

ReFuGe 2020

May 2014

Welcome to the first ReFuGe 2020 bimonthly newsletter. Stay connected with the ReFuGe 2020 consortium, read about their latest activities, and celebrate their achievements.



ReFuGe 2020 consortium meet on the shores of the Red Sea

This first newsletter showcases outcomes of the ReFuGe2020 meeting held at the King Abdullah University of Science and Technology (KAUST) in Saudi Arabia from the 7th to the 11th April 2014.

Fifteen consortium members and four consortium Post-Docs attended, representing the Great Barrier Reef Foundation, James Cook University, the Australian Institute of Marine Science, the Australian National University, Bioplatforms Australia, the University of Queensland and, of course, KAUST.



Prof. John Quackenbush, a world expert in genomics for human health & disease

Prof John Quackenbush was a keynote speaker at the meeting. His research focuses on using genomic data to reconstruct the networks of genes that drive the development of human diseases such as cancer and emphysema. He is Professor of computational biology and bioinformatics in the Department of Biostatistics, Harvard School of Public Health and at Dana-Farber Cancer Institute.

“The winners in the race to understand disease are going to be those best able to collect, manage, analyze, and interpret the data.”

Prof. Quackenbush argued that the challenge is no longer in the sequencing technique itself, as it is now cheaper and easier than ever. Instead the challenge is in what to do with the vast amounts of data generated by the sequencing. New approaches are needed to make sense of the big genomic datasets being created, and Prof Quackenbush challenged the consortium of coral scientists to consider new approaches in planning their future research direction.



Prof. Ary Hoffman, Australian Laureate Fellow and expert in pest control and environmental stress adaptation.

Prof. Hoffman was also a keynote speaker at the meeting. His team at the University of Melbourne undertake research on a range of land invertebrates, including investigating pest control options for agriculture, novel approaches for suppressing dengue mosquito vectors, and new ways to predict species distribution shifts under climate change.

What can (and can't) genomics do?

Prof Hoffman spoke about what genomics can (and can't) and should (and shouldn't) be used for. His presentation highlighted that genomics is not essential to start thinking about adaptation, but becomes essential as one moves to more complex issues. He also challenged the consortium to keep the needs of end-users such as Reef managers front and centre in their minds so that data generated from consortium projects is useful in informing the management of coral reefs.



Sea-quence project completes first coral genome

The [Sea-quence project](#) is a ReFuGe2020 initiative supported by Rio Tinto and Bioplatforms Australia. This project is sequencing the genomes of 10 coral species from the GBR and the Red Sea.

DNA from 8 of the 10 coral species has been collected, and the first coral genome sequenced (for *Porites lutea*). Sequences for two coral *Symbiodinium* are also almost complete. A world-first method is being developed to extract and sequence *Symbiodinium* DNA directly from coral, and a new method for extracting microbes from coral is in the final stages of testing (see below story).



Corals are home to billions of microbes: how do you separate their DNA?

After completing her PhD in coral-microbial ecology at Auburn University in Alabama, Dr Morrow moved to Townsville in January 2012 to commence a Post-Doctoral Research position at the Australian Institute of Marine Science. When asked by her supervisor in late 2012 to “fine-tune” a method for extracting microbes from corals for a little project called Sea-quence, Kathy thought she would have this done and dusted in 3 months...unfortunately the microbes had other ideas. Eighteen months on she is now the world expert on teasing these tiny creatures out of their coral tissue homes and will soon publish a paper on her efforts.



Sea-quence data seeds research

Consortium scientists spoke about how the genomics dataset generated by the Sea-quence project is opening up new research directions them and seeding many new projects.

There are three collaborative funding applications pending:

- Investigating the dynamics of coral-associated microbial communities in a rapidly changing climate (ARC Discovery grant, 5 years, \$1.3 million) - *UQ and AIMS*
- Coral genomes along environmental gradients (Accelerate Queensland grant, 2 years, \$1.2 million) - *UQ, AIMS, ANU, GBRMPA, GBRF, BPA and JCU*
- Impact of microorganisms on coral resilience under future climate scenarios (DECRA grant, 3 years, \$400 000) - *AIMS and UQ*



Genomics assists Reef management

Following a presentation by the Great Barrier Reef Marine Park Authority (GBRMPA) the Consortium agreed to undertake the following activities to help better connect genomic research to Reef management:

- Provide feedback to key GBRMPA documents including their draft [Science Information Needs](#) (2014 -2019) and the [Vulnerability Assessment](#)
- Draft a white paper to explain how genomics-based approaches can inform Reef management
- Genomics presentations to Reef managers



Consortium tours KAUST & the Red Sea

The generous hosts at KAUST led the consortium on a tour of the KAUST campus and a snorkel in the Red Sea. KAUST's state-of-the-art facilities open up a world of possibilities for research scientists. Here is what Karen Weynberg from AIMS had to say about the visualisation laboratory:

The visualization core lab housed a cutting-edge facility that helps the scientists, students and KAUST collaborators to present their research in a technologically advanced and visually stunning format. During our tour of the facility, we were transported to the sights of historical Petra, where we walked around the ancient site in all of its three-dimensional glory - without leaving the lab! We were also given an interactive journey around a protein structure, all with just the aid of a pair of 3-D glasses and a screen. It is a highly impressive facility that offers a plethora of innovative ways to present scientific data in a hugely captivating manner!



Major Milestones coming soon....

- First consortium scientific paper being finalised. This is a scene setting paper that describes how the coral consortium has been influenced by other fields including medical science. This will be complete by the end of June.
- World-first paper on the sequencing of the coral holobiome: the group hopes to have all technical aspects of the coral holobiome complete by the end of July. This will be a major announceable for the group and will lead to the publication of many scientific papers.
- Next important project identified: The group is developing a project proposal to help understand the differences in coral DNA along environmental gradients. This will involve collecting coral fragments from more than 1000 corals in both the Red sea and the GBR and investigating the difference in DNA in the different individuals. This will give insights into the ability of corals to adapt to a warming climate, including the mechanisms by which corals develop thermal tolerance at the genetic level.

The newsletter was prepared by the Great Barrier Reef Foundation on behalf of the ReFuGe 2020 Consortium.

Reef Re Future Fu Genomics Ge 20 20	 GREAT BARRIER REEF <i>foundation</i>
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	 Australian Government Great Barrier Reef Marine Park Authority
	 Bioplatforms Australia
	 JAMES COOK UNIVERSITY AUSTRALIA
	 KAUST  كاوست <small>King Abdullah University of Science and Technology</small> <small>جامعة الملك عبد الله للعلوم والتقنية</small>
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	 Australian National University