Orpheus Island Research Station

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Morris Family Trust Student Research Grant Successful Applicant: Sterling Tebbett

Growing up on Australia's Sunshine Coast I developed a passion for the marine environment from an early age. Due to their excellence in coral reef science, James Cook University was a clear choice to further this passion after graduating from high school. In 2012 I moved to Townsville to start a Bachelor of Science majoring in the marine biology advanced course at JCU. Following my degree, I undertook an honours degree supervised by Prof. David Bellwood and Dr. Christopher Goatley. My honours research examined the interactions between surgeonfish, sediments and algal turfs on coral reefs. After my honours, I was successful in obtaining a position as a research assistant for Prof. Bellwood until the end of 2018. In this position I worked on a range of research projects, all centring around the functionality of coral reefs. This position allowed my passion for coral reef research to develop and perfectly equipped me to begin a PhD.

In February 2019 I began my PhD candidature under the supervision of Prof. David Bellwood and Prof. Sean Connolly. My PhD will continue to build upon much of the research I have been undertaking during my honours and work with Prof. Bellwood. My thesis is entitled 'the functioning of future coral reefs: fishes, sediments and productivity'. My work is timely as global climate change has profoundly changed the status-quo for coral reefs, with never before seen back-to-back events on the Great Barrier Reef, and more generally, around the world. This has resulted in a scenario where coral reefs now largely exist in a state of transition. Indeed, it is becoming increasingly clear that coral reefs as we once knew them no longer exist, and returning coral reefs to these past configurations is generally unfeasible, and in some cases, impossible. As such, it has been widely suggested that the key for coral reef scientists and managers now is to embrace these new, altered, coral reef configurations and learn how best to manage them to sustain the critical ecosystem functions, and services to humanity, that reefs provide. Unfortunately, much of our understanding of coral reefs is based on pre-bleached reefs, and our understanding of how future reefs will operate is largely in its infancy.

This is where my PhD work will come in. It is becoming increasingly clear that future coral reefs will, in many cases, exist in a lower-coral cover, lower-complexity, algal turf-dominated state. Although less visually appealing, such coral reef states can continue to provide key services to humanity, such as fishable biomass production, if they remain in the right condition. However, we are just realising that such conditions rely on intimate links between the nature of the algal turfs, and the sediments they contain. Essentially, if too much sediment accumulates in these algal turfs, they can become less productive, and such reductions in productivity might have bottom-up effects on the rest of the food chain, culminating in lower fisheries productivity. This may be particularly problematic in overseas locations, where herbivorous fishes, that rely on algal turfs for nutrition, make up the bulk of artisanal fisheries.

This grant will assist my PhD research by providing a field trip to Orpheus Island Research Station. Orpheus Island represents a perfect model system to examine interactions between sediments, herbivorous fishes, and algal turfs as this location is at the forefront of ecosystem

transitions. It has been exposed to cumulative stressors over recent years including coral bleaching, flood plumes, and cyclones, which have culminated in a 3700% increase in accumulated sediment loads within the algal turfs in Pioneer Bay over the last decade. As such, the results gleaned from my research at Orpheus Island will be highly applicable to other reefs globally, most of which have now also experienced a variety of stressors. Ultimately, the results from my research will provide new insights into how future coral reefs will operate, and as such, provide an understanding of what we need to manage to maintain critical ecosystem functions and services, such as benthic productivity, and fishable biomass production, on future coral reefs.