

Vita

Candidate's name: Allen Derek Beck

Universities
Attended: University of New Brunswick (2014)
Bachelors of Science

University of New Brunswick (2021)
Masters of Science
Biology

Publications / Conference Presentations:

Beck, A.D., and Barbeau, M.A. 2017. Spatiotemporal patterns of the marine pulmonate snail *Melampus bidentatus* in Atlantic Canadian salt marshes. Oral presentation at Benthic Ecology Meeting.

Beck, A.D., Reimer, A.R., and Barbeau, M.A. 2018. The marine pulmonate snail *Melampus bidentatus* is found throughout the salt marsh in its northern range. Oral presentation at Atlantic Canada Coastal and Estuarine Science Society.

Boone, L.K., Ollerhead, J., Barbeau, M.A., Beck, A.D., Sanderson, B.G., and McLellan, N.R. 2017. Returning the tide to dikelands in a macrotidal and ice-influenced environment: Challenges and lessons learned. In Finkl, C.W. and Makowski, C. (eds.), *Coastal Wetlands: Alteration and Remediation*. Springer. pp 705 – 749.

Virgin, S.D.S., Beck, A.D., Boone, L.K., Dykstra, A.K., Ollerhead, J., and Barbeau, M.A. 2020. A managed realignment in the upper Bay of Fundy: Community dynamics during salt marsh restoration over 8 years in a megatidal, ice-influenced environment. *Ecological Engineering* 149: 105713.

The Ecological role of the Common Salt Marsh Snail, *Melampus Bidentatus* in its Northern Range, Maritime Canada

UNIVERSITY OF NEW BRUNSWICK

THESIS DEFENCE AND EXAMINATION

in Partial Fulfillment

of the Requirement for the Degree of
Master of Science

by

Allen D. Beck

in the Department of Biology

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

Thursday, May 20th, 2021
9:00 a.m.

via MS TEAMS

Examining Committee

Dr. Myriam Barbeau
Dr. Mark Sherrard
Dr. Loïc D'Orangeville
Dr. Shawn MacLellan

Supervisor
Internal Examiner
External Examiner
Chair of Oral Examination

Abstract

The gastropod *Melampus bidentatus* can be an abundant macroinvertebrate and omnivore-detritivore in Maritime Canadian salt marshes, near the species' northern range limit, and is among the most abundant macroinvertebrates throughout the rest of its range in Atlantic US salt marshes. Despite this abundance, the snail is said be of limited importance to the breakdown of marsh detritus in US salt marshes due to its restricted distribution within a marsh. However, my sampling showed that *M. bidentatus* snails occur throughout the salt marsh in the Northumberland Strait (in Maritime Canada). This implies that *M. bidentatus* has the potential to be an important force driving growth and breakdown of salt marsh grasses at north temperate latitudes. Through sampling and various field experiments, I examined details of and tested possible underlying mechanisms for the snails' within-marsh spatial distribution, the population structure of the snails, and the effect of snail density on *Spartina* plant and fungal dynamics in Maritime Canadian salt marshes. Investigation of snail survival (using tethering assays) and movement (using mark-recapture trials) indicated that mortality was very low independent of marsh location,

and movement was randomly oriented and circuitous, generally maintaining snails in local areas; both these mechanisms are consistent with the snails' unrestricted distribution within marsh. In a field enclosure experiment manipulating snail density, *Spartina* grass tended to have more rapid stem growth and self-thinning cycles, and to reach greater canopy heights in the absence of snails than in their presence. Furthermore, higher snail densities led to decreased aboveground dead grass biomass and often decreased fungal biomass (as quantified via ergosterol content) at the end of the plant growing season (September). However, at the end of the fungal decomposition season (November), enclosures that had higher snail densities tended to have higher fungal abundance. Despite low statistical power to detect effects of snail densities because of high natural variation and low replication, the results suggested that snails may negatively affect live grass dynamics, contribute to the processing of dead plant biomass, consume fungi occurring on *Spartina* plants, as well as possibly stimulate fungal growth. My study is an important contribution in determining the relationship between *M. bidentatus* and the growth and health of salt marshes in Maritime Canada.