

Rebecca Tory Batstone, M.Sc.

PhD Candidate in the Frederickson Lab
Department of Ecology and Evolutionary Biology
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Education

Doctorate of Science
Sept 2012 – Present

Department of Ecology and Evolutionary Biology (EEB), University of Toronto (U of T)

- PhD supervisor: **Dr. Megan Frederickson**, Associate Professor, Dept. EEB, U of T
- PhD committee: **Dr. John Stinchcombe** and **Dr. Arthur Weis**
- Required courses completed in April 2013 with a GPA of 4.00
- Candidacy achieved in Oct 2014 (written proposal, public seminar, and oral defense)



Master of Science
May 2010 – Sept 2012

Department of Biology, Memorial University of Newfoundland (MUN)

- Masters supervisor: **Dr. Suzanne Dufour**, Assistant Professor, Dept. Bio., MUN
- Masters committee: **Dr. Paul Snelgrove** and **Dr. Duncan McIlroy**
- Required masters courses completed in December 2010 with a GPA of 4.00

Bachelor of Science (Honors)
Sept 2006 – May 2010

Major in Biology, Memorial University of Newfoundland (MUN), Honours Program

- Specification: Marine biology
- Honour's project supervisor: **Dr. Paul Snelgrove**, Ocean Sciences Center, MUN



(Last updated: October 24, 2017)

Academic Contributions

Published manuscripts:

- Batstone, R. T., Dutton, E. M., Wang, D., Yang, M., & Frederickson, M. E. (2016). The evolution of symbiont preference traits in the model legume *Medicago truncatula*. *New Phytologist*. DOI: 10.1111/nph.14308. **[Impact factor = 7.672]**
- Batstone, R. T., & Dufour, S. C. (2016). Closely related thyasirid bivalves associate with multiple symbiont phylogenotypes. *Marine Ecology*, 37(5), 988-997. **[Impact factor = 1.138]**
- Laurich, J. R., Batstone, R. T., & Dufour, S. C. (2015). Temporal variation in chemoautotrophic symbiont abundance in the thyasirid bivalve *Thyasira* cf. *gouldi*. *Marine Biology*, 162(10), 2017-2028. **[Impact factor = 2.391]**
- Dufour, S. C., Laurich, J. R., Batstone, R. T., McCuaig, B., Elliott, A., & Poduska, K. M. (2014). Magnetosome-containing bacteria living as symbionts of bivalves. *The ISME Journal*, 8(12), 2453-2462. **[Impact factor = 9.302]**
- Batstone, R. T., Laurich, J. R., Salvo, F., & Dufour, S. C. (2014). Divergent chemosymbiosis-related characters in *Thyasira* cf. *gouldi* (Bivalvia: Thyasiridae). *PLoS One*, 9(3), e92856. **[Impact factor = 3.234]**

Manuscripts in review:

- Batstone, R. T.*, Carscadden, K. A.*, Afkhami, M. E., Frederickson, M. E. Using niche breadth theory to explain generalization in mutualisms. Accepted with revisions in *Ecology* **[Impact factor = 4.809]** on 13Oct2017, manuscript ID: ECY17-0832

* Joint first-authorship

Oral presentations:

PhD research -

- Batstone, R. T., & Frederickson, M. E. (2017). Rapid evolution of nodulation and partner quality in a legume-rhizobium mutualism. The Biology and Economics of Mutualism Workshop, Nov 1-3, Ploen, Germany.
- Batstone, R. T., & Frederickson, M. E. (2017). Experimentally evolving more cooperative symbionts using the legume-rhizobium mutualism. Canadian Society for Ecology and Evolution, May 7-11, Victoria, British Columbia, Canada.
- Batstone, R. T., Dutton, E. M., Wang, D., Yang, M., Ahmad, A., & Frederickson, M. E. (2016). Root foraging and mutualism-stabilizing traits in *Medicago truncatula*. Canadian Society for Ecology and Evolution, July 7-11, Memorial University, Newfoundland, Canada. **[Won 1st place for best student oral presentation (\$500)]**
- Batstone, R. T., Wang, D., Yang, M., Ahmad, A., & Frederickson, M. E. (2016). Root foraging and mutualism-stabilizing traits in *Medicago truncatula*. Ontario Ecology, Ethology, and Evolution Colloquium, May 5-7, University of Toronto, Toronto, Canada.
- Batstone, R. T., Wang, D., Yang, M., Ahmad, A., & Frederickson, M. E. (2016). Root foraging and the evolution of mutualism stabilizing traits in the model legume *Medicago truncatula*. Atwood Colloquium, April 15-16, University of Toronto, Toronto, Canada.
- Batstone, R. T., Wang, D., Yang, M., Ahmad, A., & Frederickson, M. E. (2016). Root foraging and mutualism stabilizing traits are not genetically correlated in the model legume *Medicago truncatula*. American Society of Naturalists meeting, Jan 9-14, Asilomar, California, USA.
- Batstone, R. T., Wang, D., Yang, M., Ahmad, A., & Frederickson, M. E. (2015). Root foraging and mutualism stability in the model legume *Medicago truncatula*. Evolution Conference, June 26-30, Guarujá, Brazil.
- Batstone, R. T. (2013). Two-minute thesis challenge. The Atwood Colloquium, April 12-13, 2013. University of Toronto, Toronto, Canada.

Masters research -

- Dufour S. C., Batstone R. T., Laurich J. R., Salvo F., McCuaig B., & Zanzerl H. (2014). Behaviour and host-symbiont relationships in thyasirid bivalves. International symposium "The animal within the shell: the importance of studying live molluscs". March 4-5, University of Copenhagen, Copenhagen, Denmark.
- Dufour, S. C., Batstone, R. T., & Zanzerl, H. (2013). A conceptual model of chemosymbiosis evolution in the Thyasiridae. World Congress of Malacology, July 20-28, Ponta Delgada, Azores, Portugal.

- Dufour, S. C., & Batstone, R. T. (2012). The sulphide mining activities of chemosymbiotic thyasirid bivalves. *Ichnia* Aug 9-24, St John's, Newfoundland, Canada.
- Batstone, R. T., Laurich, J. R., & Dufour, S.C. (2012). Uncovering a species complex of thyasirid clams (*Bivalvia*: *Thyasiridae*) from a subarctic fjord in Bonne Bay, Newfoundland. 1st Joint Congress on Evolutionary Biology, July 6-10, Ottawa, Canada.
- Batstone, R. T., Laurich, J. R., & Dufour, S. C. (2012). The Gouldi Complex: Uncovering a species complex of thyasirid clams (*Bivalvia*: *Thyasiridae*) using morphological and molecular characteristics. Biology Graduate Student Symposium, April 18-19, Biology Department, Memorial University, Newfoundland, Canada.
- Batstone, R. T. (2011). Understanding the ecology and evolution of thyasirids (*Bivalvia*: *Thyasiridae*) from organically enriched habitats in Newfoundland. Aldrich Interdisciplinary Conference, Feb 22-23, Memorial University, Newfoundland, Canada
- [Won the Student Affairs and Services Award for Research in Sustainability (\$600)]**

Poster presentations:

- Batstone, R. T., & Frederickson, M. E. (2014). Nitrogen foraging by *Medicago truncatula* roots promotes cooperation with rhizobia. *Genomes to/aux Biomes*, 25-29 May, Montreal, Canada.
- Batstone, R. T., & Frederickson, M. E. (2013). A preliminary investigation of nitrogen foraging and host sanctions by *Medicago truncatula*: does a positive genetic correlation exist? 3rd annual Yosemite Symbiosis Workshop, May 25-26, 2013, Sierra Nevada Research Institute, California.
- Batstone, R. T., & Dufour, S. C. (2011). The relationship between thyasirid (*Bivalvia*: *Thyasiridae*) ventilation behavior and sediment redox cycles. 2011 Third Nereis Park Conference, Kristineberg Marine Research Station, Fiskebackskil, Sweden.
- Batstone, R. T., & Dufour, S. C. (2011). Host-specificity and co-evolution between thyasirid clams (*Bivalvia*: *Thyasiridae*) and sulphur-oxidizing bacterial symbionts from organically enriched habitats in a sub-arctic Newfoundland fjord. 2011 Canadian Society of Microbiologists Conference, St. John's, Newfoundland, Canada.

Theses:

- Batstone, R. T., & Dufour, S. C. (2012). Understanding the evolution of thyasirid clams (*Bivalvia*: *Thyasiridae*) from a subarctic fjord in Bonne Bay, Newfoundland. M.Sc. Thesis. Memorial University of Newfoundland, 149 pp.
- Batstone, R. T., & Snelgrove, P. V. R. (2010). Behavior and temperature-dependent growth of the larval lobster (*Homarus americanus*). B.Sc. (Hons) Thesis. Memorial University of Newfoundland, 44 pp.

Laboratory manuals:

- Batstone, R. T. (2014). Co-author of Chapter 2 - *Medicago*-Rhizobia Mutualism) in Wheeler, J. (2014). *BIO220: From Genomes to Ecosystems in a Changing World*. Laboratory Manual Winter 2014. Department of Ecology and Evolutionary Biology, University of Toronto

Academic reports:

- Batstone, R. T. (2014). Mutualism stability and variation in the legume-rhizobium symbiosis. Proposal in partial fulfillment of PhD Appraisal Exam, University of Toronto, 45 pp.
- Batstone, R. T. (2010). The distribution of thyasirids (*Bivalvia*: *Thyasiridae*) and the abundance and diversity of other bivalves in relation to environmental factors: a bivalve survey conducted in Bonne Bay, Newfoundland. Masters course report (BIOL 7535), 25 pp.
- [Used as an example of a graduate report with research conducted in Bonne Bay]**

Research Scholarships

- 2017
Ontario Graduate Scholarship (**\$15,000**) [Sept]
- 2016
Ontario Graduate Scholarship (**\$15,000**) [Sept]
- 2015
Ontario Graduate Scholarship (**\$15,000**) [Sept]
- 2014
Zimmerman-Weis Award in Ecology and Evolutionary Biology (**\$4,750**) [Sept]
For being recognized as an excellent EEB student who conducted a substantial part of their research in a given year at the Koffler Scientific Reserve
- 2011
RDC Ocean Industries Student Research Awards (**\$13,333**) [Sept]
For Master's research involving the evolution of marine clams
- 2009
Centenary of Responsible Government Scholarship (**\$1,000**) [Sept]
For graduating my B.Sc. degree with academic excellence
- 2006
MUN Endowment Fund Scholarship (**\$2,000**) [Sept]
For graduating high school with over a 90% average

Awards and Recognition

- 2017
Harold Harvey Travel Grant (**\$400**) [May]
H.H. Harvey Prize (**\$500**) [Apr]
Grant D. Darker Memorial Award (**\$711**) [Jan]
Lillian Elfeda Darker Award (**\$789**) [Jan]
- 2016
1st place oral presentation at CSEE2016 conference (**\$500**) [Jul]
Runner up for Ramsay Wright Award, for exceptional contribution to the EEB Dept. [Apr]
Harold Harvey Travel Grant (**\$400**) [Feb]
Frederick P. Ide Graduate Award in Ecology and Evolutionary Biology (**\$500**) [Jan]
- 2015
Harold Harvey Travel Grant (**\$400**) [Jul]
Center for Global Change Science Graduate Student Award Program (**\$1,831**) [May]
Travel grants awarded for travel to Guaruja, Brazil to give an oral presentation at the Evolution conference

- Reino S. Freeman Fellowship Graduate Award in EEB (**\$3,055**) [Jan]
- 2014
- Harold Harvey Travel Grant (**\$400**) [Jun]
 Travel grant awarded for travel to Montreal, Canada to present a poster at the CSEE Genomes to Biomes Conference
- Outstanding Teaching Assistant Award in BIO220 [Apr]
 Out of 25 TA's teaching BIO220 this year, I was evaluated by 47 undergraduate students as being one of the top most effective instructors
- Jokers Hill Graduate Award (**\$1,548**) [Jan]
- Frederick P. Ide Graduate Award in Ecology and Evolutionary Biology (**\$1,166**) [Jan]
- 2013
- School of Graduate Studies Conference Grant (**\$500**) [May]
- Harold Harvey Travel Grant (**\$400**) [June]
 For travel to Yosemite Symbiosis Workshop in California, USA
- Donald A. Chant Scholarship in Ecology and Evolutionary Biology (**\$2,800**) [Jan]
- 2011
- Student Affairs and Services Award for Research in Sustainability (**\$600**) [Feb]
 1st place oral presentation at the 2011 Aldrich Interdisciplinary Conference at MUN
- 2008
- Faculty of Science Dean's List [Sept]
 For being an Honors student with an overall course average of 80% and a full-time course load (five or more course per semester) for both fall and winter semesters

Teaching and Mentorship

Teaching Assistantships

2010 – Present

- Genomes to Ecosystems (BIO220), lab instructor for **six terms** starting Winter 2013, U of T
- Adaptation and Biodiversity (BIO120), lab instructor for **five terms** starting Fall 2012, U of T
- Plant-Animal Interactions (EEB440), teaching assistant (Fall 2014), U of T
- Benthic Biology (BIOL 3712), field course assistant (Spring 2012), MUN
- Marine Biology (BIOL 4810), field course assistant (Spring 2011), MUN
- Biology of the Vertebrates (BIOL 2210), lab instructor (Winter 2011), MUN
- Principles of Marine Biology (BIOL 3711), lab instructor (Fall 2010), MUN

Undergraduate mentoring and supervision (UofT)

2012-Present

- Supervised 11 students during the completion of several independent research projects (ROP299[3], EEB397[4], EEB498[1], CGSC summer intern[2], summer research assistant[1])
- Read and evaluated CV's, conducted interviews, and supervised over 16 work-study students from 2013-present.
- Over 50 volunteers assisted me with experimental set-up and harvesting plants for data collection (2012-Present)

Panelist at the Careers in Research in Ecology and Evolution workshop

Sept 2014

- I was contacted by an EEB professor (Dr. Asher Cutter) to represent the EEB graduate students at U of T by participating in a round table discussion regarding academic careers in Ecology and Evolution

Guest Speaker for the course “Research Issues in Ecology and Evolutionary Biology” (EEB488)
Mar 2014

- I was contacted by an EEB professor (Dr. Asher Cutter) to participate in a discussion session held for U of T undergraduate students who were interested in pursuing academic careers in the future.

Guest Lecturer for Community Ecology (EEB321) at the University of Toronto
Sept 2013

- I was contacted by an EEB professor (Dr. Martin Krkosek) to give a full-hour lecture on Mutualisms to undergraduate students enrolled in the Community Ecology course at U of T

Presenter at the Careers in Research in Ecology and Evolution workshop
Sept 2012 & 2013

- Along with other graduate students in my department, I presented a poster at a workshop attended by the top undergraduate students from across Canada to promote the research my labs is currently conducting.

Student mentoring and supervision (MUN)
2007-2010

- Assisted numerous students in the Women in Science and Engineering (WISE) Program at the OSC as they conducted research on harp seals (Summer 2009)
- Assisted students in the Memorial Undergraduate Career Experience Program (MUCEP) at the Ocean Sciences Center as they conducted research on lobster larvae (Summer 2007 & 2008).

Les Mills® Group Exercise Instructor
2011 – Present

- BODYFLOW® instructor associated with Good Life Fitness across Canada. This position provides rigorous experience in instruction and other public-centered activities.
- Fitness Instructor Specialist (FIS) certification received in spring 2012 through CanFitPro

Additional Research Experience

Research Assistant – Marine Benthic Ecology Lab
2009 – 2010

- Full-time position involving research on commercially-relevant pelagic and benthic organisms, including Atlantic Cod (*Gadus morhua*) and Lobster (*Homarus americanus*).
- Responsibilities: plankton sample preparation, egg enumeration for neuston net survey, daily data logging, and independent research (Honors project).
- MUN Undergraduate Career Experience Program (MUCEP) held in December 2009 in addition to the full-time position
- Supervisor: **Dr. Paul Snelgrove**, Ocean Sciences Center, MUN

Research Assistant –Harp Seal Lab, Ocean Sciences Center
2007 – 2009

- Full-time position held in summers 2007 & 2008, supervised by **Daryl Jones**
- Responsibilities: daily monitoring and cognitive training of seals, animal husbandry and food preparation, including daily enrichment, weekly blood samples drawn for hormonal assays as well as weights and vibrissae measurements taken.

- MUCEP position held in 2007 in addition to full-time position

Academic Service

Within the University of Toronto (2012-Present):

Atwood Colloquium Volunteer

- Helped set-up food/drinks for breaks during the event

Ecology and Evolutionary Biology External seminar series poster designer and distributor 2016-2017

- I design the posters for invited speakers and send them out to the various campuses for distribution

Ecology and Evolutionary Biology Graduate Student Association (EGSA) Treasurer 2015-2016

- I dealt with all paperwork related to the finances of the association

Atwood Colloquium Organizer Spring 2015

- I was appointed by two professors (Dr. Ben Gilbert and Dr. Nicole Mideo) to be the head organizer for the largest annual event our department holds, the Atwood Colloquium, taking place in the spring (2015).

EGSA Secretary 2014-2015

- I attend all EGSA meetings and send out meeting minutes to grad students who were unable to attend the meetings

Participant in Thank you video for University of Toronto Annual Fund donors Nov 2014

- I was recommended by an EEB professor (Dr. John Stinchcombe) as a U of T student “whose level of academic achievement and engagement in the community surrounding the Department of Ecology and Evolutionary Biology is outstanding”, and was contacted by Joseph Tigar (Media Coordinator on the OISE Student Teacher's Union) to take part in filming for a thank you video for U of T's fund donors.

Fundraising Representative 2013-2014

- I was in charge of all fundraising activities (i.e., Lab Coat Sales, Charity Raffle, et c.) during the academic year.
- Additionally, I conducted a department-wide vote to donate money to the Philippines Disaster Fund. We ended up donating around \$400 dollars to the charity in Dec 2013.

Charity Raffle Committee 2012-2014

- 2014: I acted as member of the committee (see above description for duties), and raised funds for the Toronto Wildlife Center

- 2013: I was the main organizer for the Charity Raffle Committee, which was part of being the Fundraising Rep. (see description above).
- 2012: I acted as a member of the committee to help raise money for Ontario Nature

Atwood Lecture Committee

Sept-Dec 2012

- I researched and summarize the significant contributions of prestigious nominees selected to give the “Atwood Lecture” at the 2013 Graduate Colloquium at the University of Toronto. After voting, the chosen lecturer was Professor Joanna Schmitt from University of California, Davis.
- Note: this committee is completely separate from the Atwood Colloquium Committee (see above).

Within Memorial University of Newfoundland (2010-2012):

Volunteer at the Aldrich Interdisciplinary Conference

Feb 2012

- I was responsible for manning the information desk, and setting up schedules for the annual conference held at Memorial University. Note: this was a university-wide interdisciplinary conference in which grad students from both within and outside the university presented their research.

Student Code of Conduct Appeals Committee

2011-2012

- Along with faculty and staff of my department, I represented other graduate by reviewing and discussing student appeals brought forward to the University President about a particular issue.

Graduate Program in Teaching

Sept – Dec 2011

- I attended weekly seminars, classes taught by teaching supervisor (Dr. Suzanne Dufour), and gave three one-hour lectures in class of teaching supervisor. Course taught: Principles of Marine Biology (BIOL 3711).

Guest Lecturer for Benthic Biology at the Bonne Bay Marine Station, Newfoundland

May 2010

- I was invited by the Director of the Bonne Bay Marine Station (Dr. Robert Hooper) to present two full-hour lectures to undergraduate students enrolled in the “Marine Research Field Course” course (BIO4810).

Non-Departmental:

Symposium co-organizer for Canadian Society of Ecology and Evolution 2017 Conference

Nov 2016-May 2017

- Co-wrote symposium proposal, contacted invited speakers, and put together schedule

Registration desk assistant and talk monitor

June 2015

- Evolution Conference in Guaruja, Brazil

Let’s Talk Science Challenge and FunHouse

May 2014

- Created an activity booth based on our lab’s research on mutualisms to get kids from grades 6-8 engaged with science-related activities and ideas.

Let’s Talk Science Outreach Program

2010 – 2012

- Led hands-on activities in elementary schools around Newfoundland and Labrador in order to promote science, engineering, and technology to kids of age 6-10.

Seal Program at the Ocean Sciences Center, Newfoundland

2004-2006

- I provided husbandry for five harp seals, including daily enrichment activities and cognitive training, and assisted researchers with data collection.

Additional Education and Training

- Science Communication Workshop (with Jennifer Carpenter, Science Journalist) 2015
- SciNet “Intro to Research Computing with Python” 2015
- Canadian Bioinformatics Workshop on “Informatics for High-throughput Sequencing Data” 2015
- Laboratory Biosafety Training (Risk groups 1-3) 2014
- Standard First Aid/ CPR-C/ AED 2012
- CPR-A & AED (re-certified annually) 2012-2016
- Graduate Program in Teaching Certificate 2011
- Graduate Research Integrity Program (GRIP) completed through MUN 2010
- Phytoplankton workshop completed at the Ocean Sciences Center 2009
- Workplace Hazardous Materials Information System (WHMIS) 2008
- Laboratory Safety workshops completed at MUN 2008
- “Marine Pursuits” summer program at MUN 2004
- Scuba Diving PADI Open Water Certificate 2003

Professional Societies

Memberships:

- American Society of Naturalists, Jan 2016 - Present
- Canadian Society for Ecology and Evolution, March 2014 – Present
- AAAS/Science Magazine, Oct 2013 – Present (sponsored membership)
- Society for the Study of Evolution, February 2012 – Present
- Canadian Society of Microbiology, April 2011 – 2012

Reviewer Contributions

I have reviewed for manuscripts in the following academic journals:

- American Journal of Botany (2015, 2016)
- Evolution (2016)
- Journal of Ecology (2016)
- New Phytologist (2016)
- Oecologia (2017)
- The American Naturalist (2017)
- Molecular Ecology (2017)

You can see my full review history at: <https://publons.com/author/1230133/rebecca-batstone#profile>