



University
of Victoria

Graduate Studies

Notice of the Final Oral Examination
for the Degree of Doctor of Philosophy

of

MEGAN SARA ADAMS

BSc (University of Victoria, 2010)

**“Cultural and ecological relationships among consumers, food, and
landscapes; implications for stewarding bear-human-salmon systems”**

Department of Geography

Tuesday, April 23, 2019

10:00 A.M.

Clearihue Building

Room B017

Supervisory Committee:

Dr. Christopher Darimont, Department of Geography, University of Victoria (Supervisor)

Dr. Trisalyn Nelson, Department of Geography, UVic (Member)

Dr. Paul Paquet, Department of Geography, UVic (Member)

Dr. Taal Levi, Department of Fisheries and Wildlife, Oregon State University (Outside Member)

External Examiner:

Dr. Thomas Quinn, School of Aquatic and Fishery Sciences, University of Washington

Chair of Oral Examination:

Dr. Tom Gleeson, Department of Civil Engineering, UVic

Abstract

Human activity modifies the behaviour of large vertebrates and their acquisition of key resources. Despite the predation risk and competition for similar food resources that humans impose, wildlife consumers must acquire key foods across the landscape. Predation risk can modify foraging behaviour, yet we know little about the potential consequences, especially on large spatial scales. Humans may also affect food availability for wildlife by competing for shared prey, which most current harvest prescriptions fail to recognize. Against this background of threats to consumer-resource interactions, my research employed new conceptual, analytical, and practical approaches to seek not only new generalizable insight but also applied solutions.

Addressing these goals, I characterized foraging behaviour by grizzly bears (*Ursus arctos horribilis*) on a focal prey, Pacific salmon (*Oncorhynchus* spp.), at multiple spatial scales. I predicted how human activity – both as modifications to landscapes and as salmon harvest – might affect bear-salmon interactions. I co-conceived, designed, and carried out this work through a framework of community engagement, which I crafted in collaboration with Indigenous communities in coastal British Columbia (BC). The framework (Chapter 2) identifies how scientists and communities can engage throughout the research process to work towards shared priorities, despite potential challenges in differences of knowledge systems or capacities. Methodologically, I used ratios of stable carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$) isotopes in bear hair to estimate contributions of salmon in the annual diet of bears and employed existing data on landscape modification and salmon fisheries (*i.e.*, escapement and catch) to characterize human activity and to measure associated variation in salmon consumption by bears.

My first empirical contribution (Chapter 3) characterized spatial patterns of annual salmon consumption by grizzly bears across BC. I found substantial differences in salmon consumption within and among grizzly and black (*U. americanus*) bears in a large coastal region and across BC. Visualizing variation in consumer-resource interactions could guide conservation and management efforts that seek to protect predator-prey associations and marine subsidies for terrestrial ecosystems.

I also investigated potential drivers of salmon consumption by bears in interior and coastal watersheds that varied in disturbance (Chapter 4). I found that human footprint in riparian areas of salmon-bearing watersheds affected bear diets more than the amount of salmon biomass available, showing that human activity can disrupt an otherwise strong predator-prey association.

My community-based research occurred at the scale of a single large watershed, where I demonstrated how the Wuikinuxv First Nation might design their salmon management prescriptions according to their cultural values (Chapter 5). Despite a reduced abundance of salmon in the area, I identified harvest options that would trade-off benefits to local people and bears equally.

In general, my dissertation research contributes to our understanding of the role humans increasingly play in mediating consumer-resource interactions. I also highlight how scientific research can support the leadership that local management can provide in mitigating human impacts to sustain an iconic predator-prey interaction of ecological, economic, and cultural importance.