University of Victoria | Graduate Studies

Notice of the Final Oral Examination
for the Degree of Master of Science

of

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# "Herbivorous Coral Reef Fish Responses to Local and Global Stressors"

Department of Biology

Friday, December 6, 2019
9:00 A.M.
Engineering / Computer Science Building
Room 104

Supervisory Committee:
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Dr. Rana El-Sabaawi, Department of Biology, UVic (Member)
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Dr. Keivan Ahmadi, Department of Mechanical Engineering, UVic

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## Abstract

Given the current state of the climate and continuing local human impacts to coral reefs, conservation of these ecosystems requires active management efforts to arrest further deterioration. Some current management strategies focus on regulating local impacts such that reefs are provided the best chance at resisting further degradation from global, climate change-induced disturbances. One such strategy is to manage local herbivore populations. Herbivorous coral reef fish are considered natural drivers of reef recovery due to their prevention of algal overgrowth on coral and of further degradation of the reef to an undesirable state dominated by macroalgae. While the numerical response of herbivorous fish to disturbance is commonly investigated, the response of their key function to large-scale, global disturbance is still not well understood. In this thesis, I attempt to take a functional approach to describe herbivory on Kiritimati (Christmas Island), the largest coral atoll, located in the equatorial Pacific Ocean. First, I describe species-specific herbivory using three metrics: (i) bite rates; (ii) grazing impacts; and (iii) selectivity, to explore how these metrics vary with herbivore identity, individual size and life phase, and to determine if they are influenced by local gradients of human disturbance and whether or not they respond to a pulse heat stress and coral bleaching disturbance that resulted from the 2015–2016 El Niño. I found that herbivore functional groups and species exhibit distinct herbivory, driven, in part, by differences in fish size. Disturbance at a local level does not appear to have a significant influence on species-specific herbivory, but I detected an increase in bite rates and grazing impacts in response to a global heat stress event. These findings have implications for how herbivores respond to different levels of disturbance. I then scale up species-specific grazing impacts using site-averaged species' densities to explore how the herbivore assemblage grazing function responds to disturbance. A multivariate assessment of the herbivore community between sites in different years suggests species' impacts are not significantly influenced by a local gradient of human disturbance. Further, I summed average species' impacts at each site by functional group and detected distinct grazing impacts among groups and an increase following a global heat stress event. These findings suggest that the herbivory function of the assemblage is relatively robust to withstanding disturbance. Given that global scale disturbances of reef ecosystems are projected to become more frequent in the future, it is imperative to understand how this trophic function will be influenced by disturbance at different scales. Taken together, the results in this thesis provide insight into the differing impacts of local and global scale disturbances on the herbivory function at different scales and suggest a somewhat promising outcome for the potential recovery of reefs following future disturbance.