Ailene MacPherson

Address 8888 University Drive. Burnaby, BC. V5A 1S6 Canada
E-mail ailenem@sfu.ca
Website https://amacp.github.io/

Positions

Assistant Professor *Simon Fraser University* 2021-*current*
Infectious Disease Modelling and Estimation
Canada Research Chair (Tier II) in Theoretical Evolutionary Epidemiology

PDF *University of Toronto* 2020-2021
EEB Departmental Postdoctoral fellow

PDF *University of British Columbia* 2020-2020
Advisor: Matthew W. Pennell

Ph.D. Zoology *University of British Columbia* 2015-2020
Thesis: Coevolutionary Epidemiology: a population genetic exploration of evolutionary interactions between hosts and their infectious pathogens
Advisor: Sarah P. Otto

MSc. Bioinformatics and Computational Biology *University of Idaho* 2013-2015
Thesis: Estimating the Strength of Natural Selection from Parallel Evolution
Advisor: Scott L. Nuismer

BSc. *summa cum laude* Mathematics *University of Idaho* 2010-2013

Publications[1]

Peer-Reviewed Publications

1: Pennell, M.[‡], **MacPherson, A.**[‡], *Accepted*. Reading Yule in light of the history and present of macroevolution. *Phil. Trans. B.*

2: Otto, S.P., **MacPherson, A.**, Colijn, C., 2024. Endemic does not mean constant as SARS-CoV-2 continues to evolve. *Evolution*

3: Davies, T.J., **MacPherson, A.**, 2024. Seed masting as a mechanism for escape from pathogens. *Current Biology*

4: Urquhart-Cronish M.†, Angert, A.L., Otto, S.P. **MacPherson, A.**, 2023. Density-dependent selection during range expansion affects expansion load in life-history traits. *The American Naturalist*

5: Clancy, E., **MacPherson, A.**, Cheek, R.G., Mouton, J.C., Sillett T.S., Chalambor, C.K, Funk, W.C., Hohenlohe, P.A., 2023. Unraveling Adaptive Evolutionary Divergence at Microgeographic Scales. *The American Naturalist*

6: Peters, M.A.E.†, Mideo, N., **MacPherson, A.**, 2023. The maintenance of genetic diversity under host-parasite coevolution in finite, structured populations. *J. Evol. Biol.*

7: Liu, P., Song, Y.*, Colijn, C., **MacPherson, A.**, 2022. The impact of sampling bias on viral phylogeographic reconstruction. *PLoS Global Public Health*

8: **MacPherson, A.**[‡], Wang, S.[‡], Yamaguchi, R., Rieseberg, L.H, Otto, S.P., 2022. Parental population range expansion before secondary contact promotes heterosis. *The American Naturalist*

9: Wang S., Nalley M.J., Chatla K., Aldaimalani R., **MacPherson A.**, Wei K., Corbett R., Mai D., Bachtrog D., 2022. Neo-sex chromosome evolution shapes sex-dependent asymmetrical introgression barrier. *PNAS*

10: **MacPherson, A.**, Louca, S., McLaughlin A.†, Joy, J.B., Pennell, M.W., 2021. Unifying Phylogenetic Birth-Death Models in Epidemiology and Macroevolution. *Syst. Biol.*

11: Louca, S., McLaughlin A.†, **MacPherson, A.**, Joy, J.B., Pennell, M.W., 2021. Fundamental identifiability limits in molecular epidemiology. *Mol. Biol. Evol.*

[1] * Indicates a trainee in my group. † Indicates a trainee in another research group. ‡ Indicates equal contribution authors.

12: **MacPherson, A.**,Keeling M.J., Otto, S.P., 2021. Feedback between coevolution and epidemiology can help or hinder the maintenance of genetic variation in host-parasite models. *Evolution*

13: **MacPherson, A.**,Keeling M.J., Otto, S.P., 2020. Coevolution fails to maintain genetic variation in a host-parasite model with constant finite population size. *Theor. Popul. Biol.*

14: **MacPherson, A.**, Otto, S.P., Nuismer, S.L., 2018. Keeping pace with the Red Queen: Identifying the genetic basis of susceptibility to infectious disease. *Genetics*

15: **MacPherson, A.**, Otto, S.P., 2018. Joint coevolutionary-epidemiological models dampen Red Queen cycles and alter conditions for epidemics. *Theor. Popul. Biol.*

16: **MacPherson, A.**, Nuismer, S.L., 2017. The probability of parallel genetic evolution from standing genetic variation. *J. Evol. Biol*

17: **MacPherson, A.**, Hohenlohe, P.A., Nuismer, S.L., 2015. Trait dimensionality explains widespread variation in local adaptation. *Proc. R. Soc. Lond. B.*

18: Nuismer, S.L., **MacPherson, A.**, Rosenblum, E.B., 2012. Crossing the threshold: gene-flow, dominance and the critical level of standing genetic variation required for adaptation to novel environments. *J. Evol. Biol*

19: Balemba, O.B., Stenkamp-Strahm, C.H., Cady, J., **MacPherson, A.**, 2011. High-fat diet-induced neuropathy of enteric nervous system and the effect of Alpha-7 Nicotinic Acetylcholine receptoragonist, DMAB-Anabaseine Dihydrochloride. *Gastroenterology*

Pre-prints and In Review

20: **MacPherson, A.**‡, Bazzicalupo, A.‡, in review. A Unified Framework for Studying Local Adaptation.

21: Hall, R.A.*, **MacPherson, A.**, *in review*. Local Adaptation of Life-History Traits in a Seasonal Environment.

22: **MacPherson, A.**, Pennell, M., in review. The Untapped Potential of Tree Size in Reconstructing Evolutionary and Epidemiological Dynamics. `https://doi.org/10.1101/2024.06.07.597929`

23: Salehzadeh, M.*, Stockie, J.M. , **MacPherson, A.**, *in review*. Aggregation Unveiled: A Sequential Modelling Approach to Bark Beetle Outbreaks.

24: Bajgai, A.*, Elliot, L.T. , **MacPherson, A.**, *in review*. Disease as a conservation threat is non-randomly distributed among animal taxa: an examination with a large language model.

Funding and Awards

James F. Crow Early Career Award Genetic Society of America (2022)	500 USD
Tier II Canada Research Chair [CRC-2021-00276] (2022-2027)	120,000 CAD/Year
NSERC Discovery Grant [RGPIN-2022-03113] (2022-2027)	29,000 CAD/Year
NSERC Launch Supplement [DGECR-2022-00326] (2021)	12,000 CAD
EEB Postdoctoral Fellowship University of Toronto (2020)	55,000 CAD/Year
Graduate Fellowship American Association of University Women (2019)	20,000 USD
Zoology Graduate Fellowship University of British Columbia Zoology (2019)	15,000 CAD (Declined)
Godfrey Hewitt Mobility Award European Society of Evolutionary Biology (2018)	1,500 Euro
Zoology Four-Year Fellowship University of British Columbia Zoology (2015-2018)	15,000 CAD/Year
BCB Graduate Research Fellowship University of Idaho (2013-2015)	21,000 USD/Year
Outstanding Senior in Mathematics University of Idaho (2015)	500 USD
College of Science Dean's Award University of Idaho (2015)	200 USD

Research Dissemination

Invited Talks:

Seminar: *Diversification Models for Epidemiological, Paleontological, and Macroevolutionary Applications.*
ETH Zurich, *Basel, Switzerland* (October 2023)

Seminar: *Eco-Evolutionary Implications of Range Expansion.*
Univ. Bern, *Bern, Switzerland* (October 2023)

Workshop: *Phylodynamic Inference across Micro and Macroevolutionary Scales.*
Taming The BEAST 2023, *Squamish, BC* (August 2023)

Conference: *Eco-Evolutionary implications of range expansion.*
ICG2023, *Melbourne, Aus.* (July 2023)

Workshop: *Demography, epidemiology, and geography determine the maintenance of diversity.*
BIRS-Banff, (January 2023)

Seminar: *Re-envisioning the geographic mosaic of coevolution.*
SFU-Biology, (November 2022)

Workshop: *Epidemiological Inference with phylogenies.*
BIRS-CSMO, *Oaxaca, Mex.* (November 2022)

Seminar: *Inferring epidemiological parameters from viral phylogenies.*
SFU Physics, (October 2022)

Workshop: *Do host-parasite interactions maintain immune diversity?.*
IMMREP, *Germany (Virtual)* (July 2022)

Workshop: *Allele surfing: hybridization and the evolution of life-history traits.*
Fields Institute Workshop on Range Dynamics, *Virtual* (June 2022)

Talk: *Parental population expansion promotes heterosis in secondary contact hybrid zones.*
PEQG22, *Pacific Grove, CA* (June 2022)

Workshop: *Eco-evolutionary maintenance of genetic variation.*
Eco-evolutionary modelling, *Paris, France (Virtual)* (March 2022)

Talk: *Limitations to inference in a general phylodynamic model.*
AMS Special Session, *Seattle, WA (Virtual)* (January 2022)

Seminar: *Coevolution between hosts and their infectious pathogens.*
Max Plank Institute, *Plön, Germany (Virtual)* (May, 2020)

Workshop: *Identifying the genetic basis of coevolution.*
ESEB-STN, *Freising, Germany* (March, 2019)

Conferences Talks:

Expansion load in density-dependent life-history traits. Evo-WIBO, (2023)

Coevolution does not maintain genetic variation. ASN, (2020)

Finding disease genes in the face of the Red Queen. Evolution, (2017)

Epidemiological dynamics disrupt Red Queen cycles. CSEE, (2017)

Natural selection and probability of parallel evolution. Evolution, (2015)

Trait dimensionality and local adaptation. Evo-WIBO, (2014)

Students and Thesis Committees

Graduate Students/Postdoctoral Fellows:

Oliver Fijiki (Sep. 2023–current) MSc. (Coadvised with Alexander Rutherford)

Siavash Riazi (Jan. 2023–current) PDF (Coadvised with Caroline Colijn)

Mahdi Salehzadeh (Jan 2023–current) Ph.D.(Coadvised with John Stockie)

Rebekah Hall (Sep. 2022–Aug. 2024) MSc., *Thesis:* Life-history evolution under seasonal disruptions

Yexuan Song (Sep 2022–Current) PhD. (Coadvised with Caroline Colijn)

Yexuan Song (Jan 2022–Aug 2022) MSc. (Coadvised with Caroline Colijn), *Thesis:* Accounting for sampling bias in ancestral state reconstruction

Undergraduate Researchers/Research Assistants:

Simon Levi Gamboa (2024–current) RA
Oliver Fijiki (2022–2023) USRA & RA
Ananga Bajgai (2023–current) USRA & RA

Graduate Student Committees:

Zahresh Walji (2023–*current*) MSc.
Daniel Pelletier (2022–*current*) MSc.
Mina Moeini (2021–2024) MSc.
Rituparna Banerjee (2022–*current*) PhD

Teaching

2024*: *Topics in Biomathematics*: Professor. SFU.
2023*: *Mathematics of Evolution*: Professor. SFU.
2022*: *Mathematical Epidemiology*: Professor. SFU.
2021*,2022: *Mathematics for The Life Sciences*: Professor. SFU.

*courses developed including syllabi, lectures, & assignments

Professional Activities & Service

Peer Reviews:	Am. Nat., Evolution, Genetics, Heredity, J. Mol. Evol. , J. Theor. Biol. , Phil. Trans. R. Soc. B, PNAS, PLoS Genet., Proc. R. Soc. Lond. B, Virus Evol., TREE, Trends Genet., Syst. Biol.
Editor Boards	Theor. Pop. Biol. (Associate Editor)
Grant Reviews:	NSERC DG
Book Reviews:	Springer
Thesis Examiner	Mario Santer, Ph.D. Thesis, Max Plank Institute, Nicola Mulberry, Ph.D. SFU
Working Groups/Networks:	PIMS-Maud Menton Institute Co-applicant (2024) BIRS: Modeling and Theory in Population Biology (2024) UBC Biodiversity: Linking Macroevolution and Epidemiology (2020)
Society Service:	SMTPB–founding member & SMTPB–Secretary (2023-2024)
University Service:	Chair Nominating Committee (2023) & GSC (2022-*current*) & TPC (2022-23, 2024-*current*) & Hiring Committee (2022)
Outreach:	Café Scientifique University of Toronto-EEB Modelling Club Managing Fisheries with Math–Grade 12 *Palmer H.S., Palmer, Alaska* Researchers Revealed Video Series: "Counting on it" Let's Talk Science-Volunteer Idaho Women in STEM K-12 Program-Volunteer
Media	BCIT News 29/9/21 Citynews Vancouver 27/12/21