

## Vita

Candidate's name: Travis Ryan Melanson

Universities  
Attended: Université de Moncton (2011)  
Baccalauréat ès Sciences

NSCAD University (2014)  
Master of Fine Arts

University of New Brunswick (2021)  
Masters of Science  
Biology

### Conference Presentations:

October 2018: 11th Annual Atlantic Regional Comparative Physiology Workshop. St. Andrews New Brunswick.

# The Physiological cost of a sub-lethal infection with Infectious Salmon Anemia Virus (ISAV) in wild Atlantic Salmon (*Salmo salar*)

UNIVERSITY OF NEW BRUNSWICK

THESIS DEFENCE AND EXAMINATION

in Partial Fulfillment

of the Requirement for the Degree of  
Master of Science

by

**Travis R. Melanson**

in the Department of Biology

U.N.B., Fredericton, N.B.

**Tuesday, August 24<sup>th</sup>, 2021**  
**9:00 a.m.**

Via MS TEAMS

Examining Committee

Dr. Tillmann Benfey  
Nellie Gagné HRA  
Dr. Amber Garber HRA  
Dr. Kenneth Seaman  
Dr. Shawn MacLellan

Co-Supervisor  
Co-Supervisor  
Internal Examiner  
External Examiner  
Chair of Oral Examination

## Abstract

Infectious Salmon Anemia Virus (ISAV) is an important pathogen affecting farmed Atlantic salmon and infectious to wild salmon. Wild Atlantic salmon in the outer Bay of Fundy of Canada's East Coast is an important component of biodiversity in aquatic ecosystems and has been endangered since 2010. Here, the effects of sub-lethal ISAV infection are quantified in wild-type Atlantic salmon (Tobique River strain) using an ISAV strain first isolated in Nova Scotia, Canada, in 2012. All fish were intraperitoneally injected with the virus or sham-injected with physiological saline, and anemia caused by ISAV was assessed at intervals using red blood cell count, hematocrit, and hemoglobin concentration. The effects of ISAV on metabolic rates at peak infection (16 days post-infection; DPI) and post-peak infection (30 DPI) were measured using whole-tank intermittent stop-flow respirometry to obtain post-stress aerobic metabolic scope (PSAMS) and excess post-stress oxygen

consumption rates (EXPOC) using a 2-minute net chase as the stressor. Analysis of ISAV infected fish showed that they did not develop anemia. Respirometry results indicated that even with lack of anemia, ISAV at sub-lethal relative viral loads ( $10^{4.48}$  –  $10^{4.77}$  RNA copies) did not compromise aerobic metabolism and recovery of host fish post-acute chasing stress. In a separate experiment, ISAV challenged fish kidney tissue was sampled at 7, 17, and 78 DPI with respective relative viral loads of  $10^4$  RNA copies,  $10^5$  RNA copies, and  $10^{3.08}$  RNA copies to assess the effects of sub-lethal ISAV infection on the protein synthesis/degradation cycle. Anemia was observed at 17 DPI in ISAV infected fish for this experiment, and protein synthesis rates were higher in ISAV+ fish compared to shame-injected controls at 7 DPI ( $7.51 \pm 1.75$  %/day;  $p = 0.001$ ) and 17 DPI ( $7.65 \pm 1.73$  %/day (ISAV+);  $p = 0.06$ ).