

University of Prince Edward Island

Faculty of Veterinary Medicine
Summary of Dissertation

Submitted in Partial Fulfilment
of the Requirements for the

DEGREE OF DOCTOR OF PHILOSOPHY

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Estimating the dispersal of *Lepeophtheirus salmonis* using routine counts among aquaculture sites in southwest New Brunswick

Sea lice *Lepeophtheirus salmonis* requires intense management practices for the Atlantic salmon aquaculture industry in the Bay of Fundy, New Brunswick (NB). This dissertation aims to improve the knowledge of the dispersal of *L. salmonis* (commonly referred to as salmon lice) in the study area, which may aid in planning decisions for sea lice mitigation strategies using monitoring counts from the Fish-iTrends© database. The biology, history, and trends of sea lice counts and treatments were described to identify possible confounding factors that may be important during the model-building process. The impact of the internal and external infestation pressures on the abundance of adult female (AF) sea lice for the Bay of Fundy, NB, for 2009- 2018 was estimated using a multivariable linear mixed model. This model was used to compare different connectivity measures of dispersal distance and assess their impact when calculating external infestation pressure on modelling the AF sea lice abundance. A multivariable autoregressive model for the abundance of AF sea lice was built for 2016-2021 and employed for short-term predictions at the end of the summer of 2020. The multivariable linear mixed model and the multivariable autoregressive model were compared using an overlapping subset of the datasets (2016-2018). The estimations of infestation pressures, dispersal distance and other predictors, and results from the generation of novel connectivity measures may have implications for the management of the NB aquaculture industry. The results suggest that the current area-wide management structure may need to be revised, and synchronizing mitigation strategies within and among sites could reduce infestation pressure.

Publications

Parent, M. I., Stryhn, H., Hammell, K. L., Fast, M. D., Grant, J., and Vanderstichel, R. (2021). Estimating the dispersal of *Lepeophtheirus salmonis* sea lice within and among Atlantic salmon sites of the Bay of Fundy, New Brunswick. *Journal of Fish Diseases*, 44(12), 1971-1984. <https://doi.org/10.1111/jfd.13511>

Parent, M. I., Stryhn, H., Hammell, K.L., Grant, J., and Vanderstichel, R. (2023). Estimation and comparison of connectivity measures for the dispersal of *Lepeophtheirus salmonis* sea lice among Atlantic salmon farms in the Bay of Fundy, New Brunswick, Canada. [Manuscript submitted for publication]. Department of Health Management, Atlantic Veterinary College, University of Prince Edward Island.

Parent, M. I., Stryhn, H., Hammell, K. L., Grant, J., and Vanderstichel, R. (2023). Methods for the derivation of connectivity measures for the dispersal of sea lice. [Manuscript submitted for publication]. Department of Health Management, Atlantic Veterinary College, University of Prince Edward Island.

Parent M. I., Stryhn, H., Vanderstichel, R. 2023. Predicting the dispersal of *Lepeophtheirus salmonis* in the Bay of Fundy, New Brunswick. [in preparation]. Department of Health Management, Atlantic Veterinary College, University of Prince Edward Island.

Presentations

Parent M. I., Stryhn, H., Hammell, K. L., Vanderstichel, R. 2023. "Time-series analysis of *Lepeophtheirus salmonis* among New Brunswick salmon farms (2016 to 2021)." Aquaculture America 2023 International Conference & Exposition, New Orleans, Louisiana, USA. (Oral – International Conference)

Parent, M. I., Stryhn, H., Vanderstichel, R. 2022. "Time-series analysis of sea lice among New Brunswick salmon farms (2016 to 2021)." UPEI Graduate Studies and Research Conference, Charlottetown, PEI, Canada. (Oral – Institutional Seminar)

Parent, M. I., Stryhn, H., Hammell, K. L., Vanderstichel, R. 2022. "Estimating the dispersal of *Lepeophtheirus salmonis* sea lice within and among Atlantic salmon sites using multiple distance measures." 16th International Symposium of Veterinary Epidemiology and Economics in Halifax, NS, Canada. (Oral – International Conference)

Parent, M. I., Stryhn, H., Hammell KL, Fast MD, Grant J, Vanderstichel, R. (2021). "The dispersal of *Lepeophtheirus salmonis* within and among New Brunswick Atlantic salmon farms." UPEI Graduate Studies and Research Conference, Charlottetown, PEI, Canada. (Oral – Institutional Seminar)

Parent, M. I., Stryhn, H., Vanderstichel, R. (2021). "Use of Fish-iTrends data (2009 to 2018) to demonstrate sea lice abundance trends and enable modelling techniques to investigate dispersal patterns among Atlantic salmon farms in the Bay of Fundy, New Brunswick." Atlantic Canada Fish Farmers Association Research Meeting (Oral – Industry Seminar)

Parent, M. I., Stryhn, H., Vanderstichel, R. (2021). "The dispersal of *Lepeophtheirus salmonis* within and among New Brunswick Atlantic salmon farms." Canadian Emerging Veterinary Scholars Summit. University of Calgary Faculty of Veterinary Medicine. (Oral – National Conference)

Parent, M. I., Stryhn, H., Hammell KL, Vanderstichel, R. 2019. "Making the connection: Investigating salmon lice infestation at multiple salmon farms in Bay of Fundy, New Brunswick." Aquaculture Canada 2019 Conference and Tradeshow, Victoria, BC, Canada. (Oral – National Conference)

Parent, M. I., Stryhn, H., Vanderstichel, R. 2019. "Making the connection: Investigating salmon lice infestation at multiple salmon farms in Bay of Fundy, New Brunswick." UPEI Graduate Student Research Conference, Charlottetown, PEI, Canada. (Oral – Institutional Seminar)

Parent, M. I., Vanderstichel, R., Stryhn, H. 2018. "Assessing transmission patterns of sea lice among salmon farms." UPEI Graduate Student Research Days, Charlottetown, PEI, Canada. (Oral – Institutional Seminar)

Parent, M. I., Vanderstichel, R., Stryhn, H. 2018. "Estimation of Atlantic salmon age (stocking year) for sea lice modelling." Benthic Ecology Workshop, St. Andrews, New Brunswick, Canada. (Oral – Industry Seminar)

Parent, M. I., Vanderstichel, R., Stryhn, H. 2018. "Assessing transmission patterns of sea lice among salmon farms." Conference of Dalhousie Oceanography Graduate Students, Halifax, NS, Canada. (Oral – Institutional Conference)

Awards

3rd best student presentation, United States Aquaculture Society (USAS), Aquaculture America, New Orleans, Louisiana, NS
2nd best student abstract, United States Aquaculture Society (USAS), Aquaculture America, New Orleans, Louisiana, NS
Student Presentation Award, ISVEE 16, Halifax, NS, Canada
CERC Early Career Development Grant, Canada Excellence Research Chair (CERC) Grants Program
UPEI Doctoral Research Support Program

Biographical Data

Born in Montreal, Quebec