University of Victoria | Graduate Studies

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

of

JAMIE MCDEVITT-IRWIN

BScH (Queen's University, 2013)

"The Unseen World of Coral Reefs: Impact of Local and Global Stressors on Coral Microbiome Community Structure"

Department of Biology

Wednesday, April 26, 2017
11:00 A.M.
David Turpin Building
Room A136

Supervisory Committee:
Dr. Julia Baum, Department of Biology, University of Victoria (Supervisor)
Dr. Steve Perlman, Department of Biology, UVic (Member)
Dr. Brad Anholt, Department of Biology, UVic (Member)
Dr. Melissa Garren, Department of Marine Biology, California State University (Outside Member)

External Examiner:
Dr. Laura Wegener Parfrey, Department of Botany, University of British Columbia

Chair of Oral Examination:
Dr. Barton Cunningham, School of Public Administration, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Diverse and abundant coral associated microbial communities may play a key role in coral resistance to and recovery from unwavering stressors currently threatening coral reefs worldwide. The composition and structure of the coral microbiome is integral to coral health as microbes can play beneficial (e.g. nutritional or protective) or negative (e.g. pathogenic or opportunistic) roles in the coral. To review the impacts of stressors on the coral microbiome, I compiled data from 39 studies, each tracking microbial community shifts in corals experiencing stress from climate change, pollution or overfishing. Stress was associated with shifts in coral microbial communities. I found that regardless of stressor, microbial alpha diversity increased under stress, with Vibrionales, Flavobacteriales and Rhodobacterales commonly found on stressed corals, and Oceanospirillales not as abundant on stressed corals. In addition, I used 16S rRNA sequencing to evaluate how local and global stressors affect the community structure of the coral microbiome for the two coral species, *Porites lobata* and *Montipora foliosa.* I monitored tagged coral colonies at two human disturbance levels (i.e. high and low), before and during a thermal bleaching hotspot at Kiritimati, Kiribati. Human disturbance, a bleaching hotspot, and coral species were all important drivers of coral microbiome community structure. My results suggest that human disturbance increases microbial alpha and beta diversity, although results vary between coral species, with *P. lobate* having more of a difference between disturbance levels. Similarly, bleaching increased beta diversity at low disturbance sites. Both human disturbance and thermal stress appeared to homogenize coral microbiomes between species and thermal stress appeared to homogenize communities between disturbance levels. Thus, both human disturbance and bleaching appear to stress the coral and destabilize its microbiome. However, intense thermal stress (i.e. 12.86 DHWs) appears to have a greater influence than human disturbance, probably due to corals responding to stressful conditions in a similar manner. In conclusion, my results highlight the impact of local and global stressors on coral microbiome community structure.