Jarrett D. Phillips, Ph.D.
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ACADEMIC APPOINTMENTS

Adjunct Professor, School of Computer Science 2023
University of Guelph

EDUCATION

My university education has primarily focused on the use of computational statistical approaches to solve open problems in biodiversity science and conservation, with an overarching theme of aiding rapid specimen identification and species discovery in academic, applied, and regulatory settings using DNA-based techniques such as DNA barcoding and environmental DNA (eDNA).

Ph.D. in Computational Sciences**,** University of Guelph 2016-2022
Co-Advisors: Dr. Daniel Gillis and Dr. Robert Hanner
Advisory Committee Members: Dr. Deborah Stacey and Dr. Graham Taylor
Thesis: A Novel Statistical Framework for Assessment of Intraspecific Haplotype Sampling Completeness: Implications for DNA Barcode Gap Estimation

Master of Bioinformatics (MBinf.), University of Guelph 2013-2014
Co-Advisors: Dr. Robert Hanner and Dr. Daniel Ashlock
Thesis: Assessing DNA Barcode Haplotype Sampling Diversity in the Ray-finned Fishes (Chordata: Actinopterygii)

BSc. (Hons.) in Biological Science, University of Guelph 2009-2013
Coursework in bioinformatics, ecology, evolutionary biology, comparative physiology, mathematics, and statistics

RESEARCH EXPERIENCE

I bring extensive past research experience in the use of bioinformatics, computational, mathematical, and statistical tools for the analysis of a wide range of big data in the biological sciences.

Postdoctoral Fellow 2023-Present
University of Guelph
GBADs Informatics Team
Stacey Lab, School of Computer Science
Bernardo Lab, Department of Population Medicine
Supervisors: Drs. Deborah Stacey and Theresa Bernardo

- Development of an R package to run a compartmentalized equation-based Dynamic Population Model (DPM) for the Global Burden of Animal Diseases (GBADs) initiative to calculate the Animal Health Loss Envelope (AHLE) in livestock species

Postdoctoral Fellow 2023-Present
University of Guelph
Gillis Lab, School of Computer Science
Hanner Lab, Department of Integrative Biology
Supervisors: Drs. Daniel Gillis and Robert Hanner

- Developed a Bayesian hierarchical binary logistic time-series regression model and a R Shiny dashboard of seafood fraud in the Canadian supply chain
- Mentored and supervised an undergraduate STAT*4600/CIS*4900/CIS*4910 student and an Undergraduate Research Assistant (URA) working to develop models in R, Stan, and Shiny

Postdoctoral Fellow 2022
University of Guelph
Hanner Lab, Department of Integrative Biology
Supervisor: Dr. Robert Hanner

- Mentored and supervised a Master of Bioinformatics (MBINF.) BINF*6999 student on research project examining DNA barcoding in Canadian pests and disease vectors
- Participated in conceptualization and drafting of various manuscripts and invited book chapters

Summer Research Assistant 2016
Algoma University
Plant and Soil Ecology Lab, Department of Biology
Invasive Species Research Institute (ISRI)
Supervisor: Dr. Pedro Antunes

- Offered bioinformatics and statistical analysis support in R
- Assisted Principal Investigator and undergraduate thesis student with initial drafting of a manuscript on invasive plant root lesion staining quantification

Lab Assistant Volunteer 2014-2016
Algoma University
Plant and Soil Ecology Lab, Department of Biology
Invasive Species Research Institute (ISRI)
Supervisor: Dr. Pedro Antunes

- Offered bioinformatics and statistical analysis support in R
- Assisted with collaborative and outreach initiatives for the Terrestrial Invasive Plant Species (TIPS) Network Project through drafting communication letters to public and private conservation agencies across Canada and the USA seeking volunteers to collect invasive plant species for root lesion quantification

Undergraduate Research Assistant 2013
University of Guelph
Vaccine Discovery Research Group
Supervisor: Dr. Mario Monteiro

- Performed various experimental techniques (gas chromatography-mass spectrometry (GC-MS) and Nuclear Magnetic Resonance (NMR)) on bacterial polysaccharide samples for vaccine synthesis and development under the supervision of qualified graduate students

TEACHING EXPERIENCE

In addition to co-teaching three undergraduate courses, I was directly involved in grading assignments, creating course outlines and lab content, as well as materials for midterms and final exams.

Graduate Teaching Assistant (GTA) 2016-2020
University of Guelph
CIS*3130 – System Modelling and Simulation 2020
~ 30 students · Python
- Statistical and Monte Carlo methods

CIS*1910 – Discrete Structures in Computing I 2017
~ 300 students (~ 40 students per section)
- Deductive logic, set theory, and mathematical proof techniques

CIS*2460 – Modelling of Computer Systems 2016-2019
~ 60 students · R, Excel, Java
- Statistical and Monte Carlo methods

STUDENT SUPERVISION AND MENTORSHIP

I have either directly or indirectly supervised and mentored 16 undergraduate/graduate students in the School of Computer Science, the Department of Mathematics and Statistics, and the Department of Integrative Biology, all of whom are, or will be, coauthors on my publications. My primary role has been to guide students through the entire scientific process (*i.e.*, formulating research questions, designing, and setting up experiments to test hypotheses, collecting data and analyzing results and writing the

manuscript drafts), among other responsibilities, such as providing feedback on students' draft reports/manuscripts. Students completed research both as part of a course and as lab volunteers.

Nikolett Toth (with Dan Gillis) 2024
University of Guelph
Summer Undergraduate Research Assistant (URA) · Mining association rules for eDNA spatiotemporal sampling

Nathan Zeinstra (with Dirk Steinke) 2024
University of Guelph
IBIO*6070 · Habitat occupancy modelling of sea lamprey environmental DNA

Fynn De Vuono-Fraser (with Dan Gillis) 2024
University of Guelph
CIS*4910 · Bayesian modelling of seafood fraud in the Canadian supply chain

Fynn De Vuono-Fraser (with Dan Gillis) 2023
University of Guelph
CIS*4900 · Bayesian modelling of seafood fraud in the Canadian supply chain

Zaid Al-Gayyali (with Dan Gillis) 2023
University of Guelph
Summer Undergraduate Research Assistant (URA) · Seafood Fraud Visualization Tool Shiny app

Fynn De Vuono-Fraser (with Dan Gillis) 2023
University of Guelph
STAT*4600 · Bayesian modelling of seafood fraud in the Canadian supply chain

Amina Asif (with Bob Hanner) 2022
University of Guelph
BINF*6999 · DNA barcode gap analysis of Canadian disease vectors and agricultural pests

Navdeep Singh (with Dan Gillis) 2021
University of Guelph
CIS*4900 · HACSim RShiny web application

Maya Persram (with Bob Hanner) 2020-present
University of Guelph
Hanner Lab volunteer · R reporting ecological meta-analysis

Ashley Chen (with Bob Hanner) 2020-present
University of Guelph
Hanner Lab volunteer · R reporting ecological meta-analysis

Olivia Friesen Kroeker (with Bob Hanner) 2020-present
University of Guelph
Hanner Lab volunteer · R reporting ecological meta-analysis

Scarlett Bootsma (with Dan Gillis) 2020-2021
University of Guelph
CIS*4900/4910 · HACSim simulation study

Christina Fragel (with Bob Hanner) 2018-2019
University of Guelph
BINF*6999 · DNA barcode sequence classification with machine learning

Jiaojia (Paula) Yu (with Bob Hanner) 2018-2019
University of Guelph
BINF*6999 · MDMAPR R Shiny app

Danielle St. Jean (with Dan Gillis) 2018-2019
University of Guelph
MSc. thesis · DNA barcode sequence classification with machine learning
Steven French (with Dan Gillis) 2018
University of Guelph
CIS*4900/4910 · HACSim R package
Julia Harvie (with Bob Hanner) 2018-2019
University of Guelph
MCB*4500/4510 · Data mining GenBank and BOLD
Ankita Bhanderi (with Bob Hanner) 2018
University of Guelph
BINF*6999 · Data mining GenBank and BOLD

ASSISTANTSHIPS, AWARDS, SCHOLARSHIPS AND GRANTS

Throughout my Ph.D. studies, I have been recognized and awarded numerous assistantships, awards, scholarships, and grants recognizing my research excellence and potential.

Food from Thought Advancing Research Impact (ARIF) Fund – Livestock Innovation Grant 2024
University of Guelph $40000.00 CAD
- 1-year postdoctoral funding to develop and refine the Dynamic Population Model (DPM) to assess global disease burden in livestock

Food from Thought Advancing Research Impact (ARIF) Fund 2022
University of Guelph $30000.00 CAD
- 1-year postdoctoral funding to develop a Bayesian hierarchical binary logistic time-series regression model of seafood fraud in the Canadian supply chain

NSERC Postdoctoral Fellowship 2021
University of Waterloo $90000.00 CAD (not funded)
- 2-year postdoctoral funding to develop an ensemble machine learning model for taxonomic classification of regulated species in Canada

Guelph Institute for Environmental Research Small Grants Program (GIER SGP) 2020
University of Guelph $15000.00 CAD (not funded)
- 1-year postdoctoral funding to develop a Bayesian hierarchical binary logistic time-series regression model of seafood fraud in the Canadian supply chain

SoCS Travel Grant 2019
University of Guelph $1000.00 CAD
- Supported travel to the 8th International Barcode of Life Conference in Trondheim, Norway to present doctoral research

Arthur D. Latornell Graduate Travel Grant 2019
University of Guelph $500.00 CAD
- Awarded for first-class academic standing in Ph.D. coursework
- Supported travel to the 8th International Barcode of Life Conference in Trondheim, Norway to present work related to resource management and conservation

Graduate Teaching Assistantships 2017-2020
University of Guelph $34,506.00-35,148.00 CAD

Graduate Research Assistantships 2017-2019
University of Guelph $11,000.00 CAD
CPES Graduate Dean's Scholarship 2017
University of Guelph $3500.00 CAD
- Awarded in recognition of achieving over 85% in Master's coursework

CPES Graduate Excellence Entrance (GEE) Scholarship 2016
University of Guelph $30000.00 CAD
- Awarded in recognition of achieving over 85% in Master's coursework

ACADEMIC SERVICE

I have contributed to the growth of the SoCS through serving on two hiring panels for faculty positions in cybersecurity, specifically to support the new coursework-based Master of Cybersecurity and Threat Intelligence program. Duties included reviewing and ranking candidate applications, conducting in-person interviews, and hosting invited candidates for scheduled luncheons to meet with other faculty members.

School of Computer Science (SoCS) Search Committee 2018
University of Guelph
- Associate Professor position in cybersecurity

School of Computer Science (SoCS) Search Committee 2017-2018
University of Guelph
- Two-year contractually-limited Assistant Professor position in cybersecurity

ACADEMIC PEER REVIEW SERVICE

I have served as a reviewer for numerous manuscripts in different journals, both alone or under the guidance of my Ph.D. supervisors.

Ecology and Evolution (2)	2021-2022
F1000 Research (1)	2022
Frontiers in Ecology and Evolution (2)	2022
Lifestyle Genomics (2)	2022
Mitochondrial DNA Part A (2)	2023
Molecular Ecology Resources (6)	2019-2022, 2023
Molecular Biology Reports (1)	2020
Methods in Ecology and Evolution (1)	2020

PROCEEDINGS

I have presented or attended graduate research at national or international conferences and workshops, including both oral presentations and posters. Sessions listed here also include presentations by supervised undergraduate students.

9th International Barcode of Life Conference (poster presentation) 2024
Estação das Docas
GBADs Technical Workshop (oral presentation) 2023
University of Liverpool
CEPS Student Research Day (student poster presentation) 2023
University of Guelph
Pathway to Increase Standards and Competency of eDNA Surveys (PICSeS) International Conference (poster presentation) 2023
University of Guelph
8th International Barcode of Life Conference (oral presentation) 2019
NTNU University Museum and Norwegian Biodiversity Information Centre
Guelph BioMathematics and Statistics (BioM&S) Symposium
Artificial Intelligence and Machine Learning in Biology (attended) 2019
University of Guelph
CEPS Undergraduate Poster Session (student poster presentation) 2018
University of Guelph
7th International Barcode of Life Conference (oral presentation) 2017
University of Johannesburg
6th International Barcode of Life Conference (poster presentation) 2015
University of Guelph

SOFTWARE DEVELOPMENT

I have been directly or indirectly involved with the development and deployment of several R software package tools for molecular biodiversity analysis.

GBADsDPM (**G**lobal **B**urden of **A**nimal **D**iseases **D**ynamic **P**opulation **M**odel) · R package

- A novel stochastic age- and sex-structured compartmentalized equation-based model to assess the burden of animal diseases in livestock such as cattle, small ruminants, and poultry within developing countries like Ethiopia

HACSim (**H**aplotype **A**ccumulation **C**urve **Sim**ulator) · R package · R Shiny web app

- A novel nonparametric stochastic (Monte Carlo) local search optimization method of iteratively generating species' haplotype accumulation curves through extrapolation to assess within-species sampling completeness
- R package and Shiny app respectively available for download through the Comprehensive R Archive Network (CRAN) package repository or at shinyappps.io
- Publication *in PeerJ Computer Science* was one of the top five most viewed papers in the category *Optimization Theory and Computation*
- Has been downloaded over 30000 times (*c.* 743 times per month) since being published in May 2019

VLF (**V**ery **L**ow **F**requency) · R package

- A novel tool to assess PCR errors, sequencing errors, *etc.* in the form of very low frequency variants, within DNA sequences using a sliding window approach
- R package available for download through CRAN
- Manuscript published in the *Biodiversity Data Journal*
- Has been downloaded over 36000 times (*c.* 233 times per month) since publication

REFEREED WORK

I have been directly or indirectly involved with the conceptualization, research, supervision, and eventual publication of several academic and non-academic projects.

Journal Articles
Citations: 203 · H-index: 6 (According to Google Scholar, as of June 20, 2024)

***** Indicates students under my direct mentorship or supervision
****** Indicates students under my indirect mentorship or supervision

Published or Accepted

8. Raymond, K., Sobkowich, K.E., **Phillips, J.D.**, Nguyen, L., McKechnie, I., Mohideen, R.N., Fitzjohn, W., Szurkowski, M., Davidson, J., Rushton, J., Stacey, D.A. and Bernardo T.M. GBADs informatics strategy: User-centric tools, data quality, and model interoperability. Submitted to *WOAH Scientific and Technical Review*.
7. **Phillips, J.D.** and *De Vuono-Fraser, F.A. Statistical modelling of seafood fraud in the Canadian supply chain. bioRxiv. https://www.biorxiv.org/content/10.1101/2024.02.05.578947v1.abstract.
6. **Phillips, J.D.**, Athey, T.B.T., Hanner, R.H. and McNicholas, P.D. VLF: An R package for the analysis of very low frequency variants in DNA sequences. *Biodiversity Data Journal,* e96480*.* DOI: 10.3897/BDJ.11.e98480. Journal Impact Factor: 1.55.
5. **Phillips, J.D.**, Gillis, D.J. and Hanner, R.H. (2022). Lack of statistical rigor in DNA barcoding likely invalidates the presence of a true species' barcode gap. *Frontiers in Ecology and Evolution*, 10: 859099. DOI: 10.3389/fevo.2022.859099. Journal Impact Factor: 4.49. Number of article citations: 20.
4. D'Ercole, J., Dincă, V., Opler, P.A., Kondla, N.G., Schmidt, C.B., **Phillips, J.D.**, Robbins, R., Burns, J.M., Miller, S.E., Grishin, N., Zakharov, E.V., deWaard, J.R., Ratnasingham, S. and Hebert, P.D.N. (2020). A DNA barcode library for the butterflies of North America. *PeerJ*, 9: e11157. DOI: 10.7717/peerj.11157. Journal Impact Factor: 3.06. Number of article citations: 20.
3. **Phillips, J.D.**, *French, S.H., Hanner, R.H. and Gillis, D.J. (2020). HACSim: An R package to estimate intraspecific sample sizes for genetic diversity assessment using haplotype accumulation curves. *PeerJ Computer Science*, 6(192): 1-37. DOI: 10.7717/peerj-cs.243. Journal Impact Factor: 3.80. Number of article citations: 20.
2. **Phillips, J.D.**, Gillis, D.J. and Hanner, R.H. (2019). Incomplete estimates of genetic diversity within species: Implications for DNA barcoding. *Ecology and Evolution,* 9(5): 2996-3010. DOI: 10.1002/ece3.4757. Journal Impact Factor: 3.17. Number of article citations: 101.
1. **Phillips, J.D.**, Gwiazdowski, R.A., Ashlock, D. and Hanner, R. (2015). An exploration of sufficient sampling effort to describe intraspecific DNA barcode haplotype diversity: examples from the ray-finned fishes (Chordata: Actinopterygii). *DNA Barcodes*, 3: 66-73. DOI: 10.1515/dna-2015-0008. Number of article citations: 28.

Submitted or Under Revision

2. **Phillips, J.D.** and *De Vuono-Fraser, F.A. Statistical modelling of seafood fraud in the Canadian supply chain. Submitted to *Environmetrics*

1. **Phillips, J.D.** and *De Vuono-Fraser, F.A. Swimming in uncertainty: How proper statistical modelling can help expose seafood product mislabelling. Submitted to *Significance*.

In Preparation or To Be Submitted

7. **Phillips, J.D.** A Bayesian model of the DNA barcode gap. Targeted to *Stat*.
6. **Phillips, J.D.,** *Al-Gayyali, Z.B.**,** *De Vuono-Fraser, F.A., Hanner, R.H. and Gillis, D.J. The Seafood Fraud Visualization Tool: An R Shiny web app to summarize, model, and visualize seafood mislabelling trends in the supply chain.
5. Morey, K.C., **Phillips, J.D.**, Loeza-Quintana, T. and Hanner, R.H. Haplotype diversity reveals challenges and opportunities for developing targeted detection assays for COI in Canadian freshwater fish. Targeted for *Environmental DNA.*
4. Young, R.G., **Persram, M., **Friesen, O., **Chen, A., **Yu, J., **Phillips, J.D.** and Hanner, R.H. (Under review). Incomplete and irregular reporting of the R statistical and computing environment highlights the need for citation guidelines to support scientific reproducibility. *PeerJ Computer Science.*
3. **Phillips, J.D.**, *Singh, N., Hanner, R.H. and Gillis, D.J. The HACSim R Shiny app: A web interface to estimate specimen sampling sufficiency for species genetic diversity assessment with DNA sequence data.
2. D'Ercole, J., Dapporto, L., **Phillips, J.D.**, Dincă, V.E., Vila, R., Talavera, G. and Hebert, P.D.N. Macrogenetics of North American butterflies—The impact of Quaternary climatic fluctuations. Targeted for *PNAS.*
1. **Phillips, J.D.**, *Bootsma, S.E., Hanner, R.H. and Gillis, D.J. Solving the genetic specimen sample size problem with a local search optimization algorithm. Targeted for *Methods in Ecology and Evolution.*

Book Chapters

Published or Accepted

2. **Phillips, J.D**., Griswold, C.K., Young, R.G., Hubert, N. and Hanner, R.H. (2024). A measure of the DNA barcode gap for applied and basic research. DNA Barcoding Methods and Protocols. Methods in Molecular Biology. Springer Nature.
1. Hubert, N., **Phillips, J.D**. and Hanner, R.H. Delimiting species with single-locus DNA sequences. DNA Barcoding Methods and Protocols. Methods in Molecular Biology. Springer Nature.

Conference Proceedings

4. Morey, K., Loeza-Quintana, T., **Phillips, J.** and Hanner R. (2023). Haplotype diversity reveals challenges and opportunities for developing targeted detection assays for *COI* in Canadian freshwater fish. Pathways to Increase Standards and Competency in eDNA Surveys (PISCeS) Conference. Poster.
3. **Phillips, J.D.**, Gillis, D. and Hanner, R. (2019). HACSim: Iterative extrapolation of haplotype accumulation curves for assessment of intraspecific COI DNA barcode sampling completeness Scientific abstracts from the 8th International Barcode of Life Conference, Trondheim, Norway (ed. Torbjørn Ekrem), *Genome*, 62(6): 349-453. Oral presentation.
2. **Phillips, J.D.**, Gillis, D. and Hanner, R. (2017). Intraspecific sample size estimation for DNA barcoding: Are current sampling levels enough? Scientific abstracts from the 7th International Barcode of Life Conference, Johannesburg, South Africa (ed. M. van der Bank), *Genome*, 60(11): 881-1019. Oral presentation.

1. **Phillips, J.D.**, Gwiazdowski, R.A., Ashlock, D. and Hanner, R. (2015). An exploration of sufficient sampling effort to describe intraspecific haplotype diversity in the ray-finned fishes (Chordata: Actinopterygii). Scientific abstracts from the 6th International Barcode of Life Conference, Guelph, ON., Canada (ed. S.J. Adamowicz), *Genome*, 58(5): 163-303. Poster

NON-REFEREED WORK

I have communicated aspects of my research to non-technical audiences through various online media, including blog posts and newsletters.

Blog posts

6. **Phillips, J.D.** (2022) Mind the Gap — The DNA Barcode Gap, That Is. Contributed CEPS Research Highlights article (https://www.uoguelph.ca/ceps/news/2022/08/mind-gap-–-dna-barcode-gap).
5. **Phillips, J.D.** (2020). Barcode Cracking. Contributed CEPS Research Highlights article (https://www.uoguelph.ca/ceps/news/2020/02/barcode-cracking).
4. **Phillips, J.D.** (2020). Protecting Biodiversity Through the Lens of Genetic Diversity. Contributed guest post to the blog of Dr. Daniel Gillis (https://danielgillis.wordpress.com/2020/01/30/protecting-biodiversity-through-the-lens-of-genetic-diversity/).
3. **Phillips, J.D.** (2019). IBOL8 and the Midnight Sun. Contributed guest post to the blog of Dr. Daniel Gillis (https://danielgillis.wordpress.com/2019/07/02/reflections-ibol8-and-the-midnight-sun/).
2. **Phillips, J.D.** (2017). The Big Five and IBOL7. Contributed guest post to the blog of Dr. Daniel Gillis (https://danielgillis.wordpress.com/2017/12/06/reflections-the-big-five-and-ibol7/).
1. **Phillips, J.D.** (2016). Sample size estimation for DNA barcoding: Are current sampling levels enough? Contributed guest post to the DNA Barcoding Blog of Dr. Dirk Steinke (http://dna-barcoding.blogspot.com/2016/01/guest-post-sample-size-estimation-for.html).

Newsletters

1. **Phillips, J.D.** (2016). Sample size estimation for DNA barcoding of ray-finned fishes: Are current sampling levels enough? Contributed newsletter article to the Barcode Bulletin, 7(1).

VOLUNTEER EXPERIENCE

I have volunteered in various capacities in the SoCS and the Department of Integrative Biology at the University of Guelph.

2. **Pathways to Increase Standards and Competency in eDNA Surveys (PISCeS) Conference**
University of Guelph 2023

- Participated in international eDNA conference hosted by the Hanner Lab
- Duties included registration, upload, and audiovisual support

1. **Wireframing session** 2021
University of Guelph

- Participated in student-led use case mobile app prototype demonstrations for CIS*3750 – System Analysis and Design in Applications
- Graded students based on several factors via Qualtrics surveys

REFERENCES

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