

JOHANNA BRADIE, MSc, PhD

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Research Interests

My research focuses on using statistical and computational models to aid in environmental management. While there is always uncertainty in ecological outcomes, I believe it is important to use limited, available data to support the best possible decisions. My research has largely focused on the application of these techniques to aquatic invasive species management, but I am broadly interested in quantitative research to support management.

Skills & Qualifications

- 15+ years experience conducting quantitative analytics to support research
- Award-winning educator skilled in developing and delivering statistical instruction to a variety of audiences
- Works directly with decision makers to define problems and deliver research products that support decision making
- Strong writer, having led 10 peer-reviewed journal articles and 3 technical reports
- Effective communicator and presenter capable of conveying complex concepts to all levels of stakeholders
- Shortlisted for Southwood Prize by Journal of Applied Ecology (2022; Winner TBD) and profiled in Journal of Biogeography issue featuring influential contributions by women biogeographers (2021)

Academic Appointments and Professional Experience

NSERC Post-doctoral Fellow, University of Windsor

2020-Current

- Conducted Monte Carlo simulations to predict expected outcomes of new shipping regulations and evaluate biological invasion risk associated with various strategies for handling ballast water treatment system failures
- Consulted with University of Windsor and Fisheries and Oceans Canada researchers to advise on appropriate analytic techniques for research projects and informal teaching
- Parental leave (June 2020-June 2021)

Visiting Post-doctoral Fellow, Fisheries and Oceans Canada

2016-2019

- Developed statistical risk assessment tool to optimize Transport Canada's ballast water inspection targeting; Worked closely with Transport Canada management and inspectors to assess needs and optimize utility and usability of software tool that is now used to inform daily inspection decisions
- Conducted analyses to predict outcomes of various regulatory options for implementation of the Ballast Water Management Convention in Canada; Worked closely with government stakeholders to address policy questions; Results directly impacted Canada's shipping regulations
- Published 4 scientific papers and 1 Canadian Science Advisory Secretariat document; Delivered 5 presentations (3 invited) to international academic conferences and high-level government meetings
- Parental leave (February 2018-February 2019)

Statistical Consultant, BSH (Federal Maritime and Hydrographic Agency), Germany

2015-2016

- Led experimental design, statistical analysis, and dissemination of research project evaluating sampling and analysis methods in preparation for implementation of the International Maritime Organization's Ballast Water Management Convention
- Worked with diverse team of 19 researchers in academia, government, and industry from 7 countries
- Participated in research voyage from Cape Verde to Germany to assist with lab work
- Published 3 scientific papers, delivered 5 presentations (2 invited) to various stakeholders including government, industry, and academic conferences at national and international level

PhD Candidate in Biology, specializing in Ecological Modelling, McGill University <ul style="list-style-type: none"> • Generated methodology to use high-level data (i.e. import records) to quantitatively predict the number of expected invasive species establishments; methodology enables calculation of benefit derived by limiting number of individuals imported rather than restricting imports entirely; model parameterized using sensitive microdata from Canada Border Service Agency database • Conducted a meta-analysis to evaluate which environmental variables are the most important determinants of species' ranges (174 citations as of February 2022) • Conducted first statistical validation of 'environmental distance' metrics which are used to evaluate risk of species invasion; Used data from past establishments to improve metric formulation • Assisted researchers at Canadian and international institutions with statistical analyses • Mentored undergraduate and graduate students; Inaugurated weekly lab meetings to jointly troubleshoot projects and provide mini tutorials on new statistical techniques • Published 5 papers and delivered 12 oral presentations at provincial, national, and international conferences 	2010-2015
Statistics and R Workshop Developer and Instructor, Quebec Centre for Biodiversity Science <ul style="list-style-type: none"> • Founding member of team that developed and delivered workshop series to teach graduate students and faculty how to perform statistical analyses in the R programming environment • Developed two four-hour workshops: "Loading and manipulating data in R" and "Programming in R", and critically reviewed two additional workshops: "Linear and generalized linear mixed models", and "Introduction to data visualization with ggplot2". • Received Learning Development Award for providing substantial contribution towards the training and learning experience of graduate students and faculty beyond established academic courses 	2014
Teaching Assistant, McGill University and University of Windsor <ul style="list-style-type: none"> • Delivered lecture and lab material for various courses: Statistics (McGill 2011, 2012), Cell and Molecular Biology (McGill 2010, 2011, 2013), Invasion Biology (Graduate level, McGill 2011), Introduction to Ecology and Evolution (McGill 2010), Introductory Microbiology (Windsor 2008), Conservation Ecology (Windsor 2008), Cell Biology (Windsor 2007) 	2007-2015
Biologist, Fisheries and Oceans Canada <ul style="list-style-type: none"> • Contributed to writing two Canadian Science Advisory Secretariat risk assessments • Participated in research voyage from Toronto to Thunder Bay 	2009
MSc Candidate in Environmental Science, University of Windsor <ul style="list-style-type: none"> • Conducted empirical studies to evaluate the efficacy of an emergency ballast water treatment option • Organized a field season in the Netherlands; coordinated with international colleagues to secure lab space and access shipping ports • Published 1 paper and delivered 4 oral presentations (1 invited) and 3 poster presentations at institutional, national, and international conferences 	2007-2009
EnviroWestern Coordinator, University of Western Ontario <ul style="list-style-type: none"> • Led activities of >300 members working together to address on-campus environmental issues • Organized outreach and educational activities for university community 	2007

Education

PhD in Biology specializing in Ecological Modelling <i>McGill University, Montreal, Quebec</i> <ul style="list-style-type: none"> • Dissertation title: "Predicting the establishment of non-indigenous species" • Supervisory committee: Brian Leung (supervisor), Andrew Hendry, Jonathan Davies 	2010-2015
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MSc in Environmental Science

2007-2009

University of Windsor, Windsor, Ontario

- Dissertation title: “Brine-induced mortality of ballast water organisms”
- Supervisory committee: Hugh MacIsaac, Sarah Bailey (co-supervisors), Mike Weis

BSc in Genetics and Medical Science

2003-2007

University of Western Ontario, London, Ontario

- Received Gold Medal in Genetics for top academic standing; Graduated with Distinction

Related Training and Professional Service

- Reviewed for Ecological Modelling, Methods in Ecology and Evolution, Proceedings B, Diversity and Distributions, Biogeography, Aquatic Conservation, Weed Research, Biological Invasions, Marine Biology, Marine Pollution Bulletin, Sea Research, Axios
- Member of McGill University Statistics-Biology Interdepartmental Exchange Group (2013-2015)
- McGill Biology Graduate Student Association elections official (2013-2015) and council member (2011-2015)
- Great Lakes Institute for Environmental Research council member (2008-2009)
- Panelist in Ballast Management Compliance Summit (Toledo, Ohio; 2017)
- Participant in various extracurricular courses and workshops:
 - Mozilla Foundation Software Carpentry workshop
 - Improv in Science Communication
 - Leading for Equity, Diversity and Inclusion in Higher Education course
 - Indigenous Canada course
 - Tomlinson Project workshop to develop effective teaching methods for university-level science
 - QCBS Introduction to geographic information systems software workshop
 - Calcul Quebec’s Introduction to Linux workshop
 - Collaboration for Environmental Evidence Systematic Reviews workshop

Peer-reviewed Publications

1. **Bradie, J., & Bailey, S.** 2021. A decision support tool to prioritize ballast water compliance monitoring by ranking risk of non-indigenous species establishment. *Journal of Applied Ecology*, 58 (3), 587-595. **Paper short-listed for Southwood Prize; Winner TBD.*
2. **Bradie, J., Drake, A.R., Ogilvie, D., Casas-Monroy, O., & Bailey, S.** 2020. Ballast water exchange plus treatment lowers species invasion rate in freshwater ecosystems. *Environmental Science & Technology*, 55 (1), 82–89.
3. **Drake, D.A.R., Bradie, J., Ogilvie, D., Casas-Monroy, O., Bailey, S.A.** 2020. Effectiveness of ballast water exchange plus treatment as a mechanism to reduce the introduction and establishment of aquatic invasive species in Canadian ports. Canadian Science Advisory Secretariat Document #2020/003.
4. **Casas-Monroy, O., Vanden Byllaardt, J., Bradie, J., Sneekes, A., Kaag, K., & Bailey, S. A.** 2019. Effect of temperature on chlorine treatment for elimination of freshwater phytoplankton in ballast water: bench-scale test. *Canadian Journal of Fisheries and Aquatic Sciences*, (999), 1-13.
5. **Bradie, J., Gianoli, C., Linley, R.D., Schillak, L., Schneider, G., Stehouwer, P., Bailey, S.** 2018. Catch me if you can: Comparing ballast water sampling skids to traditional net sampling. *Journal of Sea Research* 133: 81-87.
6. **Bradie, J., Gianoli, C., He, J., Lo Curto, A., Stehouwer, P., Veldhuis, M., Welschmeyer, N., Younan, L., Zaake, A., Bailey, S.** 2018. Detection of UV-treatment effects on plankton by rapid analytic tools for ballast water compliance monitoring immediately following treatment. *Journal of Sea Research* 133: 177-184.
7. **Bradie, J., Broeg, K., Gianoli, C., He, J., Heitmuller, S., Lo Curto, A., Nakata, A., Rolke, M., Schillak, L., Stehouwer, P., Vanden Byllaardt, J., Veldhuis, M., Welschmeyer, N., Younan, L., Zaake, A., Bailey, S.** 2018. A shipboard comparison of analytic devices of ballast water compliance monitoring. *Journal of Sea Research* 133: 11-19.
8. **Leung, B., Bradie, J.** 2017. Estimating non-indigenous species establishment and their impact on biodiversity, using the Relative Suitability Richness model. *Journal of Applied Ecology* 54(6): 1978–1988.

9. **Bradie, J.**, Leung, B. 2017. A quantitative synthesis of predictors used and variable importance in MaxEnt species distribution models. *Journal of Biogeography* 44(6): 1344-1361. **Paper has one of the highest citation rates in JBI since 2009 and was highlighted in virtual special issue in July 2021.*
10. **Bradie, J.**, Pietrobon, A., Leung, B. 2015. Beyond species-specific assessments: An analysis and validation of environmental distance metrics for non-indigenous species' risk assessment. *Biological Invasions* 17(12), 3455-3465.
11. **Bradie, J.**, Leung, B. 2015. Pathway-level models for predicting non-indigenous species establishment using propagule pressure, environmental tolerance and trait data. *Journal of Applied Ecology* 52(1), 100-109.
12. Chan, F., **Bradie, J.**, Briski, E., Bailey, S., Simard, N., MacIsaac, H. 2015. Assessing introduction risk using species' rank abundance distributions. *Proceedings of the Royal Society B*, 282 (1799).
13. **Bradie, J.**, Chivers, C., Leung, B. (2013). Importing risk: quantifying the propagule-pressure establishment relationship at the pathway level. *Diversity and Distributions* 19, 1020-1030.
14. Bailey, S.A., Chan, F., Ellis, S. M., Bronnenhuber, J.E., **Bradie, J.N.**, Simard, N. 2011. Risk Assessment for ship-mediated introductions of aquatic nonindigenous species to the Great Lakes and freshwater St. Lawrence River. Canadian Science Advisory Secretariat Document #2011/104.
15. Chan, F.T., Bronnenhuber, J.E., **Bradie, J.N.**, Howland, K.L., Simard, N., Bailey, S.A. 2011. Risk Assessment for ship-mediated introductions of aquatic nonindigenous species to the Canadian Arctic. Canadian Science Advisory Secretariat Document #2011/105.
16. **Bradie, J.**, Bailey, S., van der Velde, G., and MacIsaac, H. 2010. Brine-induced mortality of non-indigenous invertebrates in ballast water. *Marine Environmental Research* 70, 395-401.

Scholarships and Awards

Shortlisted for Southwood Prize by Journal of Applied Ecology; Winner TBD	2022
Profiled in Journal of Biogeography issue featuring influential contributions by women biogeographers	2021
ASLO Early Career Travel Grant (\$500)	2014
Quebec Centre for Biodiversity Science Learning Development Award (\$500)	2014
McGill Graduate Excellence Award (\$4772)	2013
Quebec Centre for Biodiversity Science Excellence Award (\$550)	2012
Clemens-Rigler Memorial Travel Award (\$225)	2012
Arthur Willey Memorial Scholarship (\$2500)	2011
Arthur Willey Award (\$640)	2010
Provost's Graduate Fellowship, McGill University (\$5000)	2010
University of Windsor Tuition Scholarship (\$11800)	2007-2009
Gold Medal in Genetics, University of Western Ontario	2007
Dean's Honour List, University of Western Ontario	2003-2007
EnviroWestern Honorarium (\$1000)	2007
St. Willibrord Admission Scholarship, University of Western Ontario (\$1500)	2003
ENM Mills Scholarship, University of Western Ontario (\$2000)	2003
University of Windsor Entrance Scholarship (\$8000; Declined)	2003

Research Funds

Transport Canada Contract- \$35,000	2021
NSERC Post-doctoral Fellowship- \$45,000 annually	2020-2022
NSERC Visiting Fellowship at Fisheries and Oceans Canada- \$56,000 annually	2016-2019
SPERA (Strategic Program for Ecosystem-Based Research and Advice) Grant- \$62,000	2017
SPERA (Strategic Program for Ecosystem-Based Research and Advice) Grant- \$55,000	2016
NSERC Postgraduate scholarship- \$63,000 (3 years)	2011-2014
Quebec Centre for Biodiversity Science Training Excellence Award- \$2500	2010
CAISN International Travel Grant- \$5000	2008

Technical Reports

1. **Bradie, J.**, Rolla, M., MacIsaac, H. 2022. Analyzing the risk of ballast water discharges for ship transits where ballast water treatment systems are inoperable or have failed to meet discharge standard. Prepared for Transport Canada.
2. **Bradie, J.** 2016. METEOR Voyage M116/2: Report on performance of ballast water collection and analysis devices. Prepared for BSH (German Federal Maritime and Hydrographic Agency).
1. **Bradie, J.**, Bailey, S., MacIsaac, H. NaCl brine treatment to inhibit the introduction of invasive species to the Great Lakes. Prepared for Saint Lawrence Seaway Development Corp, Washington, DC. Oct 30, 2008.
2. **Rup, M., Bradie, J., Deneau, M., Bailey, S.** 2008. Report on the ballast water management assessment project. Phase 2: Domestic ship study, brine toxicity study and foreign ballast water monitoring program. Prepared for Transport Canada, Sarnia, ON. March 31, 2008.

Presentations

1. **Bradie, J.**, Mudroch, P., Bailey, S. Ballast Water Invasion Probability Tool: Using Invasion Risk to Inform Monitoring Decisions. Transport Canada's National Ballast Water Meeting, Ottawa, Ontario, December 10, 2019 (Invited).
2. **Bradie, J.**, Mudroch, P., Bailey, S. Ballast Water Invasion Probability Tool: Simplifying the Application of Scientific Knowledge to Real-time Monitoring Decisions. International Conference on Aquatic Invasive Species (ICAIS), Montreal, Quebec, October 31, 2019.
3. **Bradie, J.**, Mudroch, P., Bailey, S. Bridging the gap between science and management: Ballast Water Invasion Probability Tool. Transport Canada's National Ballast Water Meeting, Ottawa, Ontario, November 29, 2017 (Invited).
4. **Bradie, J.**, Bailey, S.A. IMO and Canadian Regulations. Ballast Management Compliance Summit, National Museum of the Great Lakes, Toledo, Ohio, May 19, 2017. (Invited).
5. **Bradie, J.**, Bailey, S. Ballast Water Compliance Monitoring: Can Analytic Tools Rapidly Detect the Effects of UV-Treatment? International Association of Great Lakes Research Meeting, Detroit, Michigan, May 19, 2017.
6. **Bradie, J.**, Mudroch, P., Bailey, S. Bridging the gap between science and management: An application for shipping inspectors to apply scientific knowledge to inform real-time management decisions. American Society for Limnology and Oceanography Conference, Honolulu, Hawaii, March 3, 2017.
7. **Bradie, J.**, Bailey, S. Sailing towards a better understanding of the strengths and challenges of analytic devices for ballast water compliance monitoring. American Society for Limnology and Oceanography Conference, Honolulu, Hawaii, February 28, 2017.
8. **Bradie, J.**, Bailey, S. Comparison of sampling devices and analytic methods for ballast water compliance testing. 19th ICAIS, Winnipeg, Manitoba, April 12, 2016.
9. **Chan, F.T., Bradie, J.N., Briski, E., Bailey, S.A. and MacIsaac, H.J.** The relationship between colonization pressure and propagule pressure in ballast water introductions. 19th ICAIS, Winnipeg, Manitoba, April 12, 2016.
10. **Bradie, J.**, Bailey, S. Comparative analysis of compliance methods on the RV METEOR. ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors, Olbia, Italy, March 14, 2016 (Invited).
11. **Bradie, J.** Assessing devices for ballast water sample collection and analysis. BWMTech: Ballast Water Management Technology Conference, London, UK, December 8-9, 2015 (Invited).
12. **Bradie, J.**, Leung, B. Managing introduction pathways using data on imports and life history traits. Canadian Aquatic Invasive Species Network Annual General Meeting, Gatineau, Quebec, April 28-29, 2014.
13. **Bradie, J.**, Leung, B. Niche determinants: Are there consistent environmental predictors of species' distributions? Quebec Centre for Biodiversity Science Symposium, Montreal, Quebec, December 11-13, 2013.
14. **Chan, F.T., Bradie, J.N., Briski, E., Bailey, S.A. and MacIsaac, H.J.** Use of colonization pressure and propagule pressure to characterize introduction risk. Centre of Excellence for Invasion Biology – Canadian Aquatic Invasive Species Network Aquatic-Terrestrial Invasion Biology Workshop, Stellenbosch, South Africa, November 27, 2013
15. **Bradie, J.**, Leung, B. Niche determinants: Searching for consistency in environmental predictors of species' distributions. International Conference on Marine Bioinvasions, Vancouver, British Columbia, August 21, 2013.
16. **Bradie, J.**, Leung, B. Managing an establishment pathway using import records and biological data. ICAIS, Niagara Falls, Ontario, April 21-25, 2013.
17. **Bradie, J.**, Leung, B. Predicting pathway-level NIS establishment using import records and biological data. Quebec Centre for Biodiversity Science Conference, Montreal, Quebec, December 13-14, 2012

18. Chan, F., Bailey, S.A., Ellis, S.M., Bronnenhuber, J.E., **Bradie, J.N.**, Simard, N. Risk assessment for ship-mediated introductions of aquatic nonindigenous species to the Great Lakes and St. Lawrence River Region. International Association for Great Lakes Research Conference. May 7, 2012.
19. **Bradie, J.**, Chivers, C., Leung, B. From propagule pressure to establishment: Using import records to quantify aquarium fish establishment risk. Canadian Conf for Freshwater Fisheries Research, Moncton, NB, January 6, 2012.
20. **Bradie, J.**, Chivers, C., Leung, B. 2011. Predicting the establishment of non-indigenous fishes via the aquarium trade. Quebec Centre for Biodiversity Science Conference, Montreal, Quebec, December 8-9, 2011.
21. Sylvester, F., **Bradie, J.**, MacIsaac, H. 2011. The effect of antifouling paints on marine hull fouling on transoceanic commercial ships. 2nd World Conference on Biological Invasions and Ecosystem Functioning, Mar del Plata, Argentina, November 21-24 2011.
22. **Bradie, J.** Predicting fish invasions using maximum likelihood estimation. Biometry, McGill. Nov 12, 2011 (Invited).
23. **Bradie, J.**, Chivers, C., Leung, B. Predicting the establishment of non-indigenous fishes via the aquarium trade. Canadian Aquatic Invasive Species Network Meeting, April 27, 2011.
24. Bailey, S., **Bradie, J.**, Deneau, M., Simard, N., McKenzie, C., Howland, K., Martin, J., Sutherland, T., Chan, F. National risk assessment of ship-mediated ANS introductions to Canada's Four Coasts. 17th International Conference on Aquatic Invasive Species, San Diego, California, August 29-September 2, 2010.
25. **Bradie, J.**, Bailey, S., and MacIsaac, H. Examining the efficacy of NaCl Brine Treatment: An international Experience. Canadian Aquatic Invasive Species Network Annual General Meeting, Halifax, Nova Scotia, May 3-6, 2009 (Invited).
26. **Bradie, J.**, Bailey, S., MacIsaac, H., and Wiley, C. Using Brine to Limit Spread of Non-Indigenous Species by Ballast Water. Canadian Aquatic Invasive Species Network Meeting, Halifax, Nova Scotia, May 3-6, 2009. (Poster).
27. **Bradie, J.**, Bailey, S., MacIsaac, H., and Wiley, C., Reid, D., Johengen, T., Santagata, S., and Ruiz, G. Brine Treatment for Limiting Spread of Non-Indigenous Species via Ballast Water. 16th ICAIS, Montreal, Quebec, April 19-23, 2009.
28. **Bradie, J.** Stopping the introduction of non-indigenous species in ballast water. Great Lakes Institute for Environmental Research Symposium, Windsor, Ontario, April 9-10, 2009.
29. **Bradie, J.** Efficacy of NaCl brine treatment for limiting spread of non-indigenous species. Great Lakes Institute for Environmental Research Symposium, Windsor, Ontario, April 17-18, 2008.
30. **Bradie, J.**, Bailey, S., MacIsaac, H., and Wiley, C. Efficacy of NaCl brine treatment for limiting spread of non-indigenous species via ballast water. Canadian Aquatic Invasive Species Network Annual General Meeting, Banff, Alberta, April 21-22, 2008 (Poster).
31. **Bradie, J.**, Bailey, S., MacIsaac, H., and Wiley, C. Evaluating the biological efficacy of NaCl brine as a ballast water treatment technology for transoceanic vessels entering the Great Lakes. 15th International Conference on Aquatic Invasive Species, Nijmegen, The Netherlands, September 23-27, 2007 (Poster).