

**Jarrett D. Phillips, BSc. (Hons.), MBinf., PhD. (ABD)**✉ [jphill01@uoguelph.ca](mailto:jphill01@uoguelph.ca)[phillipsjarrett1@gmail.com](mailto:phillipsjarrett1@gmail.com)[jphill01](#)[Jarrett Phillips](#)[Jarrett D. Phillips](#)[Jarrett Phillips](#)[Jarrett Phillips](#)[Jarrett D. Phillips](#)**Professional Summary of Research Interests and Expertise**

I am a highly motivated and passionate bioinformatician, data scientist and researcher naturally driven by curiosity to use mathematical, statistical and computational methods to answer fundamental and applied research questions in biodiversity science, evolutionary biology, ecology, genomics and bioinformatics, particularly related to molecular species identification and discovery through DNA barcoding and other DNA-based approaches.

**Education****Doctor of Philosophy (PhD.), Computational Sciences**

2016-Present

University of Guelph

- Thesis title: A Novel Statistical Framework for Assessment of Intraspecific Haplotype Sampling Completeness
- Cumulative GPA: 90%

Advisor: Dr. Daniel J. Gillis, School of Computer Science

Co-Advisor: Dr. Robert H. Hanner, Department of Integrative Biology

Committee: Dr. Deborah Stacey, School of Computer Science

Dr. Graham Taylor, School of Engineering

**An Introduction to Interactive Programming in Python**

2014

Rice University

- Online course through Coursera on the development of interactive applications in Python
- Grade received: 98.4%

**Master of Bioinformatics (MBinf.)**

2013-2014

University of Guelph

- Primary coursework in bioinformatics, data science, statistics, and machine learning within the R Statistical Computing Environment
- Major research project title: Assessing haplotype sampling efficiency in *Actinopterygii* using DNA barcodes

- Cumulative GPA: 85.8%

Advisor: Dr. Robert H. Hanner, Department of Integrative Biology

Co-Advisor: Dr. Daniel A. Ashlock, Department of Mathematics and Statistics

### **Introduction to DNA Barcoding**

2013

University of Guelph

- Online course through Open Learning and Education Support (OpenEd)
- Grade received: 97.0%

### **Honors Bachelor of Science (BSc. (Hons.)) Biological Science**

2009-2013

University of Guelph

- Primary coursework in bioinformatics, evolutionary biology, ecology, mathematics and statistics

### **Research Experience**

#### **Summer Research Assistant**

2016

Algoma University

Antunes Plant and Soil Ecology Lab, Department of Biology

Invasive Species Research Institute (ISRI)

- 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 quantification

#### **Lab Assistant Volunteer**

2014-2016

Algoma University

Antunes Plant and Soil Ecology Lab, Department of Biology

Invasive Species Research Institute (ISRI)

- 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

Monteiro Vaccine Discovery Research Group

- 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**

<b>Graduate Teaching Assistant (GTA)</b>	2016-2020
University of Guelph	
<b>CIS*3130 – System Modelling and Simulation</b>	2020
~ 30 students · Python	
<b>CIS*1910 – Discrete Structures in Computing I</b>	2017
~ 300 students (~ 40 students per section)	
<b>CIS*2460 – Modelling of Computer Systems</b>	2016-2019
~ 60 students · R, Excel, Java	

### **Undergraduate Student Supervision**

I have directly supervised and mentored several undergraduate students in computer science and integrative biology, all of whom are 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). Students completed research both as part of a course and as lab volunteers.

<b>Navdeep Singh</b> (with Dan Gillis)	2021
University of Guelph	
CIS*4900 · HACSim RShiny web application	
<b>Maya Persram</b> (with Bob Hanner)	2020-present
University of Guelph	
Hanner Lab volunteer	
<b>Ashley Chen</b> (with Bob Hanner)	2020-present
University of Guelph	
Hanner Lab volunteer	
<b>Olivia Friesen Kroeker</b>	2020-present
University of Guelph	
Hanner Lab volunteer	
<b>Scarlett Bootsma</b> (with Dan Gillis)	2020-2021
University of Guelph	
CIS*4900/4910 · HACSim simulation study	
<b>Christina Fragel</b> (with Bob Hanner)	2018-2019
BINF*6999 · DNA sequence classification with machine learning	
<b>Jiaojia (Paula) Yu</b>	2018-2019

(with Bob Hanner)

BINF\*6999 · MDMAPR qPCR R Shiny app

**Steven French** (with Dan Gillis) 2018

CIS\*4900/4910 · HACSim R package

**Julia Harvie** (with Bob Hanner) 2018-2019

MCB\*4500/4510 · Data mining GenBank and BOLD

**Ankita Bhandari** (with Bob Hanner) 2018

BINF\*6999 · Data mining GenBank and BOLD

**Assistantships, Awards, Scholarships and Travel Grants****Graduate Teaching Assistantships** 2017-2020

University of Guelph \$34,506.00-35,148.00

**Graduate Research Assistantships** 2017-2019

University of Guelph \$11,000.00

**CPES Graduate Dean's Scholarship** 2017

University of Guelph \$3500.00

**CPES Graduate Excellence Entrance (GEE) Scholarship** 2016

University of Guelph \$30000.00

**Arthur D. Latornell Graduate Travel Grant** 2019

University of Guelph \$500.00

**SoCS Travel Grant** 2019

University of Guelph \$1000.00

**Academic Service****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 9 manuscripts in 4 different journals, both alone or under the guidance of my PhD. supervisors.

*Ecology and Evolution* 2021-2022*Molecular Ecology Resources* 2019-2022*Molecular Biology Reports* 2020*Methods in Ecology and Evolution* 2020

**Proceedings**

I have presented graduate research at 3 international conferences, including both oral presentations and posters.

<b>8<sup>th</sup> International Barcode of Life Conference</b>	2019
NTNU University Museum and Norwegian Biodiversity Information Centre	
<b>7<sup>th</sup> International Barcode of Life Conference</b>	2017
University of Johannesburg	
<b>6<sup>th</sup> International Barcode of Life Conference</b>	2015
University of Guelph	

**Skills****Programming Languages and IDEs**

R · RStudio · TeX · Python · PyCharm

**Document Preparation, Spreadsheet Applications, Version Control and Continuous Integration**

LaTeX · RMarkdown · Excel · HTML · Git · GitHub · Travis CI

**Other**

R Shiny

**Software Development**

HACSim (**H**aplotype **A**ccumulation **C**urve **S**imulator) · 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
- Available for download through the Comprehensive R Archive Network ([CRAN](https://cran.r-project.org/)) package repository and accessible online at [shinyapps.io](https://shinyapps.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 14000 times (c. 245 times per month) since being published in May 2019

## **Refereed Work**

### **Journal Articles**

#### **Published**

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*.
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.
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.
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.

#### **Accepted**

1. **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*.

#### **Submitted**

1. Young, R.G., Persram, M., Friesen, O., Chen, A., Yu, J. **Phillips, J.D.** and Hanner, R.H. R you citing your use of the R statistical computing and graphics environment correctly? *PeerJ Computer Science*.

#### **To Be Submitted**

4. D'Ercole, J., Dapporto, L., Phillips, J.D., Dincă, V.E., Vila, R., Talavera, G. and Hebert, P.D.N. (2022). Macrogenetics reveals the impact of glacial cycles on mitochondrial DNA diversification in North American butterflies. *PNAS*.
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. *Bioinformatics*.
2. **Phillips, J.D.**, Bootsma, S.E., Hanner, R.H. and Gillis, D.J. (2022). Solving the genetic specimen sample size problem with a local search optimization algorithm. *Methods in Ecology and Evolution*.

1. Athey, T.B.T., **Phillips, J.D.**, Hanner, R.H. and McNicholas, P.D. (2022) VLF: An R package for the analysis of very low frequency variants in DNA sequences. *Biodiversity Data Journal*.

### Conference Proceedings

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.

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.

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.

### Non-Refereed Work

I have communicated my research to non-technical audiences through various media.

### Blog posts

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 (<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**

1. Wireframing session volunteer  
University of Guelph

November 2021

- Participated in student-led use case 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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