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

of

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BSc (University of Victoria, 2016)

“Passive Restoration and Non-Invasive Monitoring of Soft-Sediment Ecosystems on the North Coast of British Columbia, Canada”

Department of Biology

Friday, June 28, 2019
1:00 P.M.
Elliott Building
Room 161

Supervisory Committee:
Dr. Francis Juanes, Department of Biology, University of Victoria (Co-Supervisor)
Dr. Travis Gerwing, Department of Biology, UVic (Co-Supervisor)
Dr. Sarah Dudas, Department of Biology, UVic (Member)

External Examiner:
Dr. Melissa Frey, Invertebrate Zoology Collections Manager, Burke Museum

Chair of Oral Examination:
Dr. Wanda Boyer, Department of Educational Psychology & Leadership Studies, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies
Abstract

Soft-sediment ecosystems can be degraded through anthropogenic development, leading to reduced habitat suitability for biological communities. On the North Coast of British Columbia, Canada, intensive industrial activity and coastal development has occurred, specifically around the Skeena and Kitimat River Estuaries. In addition to current development, both regions have the potential for further development, while also undergoing passive restoration from historical disturbances. Therefore, I aim to broaden our understanding of passive restoration and non-invasive monitoring of intertidal soft-sediment ecosystems, by carrying out experiments at mudflats in both estuaries during the summer of 2017. Specifically, I aimed to expand the use of a non-invasive population assessment technique to novel species in soft-sediment ecosystems. Relationships between burrowing decapod abundance and burrow openings have been successfully used to estimate population sizes, but this technique has yet to be applied to large burrowing polychaetes, bivalves, or in regions of high macrofaunal diversity. As such, I assessed mudflats in regions of low (n = 1 species) and high (n = 8 species) biodiversity to determine if macrofauna abundances could be estimated from burrow openings on the sediment surface. Where only one burrowing bivalve species was present, a relationship between burrow openings and population abundance was not feasible, but burrow openings were useful in estimating total macrofaunal community abundance at a high diversity mudflat. This suggests that monitoring through burrow openings counts has the ability to detect overall changes in population abundance. Next, I examined the infaunal community, sediment conditions (particle size, water content, penetrability, woody debris/macroalgae cover, apparent redox potential discontinuity depth), and nutrient availability (chlorophyll α concentration/organic matter content), at one intertidal mudflat in the Skeena River Estuary following the cessation of heavy industrial activities (i.e. a salmon cannery and pulp mill) to determine the capacity for passive restoration. Sediment conditions varied spatiotemporally, and nutrient availability showed temporal variation but trends were difficult to relate to historical or current potential disturbances. The scars of past development were still apparent on the infaunal community in the form of patchy distributions of disturbance-indicating taxa, but the mudflat appears to be in an overall healthy state with a diverse and functioning food web, indicating community recovery from historical activities. Results from these studies indicate passive restoration can be appropriate for estuarine soft-sediment ecosystems, while monitoring population abundance through burrow openings could be a method of detecting disturbances or tracking recovery of macrofaunal populations.