



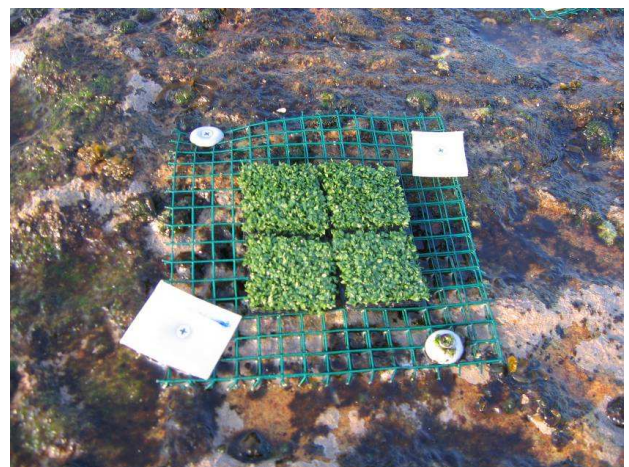
USIMS showcase – A reflection of Sydney University's active research program in marine science

On Friday the 7th May marine scientists and students gathered to hear about the exciting marine research that is currently undertaken at the University of Sydney. Speaker attendance was great so the presentations had to be kept brief to accommodate all speakers in one afternoon. Speakers from all marine research groups were speaking giving students a great taste of the diversity in the field.

The showcase was opened by a short welcome from Assoc Prof Peter Cowell who highlighted the importance of USIMS and events such as the showcase in fostering collaborations and attracting postgraduate students. Peter's introduction was followed by a presentation by Arvic Osorio, an active member of GEMS – the Geo, Environmental and Marine Science Society. Arvic introduced the society and its activities and particularly invited the biology students to join in.

The first session was dedicated to speakers from the School of Biological Sciences and the EarthByte group at the School of Geosciences.

Assoc Prof Ross Coleman, the director of the Centre for Research on Ecological Impacts on Coastal Cities (EICC), introduced the three main areas of research in the centre. These are habitat occupancy – what factors influence the spatial distribution of marine invertebrates – contaminants and habitats – what are the effects of pollutants in the marine intertidal – and building biodiversity – how can artificial structures enhance biodiversity in the marine environment. Dr William Figueira, one of the deputy directors of the EICC, introduced his work on the



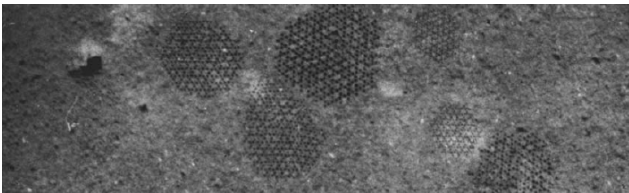
EICC experimental setup on a rocky shore.

performance of tropical marine fish in temperate environments and its implications on a changing environment due to climate change.

Prof Maria Byrne, an echinoderm biologist, introduced the multi-faceted research undertaken in her lab. Postdocs and students in Prof Byrne's lab currently mainly investigate the impact of ocean warming and acidification on marine invertebrates using echinoderm larvae. Work on these questions takes the researchers to One Tree Island Research Station on the Southern GBR as well as Antarctica. Other projects investigate the molecular phylogeny of different groups of sea stars and sea cucumbers, the genetic connectivity between populations of invertebrates for marine parks design and the conservation and fishery biology of tropical, edible sea cucumbers, also called Beche-de-mer.

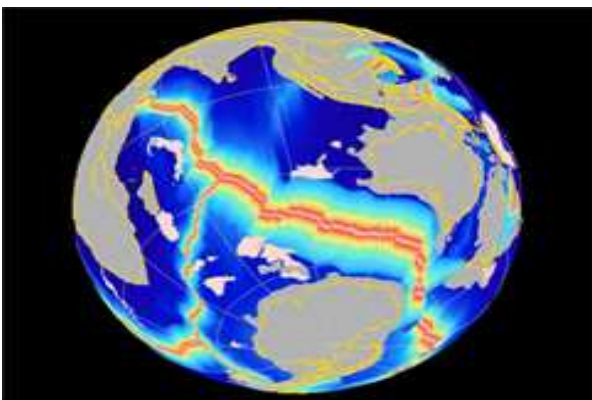
Dr Adrienne Grant from the School of Biological sciences gave an interesting talk on the effects of copper on the cnidarian *Zoanthus robustus* which is used as a model to investigate the damaging effects of this heavy metal on organisms.

Next to present was Dr Sebastian Holmes, who is a member of Dr Adele Pile's deep-sea laboratory. One of the mysteries Sebastian is trying to solve is the paradox of a high biodiversity in what appears to be a very homogenous environment in the deep-sea. One hypothesis, Sebastian is testing, is speciation derived from bathymetric isolation. Coupled to this is the question of the source of deep sea fauna? Next year Sebastian will participate in a research cruise from New Zealand to Australia where he is hoping to capture live 'Paleodictyon' which haven't been described yet.



Paleodictyon (Photograph courtesy of the Ocean Survey 2020).

The EarthByte group was represented by two post-doctoral researchers, Dr Joanne Whittaker and Dr Simon Williams, and Ana Gibbons, one of the PhD students in the group. Joanne gave an overview of the groups research program which involves the study of global and local geodynamics and plate kinematics by using and developing software tools such as 'G-Plates' which is used by the group to study the plate tectonic evolution of the earth. Anna showed us how the program is applied to reconstruct the West Australian margin.



G-Plate reconstruction of tectonic plate movement at present day.

The second session was chaired by Assoc Prof Ross Coleman and it included presentations from veterinary science, engineering and other aspects of marine geosciences.

First to present was Dr Rachael Grey who studies the Australian sea lion which is Australia's only endemic pinniped species. However, some of the populations declining and Rachael's work aims to investigate the common causes of the high mortality in the pups and how pup mortality effects the population structure.



Australian sea lion adult and pup.

Jeffrey Go, a PhD student at the School of Veterinary Science, gave a fascinating talk on the effects of idioviruses on ornamental and commercial fish. In particular Jeffrey investigates the susceptibility of a number of Australian marine finfish species to *Megalocytivirus* infection. Jeffrey also presented Prof Richard Whittington's work on the epidemiology of *Pilchard herpesvirus* (PHV) a pathogen that has been devastating several pilchard populations along the Australian coast. Prof Whittington's study showed that PHV is now endemic in *S. sagax neopilchardus* in Australian waters. However, the NSW sub-population has a low prevalence of PHV and it may be beneficial to manage anthropogenic influences to limit contact between the NSW and SA subpopulations.

We continued on with more presentations on marine mammals. Prof Doug Cato introduced his work on the effects of seismic air guns on the behaviour of humpback whales. Air guns are used for seismic surveys of the sea floor and may trigger behavioural responses in whales. Prof Cato and his team are investigating these responses by visual tracking of whales using theodolites, "Focal follows", acoustic tracking of vocalising whales using DTAGs.

We also learned from Natalie Soars, who is currently working with Prof Cato on a beaked whale project, that not only whales produce sounds. Sea urchins, grazing along rocks and boulders, produce a distinct noise which may help monitor the spread of the invasive sea urchin *Centrostephanus rodgersii*.



Humpback whale at Peregian Beach approximately 100 km North of Brisbane.

Dr Michelle Blewitt, a colleague of Prof Cato and also a marine mammal expert, presented a study on habitat preferences of bottle nose dolphins in Jarvis Bay which showed that dolphins at Jarvis bay do indeed use different habitats for certain activities throughout the day.

Marine engineering was represented by the Ocean Technology Group and the ARC Centre of Excellence for Autonomous Systems.

Prof Ian Jones introduced research that is being undertaken by the Ocean Technology Group. Two main projects involve collaborative research on cohesive sediments in the Pearl River, China and studies on ocean nourishment which introduce additional nutrients into the ocean to stimulate primary and subsequently fish production.

Mike Jakuba reported about new developments at the Australian Centre for Field Robotics. Mike and his team have developed an automated underwater vehicle which produces high resolution information out the sea floor which is amongst other things used for habitat mapping. Currently the group is working on optimising navigation of the AUV, automated processes to interpret the data and customizing the vehicle for different surveys.



Automated underwater vehicle developed by the Australian Centre for Field Robotics.

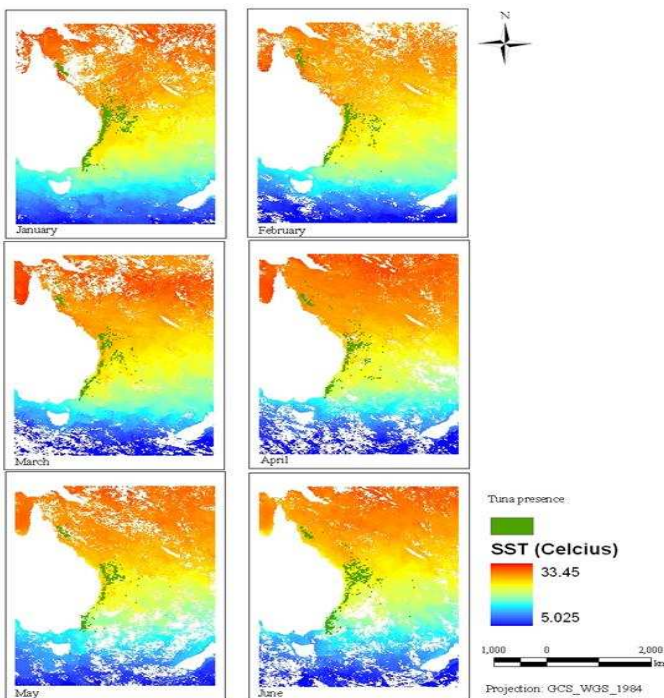
The last (but not least) group for the day were researchers from the School of Geosciences who study the effects of climate change in coastal and reef environments.

Dr Jody Webster talked about the work 'GeoReef Lab: Unlocking the climate secrets of the Great Barrier Reef'. He described collecting sediment core data from the Great Barrier Reef that he helped to collect on the IODP (Integrated Ocean Drilling Program) expedition earlier in the year. The scientific aims of the project are to: Establish the course of sea-level rise during the last deglaciation (~20-10 ka); reconstruct the nature and magnitude of seasonal-millennial scale climate variability (ie. sea surface temperature and sea surface salinity); and to determine the biologic and geologic response of the Great Barrier Reef to abrupt sea-level and climate changes in the past as a possible template to improve predictions of ecosystem response to future global climate changes.



Great Ship Maya – Deepwater geotechnical vessel.

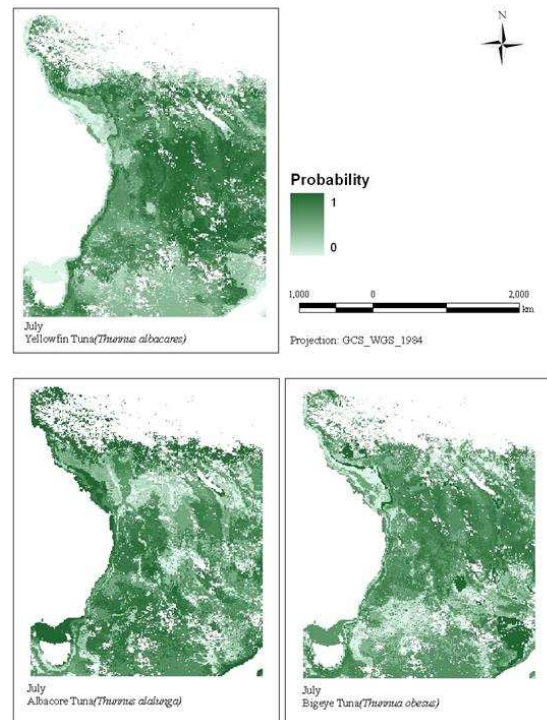
Dr Eleanor Bruce discussed the spatio-temporal modelling of coastal environments. She introduced a number of models which are being integrated into ARC-GIS that can be used for planning and decision support of marine environments. The models include: an estuarine sedimentation model which describes the biophysical response to changing sea levels in estuarine environments; and predictive habitat distribution models which combine physical and biological parameters with Bayesian probability to predict habitat preference for marine species.



Sea surface temperature input for predictive habitat modelling.

The last speaker for the day was Assoc Prof Peter Cowell who briefly introduced his work on the effects of climate change on coasts all around the world.

The afternoon was concluded with drinks in the courtyard where students and scientists chatted for a couple of hours. USIMS received a lot of positive feedback on the day and we would like to thank the presenters for their interesting contributions and are looking forward to hosting another showcase next year.



Predictive habitat model output.



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