



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

**Volume 5, Issue 1
February 2009**

Five New Research Scholarships for 2009

The 2009 AIMS@JCU scholarship funds have been allocated to five PhD students. Along with the Graduate Research School, we have co-funded a full stipend award for Jean-Baptiste Raina and provided research funds to Jean-Baptiste Raina, Charlotte Johansson, Raechel Littman, Darren Coker and Gergely Torda. All five students will be joining the Stress in Tropical Marine Systems program. Watch out for full bio's in this and future issues of our Newsletter.

Jean-Baptiste Raina

Jean-Baptiste is a current AIMS@JCU member upgrading from his Master of Applied Science at JCU. We have co-funded his International Postgraduate Research Scholarship stipend and will be providing annual research funds of \$5000 for three years. His JCU supervisor is Bette Willis and his AIMS supervisor is David Bourne. The title of his thesis is "Coral associated bacteria and their role in the biogeochemical cycle of sulphur".

Raechel Littman

Raechel is a current AIMS@JCU member and began her PhD in February 2008. Raechel was awarded a JCU Postgraduate Research Scholarship and we will be providing annual research funds of \$5000 for her two remaining years of study. Her JCU supervisor is Bette Willis and her AIMS supervisor is David Bourne. The title of her thesis is "The dynamics of bacterial populations associated with corals and the role of bacterial pathogens in coral bleaching".

Darren Coker

Darren began his PhD in September 2008. He was awarded an Australian Postgraduate Award and we will be providing annual research funds of \$5000 for three years. His JCU supervisor is Morgan Pratchett and his AIMS supervisor is Aaron MacNeil. The title of his thesis is "Effects of climate change on coral reef fishes".

Charlotte Johansson

Charlotte is from Sweden and will be commencing her PhD in March. She has been awarded a JCU Postgraduate Research Scholarship and we will be providing annual research funds of \$5000 for three years. Her JCU supervisor is David Bellwood and her AIMS supervisor is Martial Depczynski. The title of her thesis is "Managing coral reefs – the importance of working with functional groups to conserve ecosystem resilience".

Gergely Torda

Gergely (Greg) is from Hungary and will be commencing his PhD in March. He has been awarded an International Postgraduate Research Scholarship and we will be providing annual research funds of \$5000 for three years. His JCU supervisor is Bette Willis and his AIMS supervisor is Madeleine van Oppen. The title of his thesis is "Assessment of ecological connectivity in corals: implications for their recovery from major perturbations and their potential to adapt to climate change".

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About AIMS@JCU News:

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Gergely (Greg) Torda - PhD Candidate

ASSESSMENT OF ECOLOGICAL CONNECTIVITY IN CORALS: IMPLICATIONS FOR THEIR RECOVERY FROM MAJOR PERTURBATIONS AND THEIR POTENTIAL TO ADAPT TO CLIMATE CHANGE

Greg is originally from Hungary, and came to Australia in January 2009 to start a PhD on ecological connectivity in corals, leaving behind a junior researcher position with the Hungarian Academy of Sciences. He completed his Master's degree in Zoology at the Szent Istvan University, Hungary, and did a 2-year postgraduate research and coursework program on marine

His PhD study aims to obtain estimates of ecological connectivity and its temporal stochasticity for two common pocilloporid coral species on the GBR, *Seriatopora hystrix* and *Pocillopora damicornis*, by genetically characterizing new recruits at a small number of locations in the Palm and Lizard Islands, and comparing these with the genetic characteristics of adult

scales that are increasing in both frequency and severity.

Assessment of ecological connectivity further provides insights into the potential of populations to change their distributional range (for example, towards the sub-tropical and temperate regions in response to global warming), and whether adaptive alleles can spread and expedite local adaptation to a changing environment. Assessing temporal and small scale spatial genetic patterns may also provide insights into the effects of site specific selection and adaptation, both of which need to be considered for the management and restoration of degraded coral reefs.

Greg's PhD project will provide detailed spatial and temporal genetic data from two important early succession corals on the GBR, hence provide important information regarding the ecological connectivity of brooding corals and their potential to recover from major disturbances. It is anticipated that main source and sink reefs will be identified and that predictions can be made about the potential of these corals to shift to cooler waters in response to climate change.

Apart from the AIMS@JCU support, the research receives funding from RRRRC through MTSRF 2.5i.3, and Greg holds an Endeavour International Postgraduate Research Scholarship and a James Cook University Postgraduate Research Scholarship.

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Greg Torda enjoying the marine wildlife of Australia (*Caretta caretta*)

ecology at the University of Las Palmas de Gran Canaria, Spain. Greg's early research was on behavioral ecology of birds and marine mammals. Later, specialized on GIS applications, his research focused on landscape ecology, including studies on habitat connectivity, and the development and application of ecologically scaled landscape indices.

populations at a wider range of populations.

Ecological connectivity of most marine populations, including reef corals, is poorly understood as few studies have specifically estimated contemporary dispersal. This limits our ability to evaluate the design and potential benefits of novel conservation and resource management strategies, while most ecosystems, including coral reefs, are being affected by both natural and anthropogenic disturbances at

Another Successful Student Seminar Day

The third annual AIMS@JCU Student Seminar Day, 7th November 2008, was a thoroughly enjoyable day for all involved. We were featured on the Channel 7 news and had a great day of presentations. The first prize for Oral Presentation (\$2,000 toward conference travel) went to **Jean-Baptiste Raina**, for his talk entitled: Coral-associated bacteria and their role in the biogeochemical cycling of sulphur. Second prize (\$1,000 toward conference travel) was awarded to **Paulina Cetina Heredia** for her presentation: Modelling larval retention around reefs by local scale circulation features.



Jean-Baptiste Raina and Pauline Cetina Heredia accepting their certificates from Research Director Michelle Heupel.

The poster prize was split between the two entrants **Jasmine Jaffrés** for her poster: The seasonal and long-term variation of the mixed layer depth in the Coral Sea and its impact on the Great Barrier Reef and **Zoe Richards**, entitled: Some rare Indo-Pacific *Acropora* species are hybrids, and some common species are polyploids; with each winner receiving \$250 towards conference travel.



Jasmine Jaffrés receiving her certificate from Michelle.



Carol Devney's winning photograph for Research Subjects.

Additionally, this year we held a photo contest for AIMS@JCU students. **Carol Devney** won the *Research Subject* Category and **Emily Howells** won the best *Science in Action* photo.



Emily Howells' winning entry for the Science in Action category.

New Paper accepted in *Ecology*

SENSITIVITY OF TROPICAL SEABIRDS TO EL NIÑO PRECURSORS

Carol Devney from our Coastal Processes and Modelling program, is lead author of a paper recently accepted in highly ranked journal *Ecology*. The paper's abstract is included below. Congratulations to Carol and her co-authors!

Abstract. Intense El Niño events severely impact seabird populations, often months in advance of peak temperature anomalies. The trophic mechanisms responsible for these impacts are unknown, but are assumed to operate at seasonal scales and to be linked to ocean productivity changes. Precursors to El Niño events include changes in both sea-surface temperature and the depth of the 20°C thermocline.



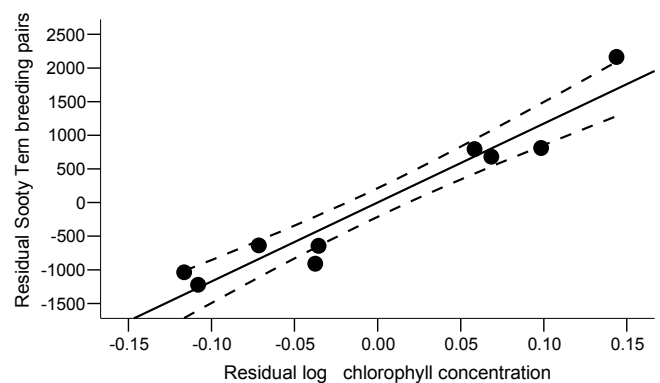
Seabird Feeding Flock

Foraging piscivorous seabirds are known to be sensitive to both thermocline depth and sea-surface temperature change, but the potential influence of these phenomena on breeding dynamics is unknown. Using 18 years of data on three seabirds of the western tropical Pacific, we show that pelagic seabird breeding participation is directly and independently related to changes in both surface chlorophyll concentration and thermocline depth that occur well in advance of El Niño generated sea-surface temperature anomalies. In contrast, breeding in an inshore foraging species is not correlated with any environmental/biological parameters investigated.

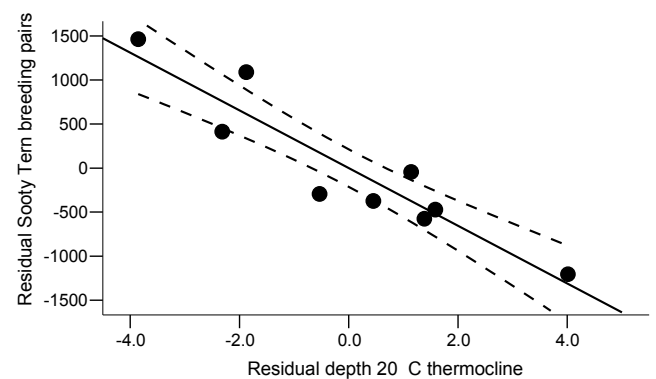
These findings demonstrate that El Niño related phenomena do not affect seabird prey dynamics solely via productivity shifts at seasonal scales, nor in similar

ways across different seabird foraging guilds. Our results also suggest that population declines observed in western tropical Pacific may be directly related to the frequency and intensity of El Niño anomalies over the study period.

(a)



(b)



Partial regression plots showing residual (a) \log_{10} surface chlorophyll-a concentration (mg/m^3) and (b) depth of the 20 °C thermocline (m) (effects of thermocline depth and chlorophyll concentration, respectively, controlled) plotted against the mean annual number of breeding pairs of Sooty Terns at Michaelmas Cay.

Authors: Carol A. Devney, Michael Short and Bradley C. Congdon

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Charlotte Johansson - PhD Candidate

MANAGING CORAL REEFS - THE IMPORTANCE OF WORKING WITH FUNCTIONAL GROUPS TO CONSERVE ECOSYSTEM RESILIENCE

Charlotte is originally from Sweden and completed her MSc at Stockholm University in 2006 on the functional behaviour of a Western Indian Ocean population of parrotfish. Shortly after graduation she arrived in Australia and has since been employed by the Australian Institute of Marine Science (AIMS) where the majority of her time has been spent examining the effects of the rezoning of the Great Barrier Reef on fish populations.

Charlotte's PhD aims to scrutinize potential variations within the functional group of herbivores between the Ningaloo Reef in Western Australia and the Great Barrier Reef. The project will focus on identifying key processes that contribute to the resilience of coral reefs within the family of parrotfish.

Species within a functional group can have different effects upon the ecosystem depending on their individual ecological role. There are therefore a range of different responses to a disturbance that influence the redundancy in the ecosys-

tem. Nevertheless, as species within a functional group can respond differently to a disturbance event a species rich system can be unexpectedly vulnerable if it is poor in responses.

Parrotfish have a key role in the control of algal populations on coral reefs and research points at a high diversity of functions within families and species. This project will look at how different species of parrotfish, life phases and sexes feed, how much they feed and what they feed on. Further, it aims to identify agents regulating these behaviours.

Improving the understanding of the various functional groups present in the ecosystem can facilitate the knowledge of what processes and functions that can be lost due to various stresses to the fish population and what effects that will have on algal populations on coral reefs. Comparative studies of herbivorous functions between east and west Australia can provide valuable information on geographical differences and potential variations between life phases, sex and species.

Field work will be undertaken on the Ningaloo reef and the Great Barrier Reef and is supervised by D. Bellwood at JCU and co-supervised by M. Depczynski at AIMS Western Australia.



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Update for AIMS@JCU Post-Doc: Thomas Stieglitz

Our Coastal Processes and Modelling Post-Doctoral scientist Thomas Stieglitz has been busy, being invited to talk at the 2008 fall American Geophysical Union (AGU) Meeting. His presentation was entitled:

'Mapping Submarine Groundwater Discharge – how to investigate spatial discharge variability on coastal and beach scales.'

Thomas's project *'The Yongala's halo of holes – who's digging it?'* is near completion. For more information regarding the acoustic tracking of stingrays at the wreck and the latest results, see our website at:

<http://aims.jcu.edu.au/AIMS-JCU/YongalaTrackingPoster.pdf>

He is also busy compiling the final report to final report for this project to ATAMS/IMOS. Watch out for a more detailed update in the next issue.

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From the Research Director

We are into another new year for AIMS@JCU and have started off well with the funding of five additional research students. Some are new to the joint venture and others are ongoing members. Congratulations to all of the 2009 scholarship recipients, I look forward to seeing the progress and results of your research.

Looking back at 2008 I think we had a very successful year in the group. The Seminar Day was a great

opportunity to showcase the findings and talents of many of our student members. 2009 looks to be a pivotal year for AIMS@JCU. We are currently working on a new Strategic Plan to lead the joint venture into the future and consider new research directions and funding approaches. We are also expecting a productive year of scientific output and publications with several of the early AIMS@JCU students nearing completion of their degrees. I hope 2009 will see AIMS@JCU develop a solid future based on the

foundations of all the excellent work that has been conducted in the past and is currently underway.

Thanks to all of our members for your continued efforts and support.

Michelle Heupel, Research Director, AIMS@JCU

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Update for AIMS@JCU Post-Doc: Monica Gagliano

ON THE SPOT: THE ABSENCE OF PREDATORS REVEALS EYESPOT PLASTICITY IN A MARINE FISH

A recent publication for AIMS@JCU is that of our Stress In Tropical Marine Systems Post-Doc **Monica Gagliano**:

Abstract: Eyespots have long been thought to confer protection against predators, but empirical evidence demonstrating the effectiveness of these markings and their survival value in the wild is limited. Using a mark-recapture experiment, I examined the functional significance of the eyespot on the dorsal fin of a juvenile tropical fish to its survival on coral reefs.

None of the juveniles recaptured 1 month after settlement showed evidence of bite marks on the posterior region of the bodies to suggest a deflective function of their eyespot. When I compared the survivors with recruits from the

same settlement cohort, I detected no change in the frequency distribution of eyespot size, suggesting no selective pressure operating on this trait. I compared these survivors with conspecifics from the same cohort collected at settlement and then outgrown in the absence of predators under 3 food regimes and 2 levels of intraspecific competition. I found that the eyespots of wild juveniles were larger overall than those of conspecifics maintained in a predator-free environment.

The results of this study indicate that larger eyespots per se do not confer a survival advantage in the wild, suggesting that eyespots of this species may not have the long-assumed antipredatory function but play a role in interactions with adult conspecifics. I suggest that juveniles maintain eyespots even when

predators or adult conspecifics are absent because they can be afforded at very low costs and may still be beneficial to their bearer under specific ecological conditions.

Reference: Gagliano, M. 2008. On the spot: the absence of predators reveals eyespot plasticity in a marine fish. *Behavioural Ecology* 19 (4) 733-739.

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

