



Joe Pollock

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AIMS@JCU Science Communication reports

This issue of our newsletter includes more reports from students on how they spent their science communication funding which was awarded earlier this year.

Muhammad Azmi Abdul Wahab, \$1,500 - Networking for future career opportunities, Norway

In August 2014, I had the privilege to visit the Institute of Marine Research (IMR) in Bergen, Norway. The purpose of the visit was to liaise with Dr Raymond Bannister (AIMS@JCU alumni), from the Benthic

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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:

Editor: Lauren Gregory
Phone: (07) 4781 4074
Email: aims@jcu.edu.au

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Resources and Processes group at IMR, with regards to future career opportunities upon completion of my PhD. This visit was made possible through the travel funds provided by AIMS@JCU.

During the visit, I was involved in the very first survey for a new project funded by the Norwegian Research Council titled “Environmental responses to aquaculture (ERA)”. The aim of this project is to increase the knowledge base on the impacts of aquaculture effluents on the structure and functioning of coastal ecosystems, which will in turn aid in the management of coastal aquaculture developments in the North Atlantic.

The expedition team consisted of researchers from Norway, Netherlands, Canada and Australia. We started the expedition in Bergen, a beautiful port city set in the fjords region of Norway and surrounded by seven mountains, where we boarded the University of Bergen research vessel “Hans Brattström”. After a two day journey north along the coast of Norway we arrived at the coastal region of the island of Hitra (63°N), west of Trondheim where we were for the next ten days. The area is home to a number of large scale, intensive fish farms which contribute hundreds of thousands of tonnes per year towards world Atlantic salmon supply.



For our surveys, we investigated the interactions between fish farms, the substrate and benthic communities. Using a suite of benthic survey techniques which included video surveys, dredging, grab sampling and box coring, we identified the taxa that were common to both farm “impacted” and control sites. Such organisms include species of echinoderms, sea stars, hermit crabs, crabs, snails, kelp, and scallops. Tissue and gonad samples were collected from these organisms, along with benthic sediment, which will be used to develop bio-tracers to determine whether farm effluents (fish wastes and uneaten feed) are incorporated into the natural ecosystems, and to determine if these effluents

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contribute significantly to the functioning of benthic ecosystems around fish farms. In addition, hydrodynamic mapping of waters around these fish farms along with assessments of water turbidity and suspended particle concentrations were also conducted to aid in predictions of effluent accumulation within the area.

I find work in the temperate/ arctic region to be especially novel, considering having worked in the tropics for all of my life. Being summer, days were long in Hitra with the sun rising at 5 am and only setting past 11 pm. In addition, I find the applied nature of the project, working synergistically with the aquaculture industry most intriguing and fulfilling. Despite the overly high costs of living, Norway has really impressed me with its stunning and dramatic landscapes, friendly and helpful people and the numerous tunnels and bridges this country possess.



James White, \$1,500 - International Society for Behavioral Ecology Conference, New York City

I was fortunate enough to attend the recent International Society for Behavioral Ecology Conference in New York City in early August. This biennial conference was hosted by Hunter and New York City Colleges, and brought together a lot of the big names in the behavioral ecology field. This was one of the best and conferences I've attended, being much more relevant to my field of study than the coral reef or fish conferences I normally have graced with my presence. The opening banquet was held at the Central Park Zoo in front of playful juvenile California sea lions and at the end they were giving out free flowers for your

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beard, yes please! The rest of the conference was pretty full on for the following 5 days. I listened to a wide range of talks, from human attractiveness to honeybee social structure. My personal favorite was Dr. Patricia Brennan of Univ. Massachusetts Amherst discussing her experience with defending basic science against politicians and the popular media with a political agenda.

I gave my talk entitled, "Metabolic phenotype of the hunter affect the outcome of predator-prey encounters" on the very last time slot of the very last day. It must have captured some hearts and blown some minds because there was a small section of the audience giving me a standing ovation at the end.



Being my first time in New York, I spend some time taking in the sometimes overwhelming sights and sounds (and gross smells) of NYC. Saw the Tony award winning musical, "Kinky Boots", which has since ruined all future stage performances for my friend Bridie and Aziz Ansari doing stand-up, which has ruined all Australian comedians for me. Also ate enormous amounts of food (God Bless America!) including a 2kg pastrami sandwich, buttermilk biscuits better than Grandma used to make (don't tell her), and an ice cream cookie sandwich that must have been constructed by angels. Yes I gained some weight but totally worth it!

Thanks to AIMS@JCU for partially funding my wonderful trip with a travel grant.

Melissa Rocker

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Amin Mohamed Esmail, \$750 - Work in the bioinformatics group at the Institute for Molecular Biosciences, University of Queensland

I received an AIMS@JCU Travel Funding Award in 2014. By using this award I was able to travel to the Institute of Molecular Bioscience (IMB), the University of Queensland (UQ) in Brisbane to get training in bioinformatics analysis of large genomic datasets with the computational biology group led by Prof Mark Ragan. The level of bioinformatic expertise locally available compromised my PhD progress, as I had massive sequencing data from two RNA-Seq experiments that needs to be analyzed. To facilitate training and improve my skills in this interesting area of bioinformatics, I had the opportunity to work with that dedicated team at UQ.

During my work at the IMB, I learnt a lot about manipulation of huge genomic data sets and using the high-performance computing (HPC) cluster to perform the required bioinformatics analysis. Working at the IMB, I was able to map the huge sequencing data (hundreds of millions of illumina reads) from 48 RNA-Seq libraries against the transcriptome of the coral *Acropora digitifera*. The most interesting thing to learn was about de novo transcriptome and/or genome assembly. Hence, I was able to generate a de novo transcriptome assembly for *Chromera velia*, the newly described microalgae isolated from the coral *Montipora digitata* at the GBR. This transcriptome assembly will be used in subsequent research in my PhD. I am very grateful to receive an AIMS@JCU Travel Funding Award in 2014 that enabled me get the skills required for data analysis of my PhD project.



Kate Quigley

Pilot Research Award report

Georgia McGee

I completed my Honours research in 2013 as a part of the AIMS@JCU collaborative program, and I was fortunate enough to have been funded by an AIMS@JCU Pilot Research Grant. My research focused on the physiology of pufferfish inflation, and with the help and expertise of my primary supervisor Dr. Timothy Clark (AIMS), we have just had some of our research published. Our paper entitled "All puffed out: do pufferfish hold their breath while inflated?" details our discovery of oxygen uptake in inflated black-saddled pufferfish (*Canthigaster valentini*) and demonstrates for the first time the high metabolic cost of performing the inflation response.



The pufferfishes have one of the most intriguing and extreme predator defence strategies in nature, requiring the rapid ingestion of water into a distensible stomach to dramatically increase body volume in the hopes of becoming too large for predators to swallow. Previous studies have suggested that pufferfish inflation is a breath-holding response, whereby oxygen uptake ceases for the duration of the inflation response. Perpetuated by popular fiction such as the movie 'Finding Nemo', the belief that pufferfishes might hold their breath while inflated has raised speculation that cutaneous respiration may play a compensatory role for pufferfishes during inflation. As a non-evasive form of defence, the success of the puffing response essentially relies upon the capacity of the pufferfish to remain inflated for longer than the attention span of the would-be predator. To this end, the aim of our paper was to investigate oxygen uptake patterns in inflated black-saddled pufferfish in order to determine how they are able to remain inflated long enough for a predator to lose interest and move on to easier prey.

Using intermittent flow-through respirometry, we quickly discovered that the black-saddled pufferfish is indeed able to breathe while inflated, and that this species actually has an excellent capacity for oxygen uptake while maintaining an inflated state. Their ability to consume oxygen while inflated allowed us to

Justin Rizzari

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then demonstrate that pufferfish inflation is a very metabolically taxing activity to perform, increasing the oxygen uptake of the fish to five times that of resting levels and requiring a substantial mean recovery time of over 5 hours. All of the pufferfish had active opercula and gills throughout the inflation response, indicating that the gills were the primary site of oxygen uptake. This may explain why we found that negligible levels of oxygen were being absorbed across the skin of inflated black-saddled pufferfish, as it appears that this species does not require the ability to respire cutaneously.

Although our research indicates that pufferfish inflation is not limited by an inability to respire, the energetically taxing nature of the inflation defence strategy and the substantial amount of time required to fully recover from inflation may have profound implications for the black-saddled pufferfish in its natural environment.

Our paper can be found in the December issue of *Biology Letters*, or at <http://dx.doi.org/10.1098/rsbl.2014.0823>. We are currently working on a manuscript that focuses on the next phase of this research project – understanding how warming oceans may influence the inflation response of pufferfishes.

Contact: georgia.mcgee@my.jcu.edu.au

Research Director report

In the three months since the last newsletter we've explored some new ways of linking AIMS to JCU in addition to our cohorts of jointly supervised students. We've seen several undergraduate JCU students undertake Work Integrated Learning (WIL) placements at AIMS, we are looking at AIMS data being live-streamed into JCU's new CBD campus shop-front, JCU student groups have visited AIMS to see facilities and discuss future collaborations, AIMS@JCU has sponsored the JCU Genomics workshops and supported student attendance, and future collaborative projects involving access to AIMS data holdings have been discussed. We are always interested in finding and facilitating new ways for AIMS and JCU to join forces in marine science, so let me know of any ideas you have to get the most out of our synergies.

As you probably already know, our Management Committee (the governing body of AIMS@JCU) has established Quantitative Marine Science (QMS) as a strategic focus for AIMS@JCU scholarship investment. To implement this priority, we provide four new PhD



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scholarships each year for projects that will establish advanced QMS skills in a new marine scientist, while delivering new QMS outcomes. Each year, we offer four generous 4-year scholarships which include a stipend, a tuition fee waiver (for international students), and an extra \$5,000/year (for stipend top-up OR project funds).

The Management Committee (MC) and Scientific Advisory Committee (SAC) met on 8th December, to consider the applications for the 2015 AIMS@JCU scholarship cohort. This year, of the 12 applications, nine met the GRS merit-score benchmark for scholarship eligibility and these were the ones considered for an AIMS@JCU scholarship. I need to report that the committees were disappointed that in addressing the specific AIMS@JCU scholarship questions, these applications did not show clear evidence and detail of the applicants' quantitative background, skills to be developed, and outcomes to be achieved. In fact, the committees considered that only one application adequately addressed the QMS questions on the AIMS@JCU application form – and consequently – for the first time ever – we will only offer one AIMS@JCU scholarship for 2015. The MC decision only relates to AIMS@JCU scholarships and the other eight applicants will still be eligible for other varieties of JCU scholarships (eg APA or IPRS). However, I want to emphasise the importance of fully addressing the AIMS@JCU scholarship application questions on our form, as this is the main source of information used by the MC and SAC when selecting scholarship recipients (once applicants are determined to be eligible for a scholarship based on their merit scores).

We may initiate a secondary round for new PhD projects commencing later in 2015, for the remaining three AIMS@JCU scholarships budgeted in 2015. I will provide more information about this in the new year – but I mention it now because the timing of this may work well with NESP project development.

Another issue discussed at the MC/SAC meeting was the need to grow the pipeline of maths/quantitatively skilled students. Subsequently, AIMS CEO John Gunn has generously offered 20 hours of his time to talk to schools and undergraduates at JCU about opportunities and career potential in QMS. We look forward to facilitating this in the new year, and possibly reaping the benefits in years to come.

It was wonderful to see so many of you at our Christmas function! On behalf of all of us at AIMS@JCU I wish all members and their families a safe and merry Christmas, and a prosperous 2015.

Libby Evans-Illidge, AIMS@JCU Research Director

Contact: e.evansillidge@aims.gov.au

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