University of Victoria | Graduate Studies

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

of

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MSc (University of Victoria, 2012)
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"Listening to whales: Tying acoustics to ecology"

Department of Geography

Wednesday, November 14, 2018
10:00 A.M.
Clearihue Building
Room B007

Supervisory Committee:
Dr. David Duffus, Department of Geography, University of Victoria (Supervisor)
Dr. Paul Paquet, Department of Geography, UVic (Member)
Dr. Thomas Reimchen, Department of Biology (Outside Member)
Dr. Tetiana Ross, Fisheries and Oceans Canada (Additional Member)

External Examiner:
Dr. David Johnston, Division of Marine Science and Conservation, Duke University Marine Laboratory

Chair of Oral Examination:
Dr. Jeremy Wulff, Department of Chemistry, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

The acoustic sense is vital to all life processes for whales. It defines their 'active space', and the extent and nature of interactions with their surroundings. Yet, we are still learning the basics of most species' acoustic behaviours and vocal repertoires.

The ecology of gray whales (*Eschrichtius robustus*) is well known, however vocal behaviours are not well describedoutside of breeding lagoons. Bottom-stationed acoustic monitoring devices were deployed in Clayoquot Sound, west coast Vancouver Island to explore acoustics use outside of these areas. During migration the use of low frequency moan calls are prevalent, perhaps for group cohesion, with lead whales guiding followers. During the summer more inter-group calls (knocks, upsweeps) are employed. Here I explored the use of 'motherese' calls between cow-calf pairs, and how this may mirror the weaning process. Photoperiod, increased ambient noise, threat perception, and vessel and aircraft presence elicited acoustic responses. Calling was also altered by social, behavioural, and physiological state. These results begin to show gray whales to be acoustically sensitive, with highly nuanced vocalizing behaviours.

Acoustic methods afford monitoring at times and in places that would otherwise be impossible, and lends themselves to the study of rare or cryptic species. Ocean gliders with passive acoustic capacity were used to explore deep-coastal and shelf-break waters for large whale species. Humpback whales (*Megaptera novaeangliae*) were common on the shelf, whereas calls from fin (*Balaenoptera physalus*), blue (*Balaenoptera musculus*), sperm (*Physeter macrocephalus*), and possibly sei whales (*Balaenoptera borealis*) were heard in more offshore locations. Concurrent habitat data steams help establish area use and importance to these species. The surveys focus on submarine canyons that are thought to aggregate prey. Calls denote whale presence, whereas call type may suggest behaviour and habitat use. Calls described for feeding and breeding were heard for fin and blue whales, with distinct temporal distribution.

Acoustic techniques complement other ecological methods and can fill existing knowledge gaps in whale life histories. It can also help quantify the effect of human activities on whale populations and ocean soundscapes. These findings will inform management actions. I provide examples of management links to acoustic-ecological research.