University of Victoria | Graduate Studies

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

of

EMMA PASCOE

BScH (Queen's University, 2015)

"Quantifying Interannual Variability in the Condition of Young-of-Year Pacific Herring (*Clupea pallasi*) in the Strait of Georgia, BC**"**

School of Earth and Ocean Sciences

Friday, August 3, 2018
1:00 P.M.
Clearihue Building
Room B017

Supervisory Committee:
Dr. John Dower, School of Earth and Ocean Science, University of Victoria (Supervisor)
Dr. Francis Juanes, Department of Biology, UVic (Non-Member)
Dr. John Taylor, Department of Biology, UVic (Non-Member)

External Examiner:
Dr. Jennifer Boldt, Pacific Biological Station, Fisheries and Oceans Canada

Chair of Oral Examination:
Dr. Barbara Hawkins, Department of Biology, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

The condition of juvenile fish relates to their overall health and is a strong predictor of survival and eventual recruitment. Condition can be quantified and interpreted in a variety of ways covering different time scales and levels of biological organization. Here I (i) quantify interannual variability in the condition in Young-of-Year (YOY) Pacific herring (*Clupea pallasi*) in the Strait of Georgia, BC, from 2013-2016, and (ii) examine the extent to which the condition of an individual fish varies depending on which condition metric is used. Chapter 1 provides a general background on the concept of measuring condition in fish, as well as the basic biology of Pacific herring and their importance in Strait of Georgia ecosystem. In Chapter 2, I report the condition of YOY herring from 2013-2016 using six metrics: (i) Fulton's K, (ii) the residuals from a length:weight regression, (iii) the RNA:DNA ratio, (iv) recent growth estimated via otolith microstructure analysis, (v) lipid content, and (vi) the ratio of two essential acids DHA:EPA. Four of these metrics (Fulton's K, length:weight residuals, and growth from RNA:DNA and otolith increments) indicate a decrease in condition over the four years. In contrast, lipid content suggests an increase across the four years, while DHA:EPA suggests a decrease in 2015 but no change over the other three years. The observed interannual variability in condition can be partly linked to unfavourable changes in temperature and zooplankton community composition in 2015 and 2016, and to the propensity of juvenile fish to prioritize energy storage over somatic growth before a period of prey scarcity, such as their first winter. This dataset is further examined in Chapter 3, wherein I examine variability in condition of individual fish based on the different metrics used. Individual herring are ranked based on their scores from the six different metrics of condition, and the distribution of these rankings are examined to assess the degree of intercorrelation among the metrics. Based on this model, as well as pairwise Spearman rank correlations between the six metrics, I conclude that there is little intercorrelation between metrics, and that a fish that scores highly in terms of condition in any one metric will not necessarily score highly for the other metrics. These findings underscore the importance of choosing condition metrics carefully, based on the nature of the question being asked.