

Nick Barrett

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Exciting new paper for AIMS@JCU PhD researcher Leanne Currey

Reef fish disappear on hot days?

It appears that reef fish move deeper to beat the heat. A new study has investigated whether movement patterns of an important reef fish were related to environmental parameters, as part of research by AIMS@JCU PhD researcher Leanne Currey. Her study was recently published in the journal Coral Reefs and revealed that adult redthroat emperor were less likely to be detected on the reef slope on days of warmer water temperature.



A redthroat emperor being released; photo credit M. Heupel

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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.

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Exciting new paper for AIMS@JCU PhD researcher

continued

Redthroat emperor are the most important Lethrinid species to commercial fisheries of Australia, Japan, New Caledonia and Tonga. Despite their importance, little information on the movement patterns and dispersal of this species was available prior to Leanne's PhD. Her research set out to build a more complete picture of reef fish spatial ecology, by using different techniques to capture the movements of adult individuals at multiple scales.

In this study, redthroat emperor were captured at Heron Island reef in the Southern Great Barrier Reef and surgically implanted with acoustic transmitters into their body cavity. The fish were then released and their movements were monitored by an array of acoustic receivers ("listening stations") set up along the reef slope. These fish were monitored for periods of up to 12 months, and their locations were matched with environmental variables recorded by in situ weather stations and buoys.

Tagged individuals occurred more often on the reef slope during days of cooler temperatures suggesting a thermal tolerance threshold may exist. Results indicate that fish responded to elevated temperatures by moving away from the reef slope to deeper adjacent habitats, thus shifting their position in the water column to remain at a preferred temperature. While the physiology of this species needs to be better understood, and further research is required in deeper habitats, such information is useful for fishery managers. These findings are significant because predicted increases in ocean temperature mean species such as redthroat emperor may need to adapt to warmer waters or disperse into cooler habitats. Identifying key environmental drivers that affect the distribution of reef fishes is important, and may allow managers to predict the effect of these changes on exploited species.

To read this paper in full, it can be accessed at: <http://link.springer.com/article/10.1007/s00338-015-1318-7>

Citation: Currey LM, Heupel MR, Simpfendorfer CA, and Williams AJ (2015) Assessing environmental correlates of fish movement on a coral reef. *Coral Reefs* (June 2015) doi: 10.1007/s00338-015-1318-7

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Nick Barrett

New AIMS@JCU Scientific Advisory Committee

Richard Brinkman:

Research Program Leader - Sustainable Coastal Ecosystems and Industries in Tropical Australia, AIMS

Richard leads the Sustainable Coastal Ecosystems and Industries in Tropical Australia Research Program at the Australian Institute of Marine Science, Townsville, Australia.



Richard is a physical oceanographer/numerical modeller with research interests that fall within the broad topics of coastal oceanography and physical-biological interactions on continental shelves. He has significant expertise in conducting observational and modelling based research on shelf dynamics, coupling of shelf and ocean circulation, and physical-biological interactions at regional and local scales on Australia's tropical coasts and marginal seas. Richard has published over 40 scientific, technical

and client reports, including studies on the hydrodynamics and sediment transport dynamics within the Great Barrier Reef.

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Yvette Everingham:

Dr Everingham completed her PhD in 1998 in the field of pattern prediction methods and commenced a four year term with CSIRO as a climate impacts scientist. Today, she currently holds a position as a senior lecturer in the College of Science, Technology and Engineering and is a member of the Centre for Terrestrial Environmental and Sustainability Science at James Cook University. Her research aims to offer sustainable solutions that will benefit a range of industries and societies in the tropics.



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Pilot Research Award reports

Danilo Malara:

I grew up in Messina, a small city situated in south of Italy. Since I was child I was fascinated by the marine environment. This inspired my pursuit of a bachelor of science in Marine Biology and Ecology and master's degree in Biology and Ecology of Marine Coastal Environment. During my university studies, I had a chance to get my diving license. After completing my Master's Degree in 2010 and several years as a Bluefin tuna observer in Mediterranean sea (in fish farms and purse seiners), I moved to Cairns. In far north Queensland I studied English at academic level and I got all my PADI dive licenses from Rescue to Open Water Scuba Instructor. I have taught diving since 2013 until I was notified that I was selected to do a PhD with a JCU scholarship, at JCU Townsville campus.



With the supervision of A. Prof. Kirsten Heimann, A. Prof Michael Oelgemöller and Dr. Lone Høj, I will be studying the potential use of porphyrins as an

innovative disinfection tool for aquaculture. The single oxygen produced by this chemical compound, when irradiated with visible light, has a killing effect on microorganisms. Research in this field showed that low concentration solutions of singlet oxygen have no negative effect on aquaculture animals. In addition, porphyrins have a self-destroying mechanism if exposed to visible light for a period of time depending on concentration.

Porphyrins have been well researched in the medical and dentistry field, but very few studies have been conducted in aquaculture. Thus, the effect of this chemical compound on farmed animal larvae and live feed is unknown.

My project will study the efficiency of single oxygen producer molecules to kill potential marine prawn pathogens. The effect of this chemical compound on pathogen carriers (live feed species) will also be examined. Finally, I aim to confirm the efficiency and non-toxicity of these molecules using prawn larvae and feeding them with live feeds organisms previously treated with porphyrins.

Time course experiments using different light irradiation sources, for photodegradation of anionic and cationic porphyrins have

Pilot Research Award reports continued

been performed to identify their potential treatment window. Based on our results, the porphyrins will be degraded between 2 and 18 days depending on different light source used. Thus, the photodegradation is slow enough to allow efficient disinfection.

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Jordan Matley:

After completing my M.Sc. studying food web interactions in the Canadian Arctic, I came to Australia to broaden my research experience and skills. My main interests focus on understanding how animals obtain resources and what factors influence these behaviours. Stable isotope analysis is an increasingly used approach to study trophic relationships between predators and their prey. However, the application of stable isotopes is often limited by the lack of experimentally derived parameters.

Under the supervision of Dr. Michelle Heupel (AIMS), Dr. Colin Simpfendorfer (JCU), and Dr. Andrew Tobin (JCU) I conducted an aquarium-based stable isotope study using coral trout (*Plectropomus leopardus*). The goal was to determine diet-tissue discrimination factors and turnover rates from several tissues to improve interpretation of dietary patterns in wild individuals.

The results from this pilot research provided fundamental information that many ecological studies overlook and will help understand foraging behaviour of coral trout and other reef species. I am particularly thankful to AIMS@JCU for their continued support, including the Pilot Research Grant. This award facilitated the processing of tissues for stable isotope analysis – the basis of this study, and allowed me to pursue a novel approach I was passionate about to conduct better science.



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Dr Ian McLeod

Science Communication report

Vinay Udyawer

In June 2015, I was fortunate enough to attend the annual meeting of the Society for Experimental Biology held in Prague, Czech Republic. The conference brought biologists from Europe and around the world together and consisted of three main themes: plant biology, cell biology and animal biology. I attended the conference to present some of the experimental work from my PhD that was conducted in the new SeaSim facility at AIMS looking at the energetics and metabolic rates of sea snakes. The conference was well placed as it gave me an opportunity to network with animal biologists from Europe that were recognizable names in my field of animal biotelemetry and movement biology, as well as from other fields like biomechanics and bio-robotics.



The bustling old town square in Prague.

Initially I was to present an oral presentation on my work, however with the large number of presenters and limited time available for my symposium, the organisers asked me to present my work as a poster and a speed talk. This gave me a great opportunity to discuss my work and findings in a more informal setting. The poster session was very successful as I engaged with a lot of people interested in my PhD work, and had the opportunity to discuss my work with experts who gave me useful suggestions to improve and extend my analytical approach. The conference was very full on lasting 5 days, with a careers day for PhD and early career researchers at the start. The careers day was very useful in helping me plan through the next stage of my research career post-PhD. I had an extra couple of days after the conference to sightsee and explore Prague. As it was my first time in Europe, walking around the city, over the Charles Bridge and to the Prague castle was a very memorable experience. Thanks to AIMS@JCU for partially funding this trip to present my work at an international scientific conference.

Dr Ian McLeod

Where are they now?

Sarah Castine

Sarah completed her PhD titled "Nitrogen removal and re-use in land base aquaculture" with AIMS@JCU in mid-2012. She subsequently took a two-year Post-Doctoral position at WorldFish, an international not-for-profit research organisation with headquarters in Penang. A key goal of WorldFish is to promote evidence-based development solutions to help those dependent on fisheries and aquaculture for food and livelihoods.

The majority of the field work for her primary project was conducted in Bangladesh, which has some of the highest rates of undernutrition in the world. In the capital, Dhaka, 39% of children under five are stunted (low height-for-age) and 28% are wasted (low weight-for-height). The primary focus of the Post-Doctoral work was, therefore, to address undernutrition during the critical first 1,000 days of life (from conception until the age of two). This was done by improving access to nutritious small fish for pregnant and lactating women and children.

Owing to the way in which they are consumed (i.e. whole, with the bones, viscera and head), several species of small fish in Bangladesh are a rich source of micronutrients such as vitamin A and iron. Sarah's work investigated the production and potential health outcomes of integrating small fish into traditional carp-polyculture systems in ponds adjacent to the homestead. A particularly nutritious species, mola (*Amblypharyngodon mola*), accounted for just 15% of the total production by weight but produced 98% of the vitamin A and 56% of the iron. If used purely for consumption within the household this would contribute 54% of vitamin A and 24% of iron needs for a family of four (a lactating woman, an adult man, child <2 years, and child 9 years of age) for one year. As a second part to her work Sarah is seeing similar health outcomes through stock enhancement programs with small fish in wetlands.



After completing the two-year Post-Doc, Sarah relocated to Hobart where she is fulfilling a consultancy contract with WorldFish and some work with a private environmental consultancy, Marine Solutions.

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Dr Ian McLeod

Research Director report

This has been a busy quarter for AIMS@JCU, with different aspects of our strategic alliance growing and changing. The second round of AIMS@JCU PhD scholarship applications for 2015 is now complete, best of luck to all those who have applied. The annual AIMS@JCU R-Course with Murray Logan took place this year in the brand new CBD campus and, as always, attracted lots of interest and was fully booked for the third year in a row. Many thanks to all the AIMS@JCU people who participated in the AIMS Open Day, which was a hugely successful, fun and exciting science communication event. I was happy to give a talk about AIMS@JCU at the JCU College of Marine and Environmental Sciences postgraduate conference on the 11th June, and sponsor the morning tea afterwards. Congratulations to all the AIMS@JCU students who presented their research at that conference. We were also very happy to again sponsor and support the ATSIMS program, and help welcome 40 indigenous high-school science students to the world of marine science.

There has been a changing of the guard in membership of our Scientific Advisory Committee. I would like publicly acknowledge and sincerely thank outgoing members Prof Rocky de Nys (JCU) and Dr Jamie Oliver (AIMS) for their past contributions, enthusiasm and advice as SAC members over past years. The new AIMS@JCU SAC members are Dr Yvette Everingham (JCU) and Dr Richard Brinkman (AIMS). Many thanks to both for being willing to join the SAC, and agreeing to help us move forward with and strengthen AIMS@JCU's focus on the development of quantitative marine science.

A personal highlight for me in the past month was to get away for some recreation leave in Europe! I would like to sincerely thank Dr Nicole Webster for acting in my AIMS@JCU position during my absence, and especially Lauren Gregory and Melissa McLean for running AIMS@JCU from behind the scenes with their usual professional efficiency. My batteries are fully charged again and I'm looking forward to a great few months ahead.

Please mark the date Friday 18th September for the 2015 AIMS@JCU Student Seminar day. More details will follow soon, and we hope to see many of you on the day supporting your peers and enjoying another fabulous day of marine science presentations.

Libby Evans-Illidge, AIMS@JCU Research Director

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