Christopher M. Heggerud

University of California, Davis - Department of Environmental Science & Policy

E: cmheggerud@gmail.com

W: cheggerud.github.io

T: 530-788-6075

Education

PhD in Applied Mathematics, University of Alberta.   2021
Thesis titled "Modelling phytoplankton across many scales: transient dynamics, human interactions, and niche differentiation in the light spectrum", supervised by Dr. Mark Lewis and Dr. Hao Wang.

Bachelor of Science, Toronto Metropolitan University.   2015
(Formerly Ryerson University) Bachelor of Science with honors in Applied Mathematics with a minor in Medical Physics. Supervised by Dr. Kunquan Lan.

Academic Appointments

2021-   **Postdoctoral Researcher,** Department of Environmental Science & Policy, University of California, Davis. Hastings Lab.

Publications

10.   **C. M. Heggerud,** K.-Y. Lam, H. Wang, Coexistence of phytoplankton species based on niche differentiation in absorption spectrum. *arXiv preprint arXiv:2109.02634* (2023). (Forthcoming).

9   **C. M. Heggerud**, K.C. Abbott, A. Hastings, Transient Dynamics. *Oxford Bibliographies in Ecology*. New York: Oxford University Press, forthcoming.

8.   A. Shen, S. Gao, **C. M. Heggerud**, H. Wang, Z. Ma, S. Sunling, Fluctuation of growth and photosynthetic characteristics in Prorocentrum shikokuense under phosphorus limitation: evidence from field and laboratory. (2022) (In review)

7.   J. Xu, Hao Wang, **C. M. Heggerud**, M. A. Lewis, R. Zurawell, C. Loewen, R. Vinebrooke, P. Ramazi, Predicting imminent cyanobacterial blooms in lakes using incomplete timely data. (2022) (In review, preprint available upon request)

6.   V. Kirkow, H. Wang, P. V. Garcia, S. Ahmed, **C. M. Heggerud**, Impacts of a changing environment on a stoichiometric producer-grazer system: a stochastic modelling approach. *Ecological Modelling* 469 (2022): 109971.

5.   H. Wang, P. V. Garcia, S. Ahmed, **C. M. Heggerud***, "Mathematical comparison and empirical review of the Monod and Droop forms for resource-based

population dynamics." *Ecological Modelling* 466 (2022): 109887. (*Supervisory Author)

4.   **C. M. Heggerud,** H. Wang, M. A. Lewis, "Coupling the socio-economic and ecological dynamics of cyanobacteria: Single lake and network dynamics." *Ecological Economics* 194 (2022): 107324

3.   A. Peace, P. C. Frost, N. D. Wagner, M. Danger, C. Accolla, P. Antczak, B. W. Brooks, D. M. Costello, R. A. Everett, K. B. Flores, **C. M. Heggerud,** R. Karimi, Y. Kang, Y. Kuang, J. H. Larson, T. Mathews, G. D. Mayer, J. N. Murdock, C. A. Murphy, R. M. Nisbet, L. Pecquerie, N. Pollesch, E. M. Rutter, K. L. Schulz, J. T. Scott, L. Stevenson, H. Wang. Stoichiometric Ecotoxicology for a Multisubstance World. *BioScience*: biaa160, (2021).

2.   **C. M. Heggerud**, H. Wang, M. A. Lewis, Transient dynamics of a stoichiometric cyanobacteria model via multiple-scale analysis. *SIAM Journal of Applied Mathematics* 80 (3), 1223–1246 (2020).

1.   **C. M. Heggerud,** K.Q. Lan. Local stability analysis of ratio-dependent predator-prey models with predator harvesting rates. *Applied Mathematics and Computation* 270: 349-357 (2015)

Awards

2021	Doctoral Dissertation Award	
	University of Alberta. Awarded to top 5% of theses in the Faculty of Science.	
2020	Alberta Graduate Excellence Scholarship	
	University of Alberta (Major Award)	
2019	Society of Mathematical Biology - Travel Grant	
	University of Alberta	
2019	Faculty of Graduate Studies and Research - Travel Award	
	University of Alberta	
2017/2018	Alberta Innovates - Graduate Student Scholarship	
	Held at the University of Alberta. (Major Award)	
2015/2016	NSERC [Canadian Graduate Scholarship - Masters]	
	Held at the University of Alberta. (Major Award)	
2015	Walter H. Johns Graduate Fellowship	
	University of Alberta	
2015	Dennis Mock Student Leadership Award	
	Ryerson University	
2014	C.Roy Horney Award	
	Ryerson University	
2014	Paul and Anna Maria Bonato Scholarship	
	Ryerson University	
2013 & 2014	NSERC [Undergraduate Student Research Award]	
	Held at Ryerson University	

2013   Howard Kerr Memorial Scholarship
Ryerson University
2012   Math Faculty Scholarship
Ryerson University

Research Experience

2021-   University of California, Davis [Postdoctoral Research]
Mentored by Dr. Alan Hastings at University of California, Davis, Department of Environmental Science and Policy.

2015-2021   University of Alberta [Research Assistant]
Mentored by Dr. Mark Lewis and Dr. Hao Wang at the University of Alberta, Department of Mathematical and Statistical Sciences.

2014   NSERC [Undergraduate Student Research Award]
Supervised by Dr. Kunquan Lan at Ryerson University, Department of Mathematics.

2013   NSERC [Undergraduate Student Research Award]
Supervised by Prof. Dejan Delic at Ryerson University, Department of Mathematics.

Student Mentorship

2021   Velizar Kirkow (Mathematics)
Co-supervised Velizar Kirkow from University of Exeter who was visiting with a MITACS Globalink Research Internship.

2019   Daniel Jin (Biology)
Co-supervised Daniel Jin for their biology undergraduate research project (BIOL498) at the University of Alberta.

2019   Julian Pavón García (Mathematics)
Co-supervised Julian Pavón García from Eberhard Karls University of Tübingen who was visiting with a MITACS Globalink Research Internship.

Teaching
University of California, Davis [Primary Instructor]   2022-2023
MAT 21A (Differential Calculus) Fall 2022. Sole instructor for ~100 students.
Mathematical Biology Seminar (Co-organizer and instructor on record W2023)

University of Alberta [Teacher's Assistant]   2015 - 2021
Instructing Labs:
MATH 201 (Differential Equations)
Math 100 (Calculus I)
MATH 102 (Applied Linear Algebra)

Grading:
MATH 201 (Differential Equations)
MATH 334 (Introduction to Differential Equations)
Decimal Robinson Support Centre

Ryerson University [Teacher's Assistant]   2014-2015
Instructing Labs:
MATH 131 (Modern Mathematics I)

The Math Guru [Tutor]   2014-2015
Tutored students of all levels ranging from grade 8 math to first year university math and statistics. With a focus on breaking the "math people"

Academic Talks
*Invited Talks, ^{O}Online, ^{C}Contributed Talks, ^{L}Lectures

2022	Model free methods of predicting transient dynamics* - Invited research talk at the Fields Institute: Workshop on Advances in Mathematical Ecology. Online recording found here.
2022	Mathematical comparison and empirical review of the Monod and Droop forms for resource-based population dynamics* - Invited talk in the CMS 2022 special session: Topics in Mathematical Biology: Theory, Applications and Future Perspectives
2022	Niche differentiation in the light spectrum promotes coexistence of phytoplankton species: a spatial modelling approach* - Invited talk in the CMS 2022 special session: Mathematical Modeling and Analysis in Spatial Ecology and Epidemiology
2022	Understanding transient dynamics using empirical dynamical modelling* - Invited seminar talk at York University
2022	Modelling Phytoplankton Across Many Scales: Transient Dynamics and Human Interactions - Talk in the Mathematical Biology Seminar series at University of California, Davis.
2021	Niche differentiation in the light spectrum promotes coexistence of phytoplankton species: a spatial modeling approach*^{O} - Presentation in the mini symposium, "Population dynamics of interacting species", during the 2021 annual Society of Mathematical Biology meeting hosted by University of California, Riverside.
2021	Coupling the socio-economic and transient ecological dynamics of cyanobacteria*^{O} - Seminar talk at Texas Tech University.
2021	Coupling the socio-economic and ecological dynamics of cyanobacteria*^{O} - Talk at the BIRS workshop: Mathematics of Human Environmental Systems.
2020	Coupling the socio-economic and ecological dynamics of cyanobacteria*^{O} - Talk at

The Mathematical Biosciences Institute meeting: Life on Planet Earth: Above and Below.

2020   Modeling Cyanobacteria: Transient and social-ecological dynamics* - Seminar talk hosted by Dr. Rebecca Tyson at the University of British Columbia, Okanagan.

2019   Transient dynamics of a stoichiometric cyanobacteria model[C] - Talk at the Seventh International Conference on Mathematical Modeling and Analysis of Populations in Biological Systems (ICMA VII) at Arizona State University.

2019   Multiple-scale analysis of a stoichiometric cyanobacteria model with phosphorus impulses* - Presentation in the mini symposium, "Resource explicit population models", during the 2019 annual Society of Mathematical Biology meeting at the Université de Montréal.

2019   Perturbation Theory*[L] - International Undergraduate Summer Enrichment Program (IUSEP).

2019   Multiple-scale analysis of a stoichiometric cyanobacteria model with phosphorus impulses[C] - Talk at Levin Fest (A symposium at the intersection of mathematics and biology to celebrate the conferral of UVic Honorary Doctor of Science to Dr. Simon Levin) at the University of Victoria.

2018   Stoichiometric Modeling and Multi-Scale Dynamics of Cyanobacteria* - Talk at the 6th Butler memorial conference on Differential Equations and Population Dynamics at the University of Alberta.

2018   Stoichiometric Modeling and Multi-Scale Dynamics of Cyanobacteria[C] - Talk at the 2018 annual CAIMS meeting hosted by Ryerson University.

2015   Ratio-Dependence in Predator Prey Dynamics - First talk of the Undergraduate Mathematics Seminar series at Ryerson University.

Academic & Professional Activities

2021-Current   Postdoctoral Associate, Center for Population Biology, University of California, Davis.

2021   Banff International Research Station (BIRS) Workshop: Mathematics of Human Environmental Systems. Presenter and active participant.

2018   Investigative Workshop on Stoichiometric Ecotoxicology [NIMBioS- Knoxville Tennessee]

Outreach & other relevant activities

2022-   Protect Our Winters Canada- Science Alliance.

Confirming/discussing science based approaches to combating and advocating for environmental issues directly affecting outdoor athletes.

2022   Mentor for the UC Davis Ecology and Evolution Graduate Preview Program.

2022   Ecological Society of America's Black Ecologists, Early Career, and Inclusive Ecology Sections panel discussion: 'Writing Diversity and Inclusion Statements'

2021-Current   Member of the Joint Baskett, Schreiber, Hastings, etc Lab meetings
I am an active member of the Marissa Baskett, Sebastian Schreiber, Alan Hastings and other joint lab meetings. I contribute to the group in various ways including, but not limited to, organization, research inputs, and presenting my own research.

2021-Current   Member of the Alan Hastings Research Lab
I am an active member of Alan Hastings research group contributing to the group in various ways including, but not limited to, organization, research inputs, writing of DEI statements, and presenting my own research.

2020   MEOPAR webinar: 'BIPOC experiences in STEM: Confronting racism in academia'

2015-2021   Member of the Lewis Research Group
I was an active member of the Mark Lewis research group contributing to the group in various ways including, but not limited to, organizing events, research inputs, writing of DEI statements, and presenting my own research.

2015-2021   Member of the Hao Wang Interdisciplinary Lab for Mathematical Ecology & Epidemiology
I was an active member of Hao Wang's ILMEE contributing to the group in various ways including, but not limited to, organizing events, research feedback, and presenting my own research.

2015-2020   Department of Mathematical and Statistical Sciences Math Outreach
Volunteer in math outreach at various events, including outreach to rural high schools.

2015-2020   Math Fair & Unfair
Assisted in the University of Alberta event for elementary and junior high aged students, encouraging interest in mathematics through games and other activities.

2014/2015   Ryerson Undergraduate Mathematics Seminars
Co-founder and organizer for the seminars aimed to give undergraduate students experience in seminar presentation skills, as well as give students the opportunity to engage in Mathematics research.

2014/2015   Ryerson Mathematics Course Union [President]
Elected by a group of my peers as president in May 2014. My role was to create a community for Undergraduate students in the Mathematics program at Ryerson. I ran

several successful events that helped students with academic issues and created a positive social atmosphere within the program.

2014/2015   Ryerson Science Society [Director]
Sat on the board of directors as the Ryerson Mathematics representative where we managed, monitored and oversaw affairs within the Ryerson Science Society.

2014   Undergraduate Mathematics Curriculum Advising Committee [Student Representative] Acted as a Student representative to make sure the students voices are heard at the meetings, and to provide input to the faculty members involved.