Subtidal Ecology and Ecotoxicology

Lab leader, Emma Johnston, University of New South Wales
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Emma’s research group broadly investigates human disturbances in marine communities. The group’s research is approached from both an ecological and ecotoxicological perspective using field experimentation wherever possible.

The Subtidal Ecology and Ecotoxicology Lab (SEE), member of School of Biological, Earth and Environmental Sciences (BEES) at UNSW has been enjoying the recent broadcast of “Coast Australia” in which our director Professor Emma Johnston is a co-host. Emma took viewers on an underwater journey from Tasmania to Darwin and highlighted topics as diverse as the poleward migration of urchins and tropicalisation of Sydney Harbour. Emma begins filming Season 2 this year; stay tuned and follow @DrEmmaLJohnston. She has also been awarded the inaugural Nancy Mills Medal for Women in Science from the Australian Academy of Science. The award recognizes female research leaders who have demonstrated exceptional leadership. Congratulations Emma!

We’ve also been keeping busy with a recent lab writing retreat to Smiths Lake. We had a productive week of writing and were entertained with grammar discussion groups and a fierce cooking competition!

Human use and ecology of Sydney Harbour – an iconic marine landscape
Dr Luke Hedge, together with collaborators from University of Sydney, Macquarie University and the University of Technology, Sydney, is currently undertaking the first human-use survey to ever be conducted in Sydney Harbour. Records from Transport NSW have documented 17,000 recreational and 1,800 commercial vessels plying the waters of Sydney Harbour every year and Luke’s research will document their movements and activities in relation to different habitat types around the harbour. Follow @DrLukeHedge. This research has recently incorporated underwater
Mapping techniques with the Catlin Seaview Survey and PhD student Kingsley Griffin has joined the team to analyse spatial data about underwater habitat types around Sydney Harbour.

More than 50% of the coastline in Sydney is modified by coastal armouring and boating infrastructure. The construction of artificial structures (such as pilings and pontoons) provides a novel habitat resource that favours non-indigenous species over native species. A team led by Dr Mariana Mayer-Pinto begins sampling of artificial structures around Sydney Harbour this year. Mariana will use innovative techniques to quantify functional differences between artificial and natural habitats and honours student Elisa Tan will investigate recruitment and biomass rates in the intertidal zone. PhD student Damon Bolton and honours student Wills Brassil will investigate predation pressure on artificial structures and the effects on subtidal hard substrate communities. This will be the initial phase of a large-scale ‘green’ engineering project that aims to design artificial structures to mitigate their impacts by enhancing biodiversity and deterring invasion.

Marine ecology and climate change

Global warming and invasive species represent two of the greatest threats to the world’s biodiversity. These introduced species can displace natives, disrupt community structure and food webs, and alter fundamental processes, such as nutrient cycling. Aria Lee has recently submitted her honours thesis where she investigated the reproductive potential of the invasive fan worm, Sabella spallanzanii. Aria worked closely with Biosecurity South Australia to collect samples for histological analysis and using these sampled investigated gamete development and reproductive periodicity. Aria will continue working with Sabella during her PhD.

With climate change we might expect the rate of
biological invasions to increase due to shifts in species ranges and increased temperatures may enhance the growth and development of some non-indigenous species. PhD students James Lavender and Sally Bracewell are undertaking large-scale field experiments along the coastline from Port Douglas to Hobart to investigate latitudinal variation in the abundance and species richness of fouling species, and test hypotheses about disturbance recovery and biotic pressure. James has also had a paper accepted to JEMBE entitled “Meso-predators: a confounding variable in consumer exclusion studies”. The study investigates predation pressure in a subtidal fouling community and highlights the importance of considering meso-predators in caging studies.

Dr Graeme Clark and Dr Ziggy Marzinelli have been investigating life on the sea bed with the Australian Antarctic Expedition. Sea-ice cover is a major factor driving marine biodiversity in Antarctica as it directly influences the amount of light – a key resource – that reaches the seafloor. Global climate change is altering this environment, resulting in areas that used to be covered by sea-ice throughout most of the year now remaining ice-free for longer periods, and vice versa. These changes in sea-ice cover can have profound effects on marine biodiversity, leading to shifts between communities dominated by animals in dark environments and those dominated by underwater forests of algae in light-rich environments. Graeme’s research involved the use of underwater video surveys in Commonwealth Bay, East Antarctica to quantify animal and algal biodiversity on the seafloor. They found that the underwater forests of algae that usually characterise this ice-free area are dying. Blades of large canopy-forming seaweeds are slowly decomposing and fading away. Given that seaweeds are the main primary producers in this system, their disappearance is likely to affect other organisms higher in the food-chain.

Marine ecotoxicology
PhD students Melanie Sun and Simone Birrer have recently returned from a visit to the Singapore Centre on Environmental Life Sciences Engineering, where they worked through metagenomics data to understand the effects of metals and nutrients on the recruitment and function of sediment microbial communities. Melanie is in the final stages of her PhD, which has focused on illuminating and understanding the effects of contaminants on marine microbes. She was recently published in Environmental Microbiology with her study entitled “Core sediment bacteria drive community response to anthropogenic contamination over multiple environmental gradients” 15: 2517-2531.

Simone joined our lab in early 2013 and has been keeping busy with experimental work on the effects of pulse and press disturbances on marine microbes. She now joins our stormwater sampling program “Testing the waters: Impacts of contaminants on ecosystem structure and function in urban waterways”.

Post-doctoral researchers Drs Katie Dafforn and Tim Lachnit, together with PhD student Simone Birrer and honours student Michael Sutherland, have begun a temporally extensive study of the effects of stormwater on macro and micro sediment communities. Katie was recently published in PLoS ONE with her study entitled “Polychaete richness and abundance enhanced in anthropogenically modified estuaries despite high concentrations of toxic contaminants” 8: e77018. She has also been keeping busy planning a symposium entitled “Ports and Estuaries” for the upcoming Joint SETAC AP/AU 2014 Conference. Tim joins the team from the UNSW Centre for Marine Bio-Innovation and will apply his background in microbiology and virology to the study of viruses in the stormwater sediments. Vivian Sim joins the team to investigate distribution and
ecological effects of sediment microplastics and you can follow her research @vivian_xy_sim.

Michael is our newest recruit and is working closely with Peter Scanes and Jaimie Potts of OEH to understand sediment processes under stormwater regimes. The first baseline sampling was in early February and after months of warm sunshine the Sydney drought broke on our first day of fieldwork! We will continue monthly baseline sampling and are on standby for increased temporal sampling when an intensive storm event occurs. The team’s adventures (and fashions in the field!) can be followed at @DrKDafforn or #sydneystormchasers.

Lab comings and goings – busy BEES

The SEE Lab has recently said farewell to two of our members, Drs Katelyn Edge and Ceiwen Pease. Katelyn has taken up a position at the Office of Environment and Heritage (OEH) and recently hosted a “Meeting and Tweeting” workshop for UNSW postgraduates. She was also recently published in Chemosphere with her study entitled “A biomarker of contaminant exposure is effective in large scale assessment of ten estuaries” 100:16-26. The study assessed the applicability of biomarkers in large-scale monitoring programs and found lysosomal stability to be a robust indicator of contaminant stress. Katelyn maintains strong scientific (and social!) links with the lab and we look forward to future opportunities for collaboration. Ceiwen Pease has also flown the nest and taken a job with the Environmental Research Institute of the Supervising Scientist (ERISS) in Darwin. Ceiwen has been enjoying life at the “Top End” and experiencing research by helicopter.

PhD student Jaz Lawes has been jetsetting around to conferences and most recently attended “ECSA 53: Estuaries and coastal areas in times of intense change” in Shanghai, October 2013, and “Western Society of Naturalists” in California, November 2013 where she presented her study “Cop it sweet or sweeten the deal? Investigating effects of two common contaminants on sessile communities and their recruitment” and “Contaminant cocktails: effects of multiples stressors on sessile invertebrates” respectively. Jaz is currently juggling the completion of her PhD thesis with her new job at the University of New South Wales. She has also submitted a paper to review in Marine Ecology Progress Series “Contaminant cocktails: Interactive effects of nutrients and metals on marine invertebrate settlement and mortality”.

For more information on the lab please contact Dr Katie Dafforn k.dafforn@unsw.edu.au [2].

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Links
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