

# Jantina Toxopeus, Ph.D.

Assistant Professor, Department of Biology

St. Francis Xavier University, 2321 Notre Dame Ave, Antigonish NS, B2G 2W5, Canada

(902) 867-2665 | [jtoxopeu@stfx.ca](mailto:jtoxopeu@stfx.ca) | <https://jantinatoxopeus.com>

## Summary

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I am an assistant professor at St. FX University, where I run a research program on the cell and molecular biology of insect freeze tolerance and teach courses on zoology and cell biology. I have modern pedagogical training and a background in educational development. I am an active member of societies that promote science networking opportunities for early career researchers, including the Canadian Society of Zoologists (CSZ) and Science Atlantic.

Current research funding: Research Nova Scotia, Canadian Foundation for Innovation, St. FX

Publications: 17 total peer-reviewed articles, 13 published in the last five years

Publication impact: 296 citations in the last five years (source: Google Scholar), *h*-index: 9

## Academic Positions

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2020-present **Assistant Professor**, *St. Francis Xavier University*, Antigonish, NS

2018-2020 **Postdoctoral Fellow**, *University of Colorado*, Denver, CO

Advisor: Dr. Gregory Ragland

## Education

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2014-2018 **Ph.D. Biology**, *Western University*, London, ON

Advisor: Dr. Brent Sinclair

2011-2014 **M.Sc. Biology**, *Dalhousie University*, Halifax, NS

Advisor: Dr. Thomas MacRae

2007-2011 **B.Sc. Honours Biology**, *St. Francis Xavier University*, Antigonish, NS

Advisors: Dr. Stephen O'Leary (National Research Council) and Dr. David Garbary

## Pedagogical Training

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2016 **Instructional Skills Workshop**, *Western University*, London, ON

2015 **Advanced Teaching Program**, *Western University*, London, ON

2011-2013 **Certificate in University Teaching & Learning**, *Dalhousie University*, Halifax, NS

## Research Grants

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- 2021 Nova Scotia COVID-19 Health Research, *Research Nova Scotia* (67,500 CAD)  
Project: Wastewater Surveillance of SARS-CoV-2 in Nova Scotia  
Co-applicants: Dr. Russell Wyeth, Dr. Tammy Rodela (St. FX University)  
Collaborators: Dr. Graham Gagnon, Dr. Amina Stoddart (PIs; Dalhousie U.),  
 Dr. Jennie Rand (Acadia U.), Dr. Allison Mackie (Cape Breton U.)
- 2020 John Evans Leaders Fund, *Canadian Foundation for Innovation* (460,000 CAD)  
Project: Laser scanning confocal microscope for cellular studies of biofouling,  
 neuroanatomy, symbiosis and freeze tolerance  
Co-applicants: Dr. Russell Wyeth, Dr. Cory Bishop (St. FX University)
- 2020 Start-Up Funding, *St. FX University* (27,000 CAD)
- 2015 Michael Smith Foreign Study Supplement, *NSERC* (3,195 CAD)  
Project: Metabolomics of the freeze-tolerant spring field cricket, *Gryllus veletis*  
Collaborator: Dr. Vladimír Košťál (Czech Academy of Sciences, Czech Republic)
- 2015 Theodore J. Cohn Research Grant, *Orthopterists' Society* (500 USD)  
Project: Freeze tolerance of the great grig, *Cyphoderris monstrosa*
- 2014 JEB Travelling Fellowship, *Company of Biologists* (1,800 GBP)  
Project: Physiological and molecular adaptations to extreme climatic conditions in  
 the butterfly *Pieris rapae*  
Collaborators: Dr. Natalia Li (Russian Academy of Sciences, Russia) and  
 Dr. Jesper Sørensen (Aarhus University, Denmark)

## Awards

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- 2020 Best Seminar Presentation, *University of Colorado Postdoctoral Association*
- 2019 Dr. John W. Arnold Fellowship, *Western University Biology* (1,300 CAD)  
 awarded for the best Ph.D. thesis in Biology
- 2017 Inducted into Teacher Hall of Fame, *The Princeton Review*
- 2016 Nominated for Teaching Assistant Award, *Western U. Society of Graduate Students*
- 2013 Best Oral Presentation, *Dalhousie University Patrick Lett Symposium*

## Scholarships

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- 2018 Robert and Ruth Lumsden Graduate Fellowship, *Western U.* (1,500 CAD)
- 2017 Megan J. Davey Ontario Graduate Scholarship (OGS), *Western U.* (15,000 CAD),  
 awarded to top applicant researching in the life sciences at Western University
- 2016 Malcolm Ferguson Award, *Western U. Biology* (1,500 CAD)
- 2015 Ruth Arnold Horner Fellowship, *Western U. Biology* (2,000 CAD)
- 2014 Canada Graduate Scholarship-Doctoral, *NSERC (Natural Sciences and Engineering  
 Research Council of Canada)* (105,000 CAD)
- 2012 Izaak Walton Killam Memorial Scholarship, *Dalhousie University* (20,000 CAD)
- 2011 Julie Payette Award, *NSERC*, (25,000 CAD),  
 one of the top 25 recipients of NSERC M.Sc. scholarship funding

## Courses Taught

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*St. Francis Xavier University*, Antigonish NS

2020-present Introductory Cell Biology (Biol 111)

2021-present Animal Biology (Biol 201)

2021-present Advanced Cell Biology (Biol 395)

*The Princeton Review*, Halifax, NS and London, ON

2013-2018 MCAT Biology

*Dalhousie University*, Halifax, NS

2014 Evolution (Biol 2040)

*Acadia University*, Wolfville, NS

2014 Principles of Development (Biol 3153)

## Mentoring

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### *Undergraduate Students*

#### Supervisor

Trinity McIntyre, *B.Sc. Advanced Major* (2021-present)

#### Advisory Committee Member

Amy Dodge, *B.Sc. Honours* (2020-2021)

Benjamin Fisher, *B.Sc. Honours* (2020-2021)

### *Research Assistants*

#### Co-supervisor

Katherine Rutherford, *Wastewater Technician* (2021-present)

## Educational Leadership

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### *Short Courses Taught*

*The Princeton Review*, Toronto, ON

2015-2020 **MCAT Biology Training** – *Facilitator*

- Trained new instructors to teach the biology component of a course for students intending to write the Medical College Admission Test (MCAT)

*Western University Centre for Teaching and Learning*, London, ON

2016-2018 **Teaching Assistant Training Program** – *Facilitator*

- Topics included best teaching practises for teaching assistants (e.g. effective lesson design, facilitating laboratories, interpersonal communication)
- Participants also delivered two sample lessons (microteaching); I facilitated peer feedback on these lessons in small groups

***Education Workshops Developed***

4. Help, I have to TA! (2016, 2017) Western University, *Biology Graduate Student Orientation*
3. Effective TAing: Challenges and solutions (2016) Canadian Society of Zoologists (CSZ), *Annual Meeting*
2. Thinking like a scientist: Incorporating authentic scientific inquiry into laboratory courses (2015) *Advanced Teaching Program Capstone Project*
1. Teaching in the lab: Making the most of your experience (2012) Dalhousie University, *TA Professional Development Days*

***Invited Panel Presentations***

4. Assessing student learning (2018) Western University, *Spring Conference on Teaching for Graduate Students*
3. Networking at academic conferences (2017) Western University, *Academic and Professional Communication Day*
2. Zoology education in Canada: Current state, changes and moving forward (2017) CSZ, *Annual Meeting*
1. Thriving as a TA: Panel of outstanding TAs (2016) Western University, *TA Day Graduate Conference on Teaching*

**Scholarship of Teaching and Learning**

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***Refereed Conference Presentations***

1. **Toxopeus, J.** and Sinclair B.J. (2017) Thinking like scientist: strategies to measure and improve knowledge structures of biology students. *Western Conference on Science Education (WCSE)*, London, ON. [oral] [national]
  - Also presented at the Western University *Research on Teaching and Learning Symposium*

***Non-Refereed Publications***

1. **Toxopeus, J.** (2013) Undergraduate laboratories: What are we teaching? *Dalhousie Centre for Learning and Teaching FOCUS Newsletter*, 21(2): 7-8.

**Educational Outreach**

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| 2019 | <b>Young Hands in Science Volunteer</b><br>Facilitate hands-on science activities for elementary school children in Denver, CO. Volunteer of the month in March 2019. |
| 2019 | <b>Media Coverage</b><br>Two interviews with CBC radio on the role of cryoprotectants in cricket freeze tolerance (on “Fresh Air” and “All in a Day”)                 |

- 2014-2018 **London Bug Day Volunteer**  
Led activities to educate children about insects in this 1-day annual event jointly hosted by the Western University and the Entomological Society of Ontario.
- 2012/2018 **Community Lecturer**  
Gave public talks on “Life without water: Animals that survive intense desiccation” (Public Library Lecture Series, Halifax NS, 2012) and “Life in the frozen lane: A winter survival guide for insects” (Retiring with Strong Minds, London ON, 2018).
- 2016 **Media Coverage**  
Interview with Western University GradCast on my Ph.D. research (freeze-tolerant crickets), live broadcast on Radio Western (CHRW 94.9).
- 2011-2013 **Let’s Talk Science Rural Outreach Coordinator, Educator**  
Coordinated events focused on hands-on science activities in rural Nova Scotian schools, and recruited and trained volunteers to conduct the activities (2012-13). Facilitated hands-on science activities for school children in Halifax (2011-13).

## Service

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### *Department-Level*

- 2020-present **Science Atlantic - Biology, St. FX Biology Department Representative**  
Represent St. FX University at meetings of this regional organization that plans conferences for undergraduate students in Atlantic Canada. Report to the Biology department at St. FX on any pertinent developments and events.
- 2014-2016 **Biology Graduate Education Committee, Student Representative**  
Conducted survey to solicit student and faculty opinions on the Western U. Biology Graduate Program. Evaluated applications for scholarships and entrance to the program.

### *University-Level*

- 2021 **Evaluation Committee for Undergraduate Summer Research Awards, Member**  
Evaluated approximately 50 student applications for summer research funding in the Faculty of Science in this ad-hoc committee at St. FX University.
- 2016-2018 **Senate Subcommittee for University Teaching Awards, Student Representative**  
Evaluated applications for university-wide faculty teaching awards at Western U.

### *Professional Societies*

- 2021-2024 **Canadian Society of Zoologists (CSZ), Regular Councillor**  
Elected by popular vote to represent member views at biannual council meetings. Contribute to committees and initiatives related to zoology research in Canada.
- 2020 **Women in Science and Engineering (WiSE) Atlantic, Panelist**  
Contributed to panel discussions on job market strategies for postdoctoral fellows at WiSE Atlantic’s “Stepping Forward” workshop for women.

2016-2018 **CSZ**, *Student Councillor*

Elected by popular vote to represent student views at biannual council meetings. Organized student events and managed student section funds at the CSZ annual meeting. Maintained active social media presence on behalf of the society.

## Peer Review

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### *Academic Journals*

*Conducted peer-review for manuscripts from 16 journals*

Agricultural and Forest Entomology	European Journal of Entomology
Austral Entomology	Functional Ecology
BMC Biology	Journal of Economic Entomology
The Canadian Entomologist	Journal of Experimental Biology
Cell Stress and Chaperones	Journal of Insect Physiology
Comparative Biochemistry and Physiology	Journal of Integrative Agriculture
Conservation Physiology	Oecologia
Environmental Entomology	Scientific Reports

### *Research Grants*

*External reviewer for research grants from 2 agencies*

Canadian Food Inspection Agency (CFIA)	Marsden Foundation (New Zealand)
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## Professional Affiliations

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Canadian Society of Zoologists (2014-present), Educational Developers Caucus (2017-2019), Entomological Society of America (2018-present), Entomological Society of Ontario (2014-2018), Orthopterists' Society (2014-2015), Society for Experimental Biology (2015-present), Society for Teaching and Learning in Higher Education (2017-2019)

## Peer-Reviewed Publications

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*17 total, h-index=9, 296 citations since 2016 (source: Google Scholar); trainees underlined.*

17. **Toxopeus, J.**, Gadey, L., Andaloori, L., Sanaei, M. and Ragland, G. (2021) Costs of averting or prematurely terminating diapause associated with slow decline of metabolic rates at low temperature. *Comparative Biochemistry and Physiology A*, 255: 110920.
16. Lebenzon, J.E., **Toxopeus, J.**, Anthony, S.E. and Sinclair B.J. (2021) *De novo* assembly and characterisation of the transcriptome of the Beringian pseudoscorpion. *The Canadian Entomologist*, doi:10.4039/tce.2021.2.
15. Li, N.G., **Toxopeus, J.**, Moos, M., Sørensen, J.G. and Sinclair, B.J. (2020) A comparison of low temperature biology of *Pieris rapae* from Ontario, Canada, and Yakutia, Far Eastern Russia. *Comparative Biochemistry and Physiology A*, 242: 110649.

14. Rozsypal, J., **Toxopeus, J.**, Berková, P., Moos, M., Šimek, P. and Košťál, V. (2019) Fat body disintegration after freezing stress is a consequence rather than cause of freezing injury in larvae of *Drosophila melanogaster*. *Journal of Insect Physiology*, 115: 12-19.
13. **Toxopeus, J.**, Košťál, V. and Sinclair, B.J. (2019) Evidence for non-colligative function of small cryoprotectants in a freeze tolerant insect. *Proceedings of the Royal Society B*, 286: 20190050. **\*\*Featured twice on CBC Radio (on "Fresh Air" and "All in a Day"), recommended in F1000Prime.**
12. **Toxopeus, J.**, Des Marteaux, L.E. and Sinclair, B.J. (2019) How crickets become freeze-tolerant: the transcriptomic underpinnings of acclimation in *Gryllus veletis*. *Comparative Biochemistry and Physiology D*, 29: 55-66.
11. **Toxopeus, J.**, McKinnon, A.H., Štětina, T., Turnbull, K.F. and Sinclair, B.J. (2019) Laboratory acclimation to autumn-like conditions induces freeze tolerance in the spring field cricket *Gryllus veletis* (Orthoptera: Gryllidae). *Journal of Insect Physiology*, 113: 9-16.
10. **Toxopeus, J.** and Sinclair, B.J. (2018) Mechanisms underlying insect freeze tolerance. *Biological Reviews*, 93: 1891-1914.
9. Newman, C.E., **Toxopeus, J.**, Udaka, H., Ahn, S., Martynowicz, D.M., Graether, S.P., Sinclair, B.J. and Percival-Smith, A. (2017) CRISPR-induced null alleles show that *Frost* protects *Drosophila melanogaster* reproduction after cold exposure. *Journal of Experimental Biology*, 220: 3344-3354.
8. Des Marteaux, L.E., McKinnon, A.H., Udaka, H., **Toxopeus, J.** and Sinclair, B.J. (2017) Effects of cold-acclimation on gene expression in Fall field cricket (*Gryllus pennsylvanicus*) ionoregulatory tissues. *BMC Genomics*, 18: 357.
7. Andrushchenko, I.V., Taylor, B.R., **Toxopeus, J.** and Wilson, E. (2017) Congregations of the leaf-shredding insect *Lepidostoma togatum* mediate exceptionally rapid mass loss from leaf litter in Nova Scotia rivers. *Hydrobiologia*, 78:245-265. [authors in alphabetical order]
6. **Toxopeus, J.**, Lebenzon, J.E., McKinnon, A.H. and Sinclair B.J. (2016b) Freeze tolerance of *Cyphoderris montrosa* (Orthoptera: Prophalangopsidae). *The Canadian Entomologist*, 148: 668-672.
5. **Toxopeus, J.**, Jakobs, R., Ferguson, L.V., Garipey, T.D. and Sinclair, B.J. (2016a) Reproductive arrest and stress resistance in winter-acclimated *Drosophila suzukii*. *Journal of Insect Physiology*, 89: 37-51.
4. **Toxopeus, J.**, Warner, A.H. and MacRae, T.H. (2014) Group 1 LEA proteins contribute to the desiccation and freeze tolerance of *Artemia franciscana* embryos. *Cell Stress & Chaperones*, 19: 939-948.
3. King, A.M., **Toxopeus, J.** and MacRae, T.H. (2014) Artemin, a diapause-specific chaperone, contributes to stress tolerance of *Artemia* cysts and influences their release from females. *Journal of Experimental Biology*, 217: 1719-1724.
2. King, A.M., **Toxopeus, J.** and MacRae, T.H. (2013) Functional differentiation of small heat shock proteins in diapause-destined *Artemia* embryos. *FEBS Journal*, 280: 4761-4772.

1. **Toxopeus, J.**, Kozera, C.J., O’Leary, S.J.B. and Garbary, D.J. (2011) A reclassification of *Mycophycias ascophylli* (Ascomycota) based on nuclear large ribosomal subunit DNA sequences. *Botanica Marina*, 54: 325-334.

## Book Chapters

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1. Garbary, D.J., Brown, N.E., MacDonell, H.J., and **Toxopeus, J.** (2017) *Ascophyllum* and its symbionts – a complex symbiotic community on North Atlantic shores. Edited by M. Grube, J. Sechback, L. Muggia, *In Algal and Cyanobacteria Symbiosis*. World Scientific Publishing Europe Ltd.: Hackensack, NJ, USA. pp. 547-572.

## Invited Talks

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### Seminars

3. **Toxopeus, J.** (2020) How to freeze solid and live to tell the tale: Advice from the insect world. *Mount Allison University [Seminar Series – Chemistry and Biochemistry]*. Sackville, NB.
2. **Toxopeus, J.** (2020) Challenging the hallmarks of insect diapause: A case study in *Rhagoletis pomonella*. *University of Colorado Denver [Integrative Biology Seminar Series]*, Denver, CO.
1. **Toxopeus, J.** (2016) Uncovering the mechanisms underlying insect freeze tolerance. *Czech Academy of Science [Physiology Seminar Series]*, České Budějovice, Czech Republic.

### Conference Symposia

3. **Toxopeus, J.**, Dowle, E.J and Ragland, G.J. (2020) Challenging the hallmarks of insect diapause: A case study in *Rhagoletis pomonella*. *Canadian Society of Zoologists (CSZ) Annual Meeting*. Virtual. **Finalist for Presidents’ Award for best postdoc talk**
2. **Toxopeus, J.** and Sinclair B.J. (2018) Life in the frozen lane: *Gryllus veletis* as an emerging model for insect freeze tolerance. *Orthopteroids: Small Orders, Big Ideas [Entomological Society of America Annual Meeting]*. Vancouver, BC.
1. **Toxopeus, J.**, Warner, A.H. and MacRae, T.H. (2014) Group 1 Late Embryogenesis Abundant (LEA) proteins enhance desiccation and freeze tolerance of the crustacean, *Artemia franciscana*. *Genomes to/aux Biomes [CSZ Annual Meeting]*, Montreal, QC. **Finalist for Hoar Award for best student talk**

## Conference Presentations

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15 total with Toxopeus as presenting author; trainees underlined

15. **Toxopeus, J.**, Gadey, L., Andaloori, L., Sanaei, M. and Ragland, G.J. (2021) Costs of averting diapause associated with slow decline of metabolic rates at low temperature in the apple maggot fly *Rhagoletis pomonella*. *Society for Integrative and Comparative Biology (SICB) Annual Meeting*. Virtual. [oral] [international]



14. **Toxopeus, J.**, Dowle, E.J. and Ragland, G.J. (2020) Tracking physiological time: Timing and duration of cold exposure impacts seasonal life history timing in a temperate insect. *SICB Annual Meeting*. Austin, TX. [oral] [international]
13. **Toxopeus, J.** and Ragland, G.J. (2019) Do mechanisms of cold tolerance change with development? A case study using RNA interference of multiple genes in *Drosophila melanogaster*. *International Symposium on the Environmental Physiology of Ectotherms and Plants (ISEPEP) 8*. Buenos Aires, Argentina. [oral] [international]
12. **Toxopeus, J.**, Dowle, E.J. and Ragland, G.J. (2019) Development and thermal sensitivity of the apple maggot fly (*Rhagoletis pomonella*): Implications for overwintering ecology. *CSZ Annual Meeting*. Windsor, ON. [oral] [national]
11. **Toxopeus, J.**, Des Marteaux, L.E., Košťál, V. and Sinclair, B.J. (2018) Do cryoprotectants really protect against cold? An experimental evaluation of insect freeze tolerance. *CSZ Annual Meeting*, St. John's, NL. [oral] [national]
10. **Toxopeus, J.**, Des Marteaux, L.E., Košťál, V. and Sinclair B.J. (2018) Why frozen insects die: a tale of metabolomics, transcriptomics and cryoprotectant manipulation in freeze-tolerant crickets. *SICB Annual Meeting*. San Francisco, CA. [oral] [international]
9. **Toxopeus, J.**, Košťál, V. and Sinclair B.J. (2017) Manipulating the transcriptome and metabolome of the spring field cricket, *Gryllus veletis*. *ISEPEP 7*, Tartu, Estonia. [oral] [international]
8. **Toxopeus, J.** and Sinclair B.J. (2017) Thinking like scientist: strategies to measure and improve knowledge structures of biology students. *Western Conference on Science Education (WCSE)*, London, ON. [oral] [national]
7. **Toxopeus, J.**, Košťál, V. and Sinclair B.J. (2017) Functional assessment of cryoprotectants in the freeze-tolerant spring field cricket, *Gryllus veletis*. *CSZ Annual Meeting*, Winnipeg, MB. [oral] [national]
6. **Toxopeus, J.**, Košťál, V. & Sinclair B.J. (2017) Metabolomics and transcriptomics of freeze tolerance acclimation in *Gryllus veletis*. *SICB Annual Meeting*, New Orleans, LA. [poster] [international]
5. **Toxopeus, J.**, Košťál, V. and Sinclair B.J. (2016) Crickets on ice: dissecting the mechanisms underlying insect freeze tolerance. *CSZ Annual Meeting*, London, ON. [poster] [national]
4. **Toxopeus, J.**, Jakobs, R., Ferguson, L.V., Garipey, T.D. and Sinclair, B.J. (2015) Reproductive diapause alters stress tolerance in *Drosophila suzukii*. *CSZ Annual Meeting*, Calgary, AB. [poster] [national]
3. King, A.M., **Toxopeus, J.** and MacRae, T.H. (2013) Functional differentiation of small heat shock proteins in diapause embryos of *Artemia franciscana*. *ISEPEP 5*, London, ON. [oral] [international]
2. **Toxopeus, J.**, Warner, A.H. and MacRae, T.H. (2013) Life without water: the importance of Late Embryogenesis Abundant (LEA) proteins in a stress-tolerant crustacean. *Dalhousie University Patrick Lett Symposium*, Halifax, NS. [oral] [institutional]

1. **Toxopeus, J.**, Kozera, C.J., O’Leary, S.J.B. and Garbary, D.J. (2011) Classification of *Mycophycias ascophylli*, a marine fungus associated with two brown algae. *APICS Undergraduate Biology Conference*, Halifax, NS. [poster] [regional]