University of Victoria | Graduate Studies

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

of

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BSc Honours (University of Guelph, 2015)

"Evaluating British Columbia's Artificial Reefs in a Conservation Context"

School of Environmental Studies

Thursday, April 11, 2019
1:00 P.M.
University House 4
Room 100

Supervisory Committee:
Dr. John Volpe, School of Environmental Studies, University of Victoria (Supervisor)
Dr. Jason Fisher, School of Environmental Studies, UVic (Member)

External Examiner:
Dr. Francis Juanes, Department of Biology, UVic

Chair of Oral Examination:
Dr. Ashoka Bhat, Department of Electrical and Computer Engineering, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Synthetic marine habitats such as artificial reefs (ARs) are deployed to offset marine habitat losses and aid conservation of marine communities, including species at risk. Though environmental benefit is often assumed, AR's ability to support northern temperate marine fish communities has rarely been tested. The structural orientation and location of a reef can strongly influence biodiversity and productivity of faunal communities inhabiting it. For ARs, understanding how reef characteristics affect species and community composition are key in optimizing their use in conservation initiatives. I used ROV and sonar to survey threatened rockfish (*Sebastes* spp.) and other groundfish species associated with 18 ARs and natural reefs (NRs) along the northeast Pacific coastal shelf, along the coast of BC, Canada.

In my second chapter, I investigate how ARs compare to NRs in achieving conservation objectives as measured by fish abundance and species richness. I found that community composition significantly differed between NRs and ARs. ARs had high variability in rockfish abundance, while NRs consistently supported intermediate rockfish abundances. Groundfish diversity was markedly greater on NRs. Depth and relief significantly explained variability in abundance and species richness. Interestingly, rockfish abundance was negatively associated with proximity to nearest rockfish conservation area.

In my third chapter, I assess variation between AR fish communities on six reefs to better understand and efficacy of meeting conservation objectives. I quantified structural characteristics of each reef. using high-definition sonar data to create three-dimensional models and calculate measurements of reef structure. I also examined the effects of surrounding habitat associated with reef locations. I found that depth, conservation status, rugosity, and reef age significantly explained rockfish abundance. Groundfish species richness was significantly associated with conservation status, relief, reef size, and an interaction between depth and reef age.

This research is a first step in proposing underlying mechanisms for differences between fish communities on ARs in BC, and which reef attributes facilitate successful contributions to conservation. Though ARs show promise in the conservation of some threatened species, the maintenance of diverse fish communities may depend on protection of heterogeneous natural reef communities. Given that a critical component of AR success is structure, using three-dimensional technologies can be used as a tool to understand species-habitat association on existing reefs and help predict the success of future reefs.