paper or a poster must advise the AIMS@JCU office by 17 October 2008.

Staff and Students of both AIMS and JCU are invited to attend and should advise the office by 24 October 2008 for catering purposes.

We look forward to seeing everyone there and hearing about all the research discoveries AIMS@JCU has uncovered.

Winners of the 2007 Student Seminar Day: Cameron Crothers-Stomps, Paulina Cetina Heredia and Eneour Puill-Stephan with Rhondda Jones, former AIMS@JCU Chair

Scholarships for 2009

The joint venture will offer up to four scholarships for PhD students in 2009. Scholarship recipients will be jointly supervised by scientists from both institutions, and will undertake projects based in one of the three AIMS@JCU research programs.

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About AIMS@JCU News:

This newsletter is produced quarterly, and distributed via email to all AIMS and JCU staff.

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

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Bette Willis Profile

THE NEW JCU STRESS IN TROPICAL MARINE SYSTEMS PROGRAM LEADER

Bette is a Professor in the School of Marine and Tropical Biology at JCU, where she has led an active research group addressing questions relating to the impacts of stress on the biology and ecology of scleractinian corals for the past 20 years. Currently, she is a Chief Investigator in the ARC Centre of Excellence for Coral Reef Studies and co-chairs the GEF/World Bank Working Group on Coral Disease in the Coral Reef Targeted Research program.

Her early research was directed towards understanding the evolutionary implications of mass spawning and hybridization in corals. Most recently, a major research focus has been to

determine the ecological significance of coral disease on the Great Barrier Reef and potential environmental drivers. A second focus has been to evaluate the potential for algal endosymbioses to enhance the capacity of corals to cope with climate change. Overall, her research strives to understand factors that underpin the health of reef corals and the replenishment of reefs, from mechanisms of innate immunity to those enabling acclimatization or adaptation to thermal stress.

We are looking forward to Bette's input into AIMS@JCU as JCU Program Leader and hope she enjoys her involvement with the joint venture.

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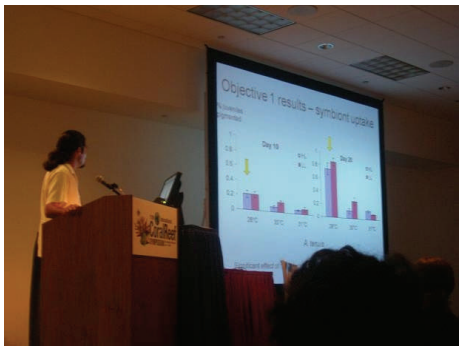
Students' Perspectives on the International Coral Reef Symposium

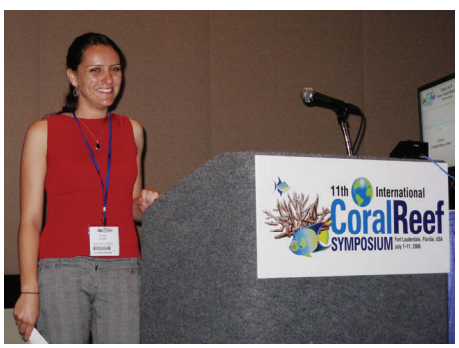
Emily Howells, Vivian Cumbo, David Abrego and Eneour Puill-Stephan

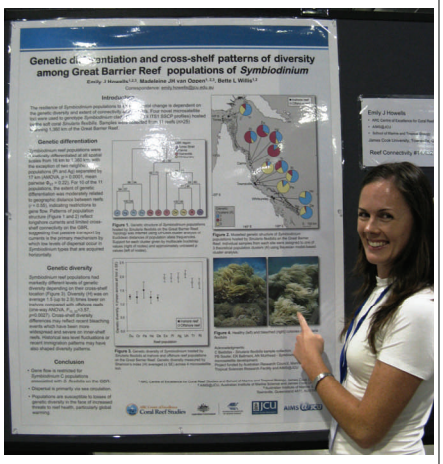
The International Coral Reef Symposium (ICRS) brings together the coral reef community from around the world once every 4 years. Over 3,500 people from 75 countries attended the 11th ICRS, which took place in Fort Lauderdale (Florida, USA) from the 7th-11th July. The scientific program was extensive with 6 plenary speeches and over 2,500 oral and poster presentations from 26 subject areas (mini-symposia).

Twelve students represented AIMS@JCU at the 11th International Coral Reef Symposium and presented research in a number of different mini-symposia, with most



receiving financial assistance from AIMS@JCU to attend the conference.





Emily Howells with her poster presentation of AIMS@JCU Honours research (above).

David Abrego (left, top) and Vivian Cumbo (left, bottom) giving their oral presentations.

Article continued on following page →

Students' Perspectives on the ICRS continued…

Mini-symposia well attended by AIMS@JCU students included the functional biology of corals and coral symbiosis (Len Muscatine memorial), coral microbial interactions, ecological and evolutionary genomics of coral reef organisms, and climate change. Some of the exciting outcomes we experienced were:

* New insights into the functional variation of different *Symbiodinium* (endosymbiotic dinoflagellates) types that associate with corals. For example, *Symbiodinium* clade A was shown to demonstrate parasitic characteristics in nature, including poor coral health and reduced nutritional exchange, which is in contrast to mutualistic associations with clade C which offer corals a competitive advantage through enhanced energy acquisition.

* An increased awareness of the identity of microbial communities on corals, their roles in maintaining coral health, and how they respond to different environmental conditions.

* Important advances in the development and application of genomic tools to coral reef biology, which is a rapidly growing field. A decision was made to sequence the entire genome of *Acropora millepora* (a common coral on the Great Barrier Reef) as a model organism to increase understanding of aspects of coral evolution, biology and adaptive potential. Additionally, NOAA announced a short course that it would offer in 2009 on "Coral genomics for the non-genomics scientist", which is the first of its kind specifically designed for coral reef researchers.

* The application of modelling tools to predict the adaptation potential of coral communities to climate change, which was a step forward from individual case studies of coral bleaching responses, which otherwise dominated the climate change mini-symposium. The adaptation model incorporated information on coral and *Symbiodinium* ecological dynamics and demonstrated the importance of variation in thermal tolerance among *Symbiodinium* types if corals are to persist in future decades, and the kinds of research needed to improve the accuracy of adaptation predictions.

The closing ceremony was one of the highlights of the symposium. The purpose of the ceremony was to summarise all of the research presented over the past week, with particular focus on any new, exciting research and the future scientific directions. Five of the worlds leading coral reefs scientists summarised a number of mini-symposia in a 4 minute speech, followed by questions from a panel of journalists. Afterwards, the audience were invited to ask questions, which stimulated an active debate (both during and after the ceremony) about the responsibility of scientists to communicate their research to the general public and our role in addressing human population growth which is the basis of many threats faced by coral reefs.

For many students, this was the first attendance at a scientific conference and was an invaluable experience to present their research to a wide and diverse audience and "get known" at early stage in their career. Students at the start of their degree valued the advice they were given to improve their research projects and the opportunity to evaluate a range of presentation styles to determine which were the most effective. Those nearing the end of their degrees valued the professional exposure at a time when they are pursuing post doctoral positions. Overall, students received positive feedback on the quality of their research, which undoubtedly raised the profile of AIMS@JCU on an international scale.

The opportunity to network with students and leading scientists from around the world over lunchtime tables and hotel bars continues to get mentioned as one of the best outcomes of the symposium. AIMS@JCU student, Vivian Cumbo recalls "I had the opportunity to build my professional network, mostly with other PhD students working in similar fields to myself. It was inspiring to discuss research ideas with people and develop a greater insight into the current topics related to my PhD."

For more information visit: http://www.nova.edu/ncri/11icrs/

AIMS@JCU students (Vivian Cumbo and Emily Howells) at networking dinner with scientists from 6 research institutions located in 5 different countries (Australia, Israel, mainland USA, Hawaii, Colombia)

Research program updates

STRESS IN TROPICAL MARINE SYSTEMS

One of the latest AIMS@JCU publications is that of Stress in Tropical Marine Systems program PhD student, David Abrego.

Abstract: The impacts of warming seas on the frequency and severity of bleaching events are well documented, but the potential for different *Symbiodinium* types to enhance the physiological tolerance of reef corals is not well understood. Here we compare the functionality and physiological properties of juvenile corals when experimentally infected with one of two homologous *Symbiodinium* types and exposed to combined heat and light stress. A suite of physiological indicators including chlorophyll a fluorescence, oxygen production and respiration, as well as pigment concentration consistently demonstrated lower metabolic costs and enhanced physiological tolerance of *Acropora tenuis* juveniles when hosting *Symbiodinium* type C1 compared with type D. In other studies, the same D-type has been shown to confer higher thermal tolerance than both C2 in adults and C1 in juveniles of the closely related species *Acropora millepora*.

Our results challenge speculations that associations with type D are universally most robust to thermal stress. Although the heat tolerance of corals may be contingent on the *Symbiodinium* strain in hospite, our results highlight the complexity of interactions between symbiotic partners and a potential role for host factors in determining the physiological performance of reef corals.

Reference:

Abrego, D, Ulstrup, KE, Willis, BL, van Oppen, MJH. 2008. Species-specific interactions between algal endosymbionts and coral hosts define their bleaching response to heat and light stress.. *Proceedings of the Royal Society B.* **275**: 2273-2282.

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TROPICAL AQUACULTURE

Tropical Aquaculture PhD student Ana Cano-Gomez presented at the Skretting Australasian Aquaculture International Conference and Trade Show in August this year. The conference was held at the Brisbane Convention and Exhibition Centre and Ana's talk was entitled: Multilocus Sequence Analysis as a tool for identification of pathogenic vibrios from the larval rearing system of the ornate rock lobster *Panulirus ornatus*.

Abstract: The ornate rock lobster *Panulirus ornatus* is a potential high value aquaculture candidate in Australia but a challenging microbial environment has hindered to date a closed life cycle breeding. Overall the evidences indicate that the primary cause of mortality amongst the larvae is infection by opportunistic pathogenic bacteria, especially *Vibrio harveyi* and related species but a definitive identification of these pathogens is still not possible due to their similar phenotypes and genotypes. This study used a Multilocus Sequence Analyses with the *16S rRNA, rpoA, recA, pyrH,* and *dnaJ* genes to further identify *V. harveyi*-related isolates from the larval rearing system of *P .ornatus* as *V. harveyi*, *Vibrio campbellii*, or *Vibrio rotiferianus* with 97% to 100% gene sequence identities.

The identity of *V. harveyi* was confirmed by the amplification of the *V. harveyi* specific *toxR* and *luxN* genes, though *luxN* was also amplified for two *V. campbellii* strains suggesting that this quorum sensing gene may not be specific for *V. harveyi*. The clear clustering of the isolates using the concatenated sequences of *16S rRNA, rpoA* and *pyrH* genes proved that MLSA is useful and required for the identification of *V. harveyi*-related species relevant to the larval rearing system of *P. ornatus*.

The results of this analysis will form the basis of a potential diagnostic assays for the detection, quantification and monitoring of pathogenic *Vibrio* species relevant to *P. ornatus*. These techniques would be also used as research tools to understand *V. harveyi*-related infections in aquaculture and to study the effects of possible treatments for their prevention.

Ana Cano-Gomez with a rock lobster

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COASTAL PROCESSES & MODELLING

Congratulations to Coastal Processes & Modelling PhD student Marie Magnusson, who has recently published a paper in Marine Pollution Bulletin:

Abstract: Pulse amplitude modulation (PAM) fluorometry is ideally suited to measure the sub-lethal impacts of photosystem II (PSII)-inhibiting herbicides on microalgae, but key relationships between effective quantum yield [$Y(II)$] and the traditional endpoints growth rate (μ) and biomass increase are unknown. The effects of three PSII–inhibiting herbicides; diuron, hexazinone and atrazine, were examined on two tropical benthic microalgae; *Navicula* sp. (Heterokontophyta) and *Nephroselmis pyriformis* (Chlorophyta). The relationships between $Y(II)$, μ and biomass increase were consistent ($r^2 \geq 0.90$) and linear (1:1), validating the utility of PAM fluorometry as a rapid and reliable technique to measure sub-lethal toxicity thresholds of PSII-inhibiting herbicides in these microalgae.

The order of toxicity (EC_{50} range) was: diuron (16–33 nM) > hexazinone (25–110 nM) > atrazine (130–620 nm) for both algal species. Growth rate and photosynthesis were affected at diuron concentrations that have been detected in coastal areas of the Great Barrier Reef.

Reference:

Magnusson, M., Heimann, K., and Negri, A. 2008. Comparative effects of herbicides on photosynthesis and growth of tropical marine microalgae. Marine Pollution Bulletin 56 (9): 1545-1552.

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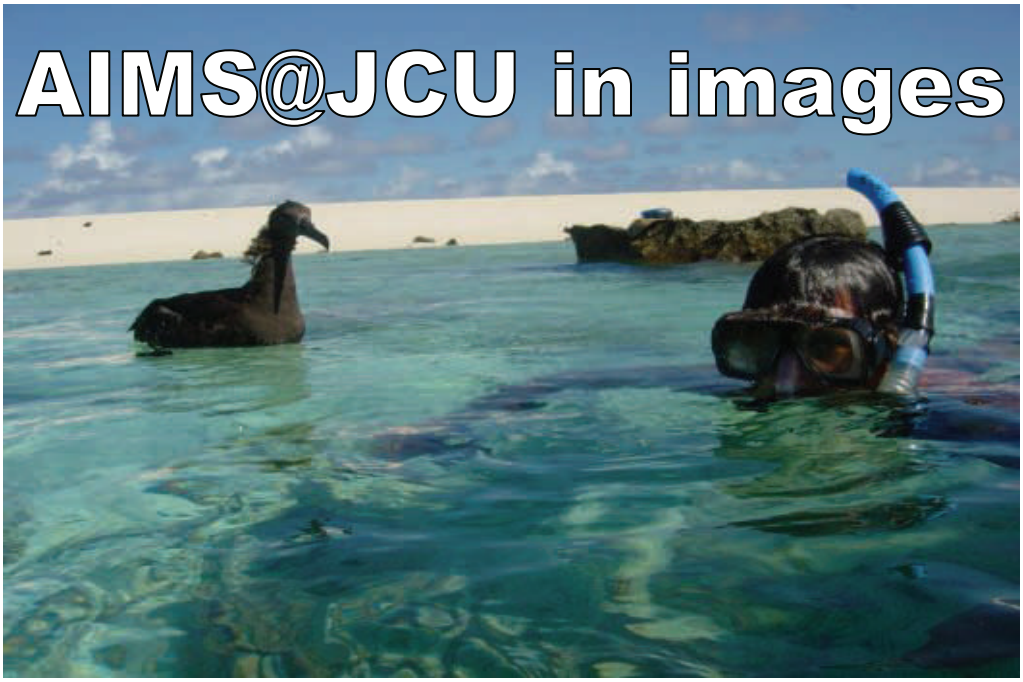

Photograph by Ronald Hoeke

Need an expensive reference book or a little extra funding to complete one more experiment?

The AIMS@JCU photography contest may be the answer you are looking for. The AIMS@JCU office needs images of study species and research in action so we can keep the website and brochures fresh and up to date. To inspire creativity and stimulate the submission of images we are sponsoring a photography contest to be held in conjunction with the AIMS@JCU Seminar Day on 7 November 2008.

Interested students should submit electronic images to the AIMS@JCU office (email to aims@jcu.edu.au) by 1 November 2008. Images should fall into two main categories: *Research Subjects* and *Science in Action*.

The *Research Subjects* category includes images of study species, study sites, etc. The *Science in Action* category should include images of students conducting research. This can include images from field work, lab work, etc. Feel free to be creative with entries in each category.

Entries are limited to one image per category per student. All received images will be printed in A4 colour format and displayed at the Seminar Day for judging. One winner per category will be awarded. Winners in each category will receive a $250 bursary to their IRA account to be used for research or travel expenses.

Copies of all submitted images will be retained by the AIMS@JCU office and may be used on the website, brochures, posters and other promotional AIMS@JCU documents.

From the Research Director

I have now reached the 6 month mark with AIMS@JCU and can say that it has been an incredibly interesting time for me learning about the Joint Venture, what it has supported and what it has to offer to students and supervisors. This is a dynamic group that has been very productive.

I want to say thank you to all of the students for providing us with progress report information so we can better showcase the accomplishments and outputs of this group. This information clearly displays to the Board how hard all of you have been working and what you have achieved thus far in your studies. We hope to be able to use this information to better showcase the Joint Venture and increase its profile nationally and internationally.

Finally, I hope that everyone will get involved in the Student Seminar Day again this year. I am looking forward to seeing the talks, posters and photos and getting a chance to interact with all of you more directly.

Don't forget, we have new AIMS@JCU shirts available for all students so please feel free to drop by and pick them up at our new offices in the DC055 building.

Michelle Heupel, Research Director, AIMS@JCU

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Where are they now?

Karin Kassahn completed her PhD with AIMS@JCU in 2006 entitled: *A microarray approach to understanding stress in a coral reef fish.* She has since published two papers from her PhD related to AIMS@JCU:

Kassahn, KS; Crozier, RH; Ward, AC; Stone, G; Caley, MJ. (2007) From transcriptome to biological function: environmental stress in an ectothermic vertebrate, the coral reef fish *Pomacentrus moluccensis*. BMC Genomics 8:358; and **Kassahn, KS**; Caley, MJ; Ward, AC; Connolly, AR; Stone, G; Crozier, RH. (2007) Heterologous microarray experiments used to identify the early gene response to heat stress in a coral reef fish. Molecular Ecology 16(8): 1749-1763.

Karin is currently a post-doc in Genomics and Computational Biology at the Institute for Molecular Bioscience, University of Queensland. Her research investigates the retention of duplicate gene copies in the genomes of five teleost fishes after whole-genome duplication and the functional consequences of genome duplication. To this end, she has performed whole-genome phylogenetic and synteny analyses and has tested the functional role and expression of duplicate gene copies in zebrafish. She is now investigating conserved non-coding elements associated with these duplicated loci to see if these elements have enhancer activity.

Post-doctoral scientist Karin hard at work.

Cameron Crothers-Stomps completed his Honours Project within the Tropical Aquaculture program in 2007. He is now working for Western Kingfish Limited, a leading Australian Aquaculture company in WA, and is working to implement knowledge learnt during his time at JCU and AIMS. Cameron wishes to thank the AIMS@JCU board for their support of his Honours project.

Other News...

AIMS@JCU POSTDOC ON ABC

Dr Monica Gagliano was featured on the show "Two in the Top End" with Tim Flannery and John Doyle on 16th September 2008. The segment featured her work on Lizard Island. It can be viewed on the ABC website, (see http://aims.jcu.edu.au/AIMS-JCU/news.htm for more details)

OFFICE MOVE

The AIMS@JCU office has moved to a new location. Please come and visit us in the Demountable B office SB007 (Building DC 055 - old printery building). A map is available at http://aims.jcu.edu.au/ to help you find us.

Photos of students in this publication were submitted by the students themselves, unless otherwise captioned.