



# Megan Barkdull

PH.D CANDIDATE, NSF GRADUATE RESEARCH FELLOW

Department of Ecology and Evolutionary Biology, Cornell University

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## Education

### Ph.D Candidate, Department of Ecology and Evolutionary Biology

ADVISOR: DR. CORRIE MOREAU

Cornell University

August 2019–expected December 2024

### Bachelor of Arts in Biology

ADVISOR: DR. EMILY HEFFERNAN

New College of Florida

August 2014–May 2018

- Honors Thesis: Population Genetics of the Threatened Florida Duskywing Skipper

## Publications

Double dagger (§) indicates co-first authors. Dagger (†) indicates mentored undergraduate co-author.

### Published:

1. Heffernan, E. V.†, **Barkdull, M.†**, N. K. Brady. 2023. Microsatellites for butterfly conservation: historical challenges, current relevance, and a guide to implementation. *Frontiers in Ecology and Evolution*. <https://doi.org/10.3389/fevo.2024.1344065>
2. **Barkdull, M.†**, C. R. Miller†, M. A. Pipkin, & C. S. Moreau. 2023. Natural history collections: What are they and why do we need them?. *Frontiers for Young Minds*. <https://kids.frontiersin.org/articles/10.3389/frym.2023.1048608>
3. **Barkdull, M.**, & C. S. Moreau. 2023. Worker reproduction and caste polymorphism impact genome evolution and social genes across the ants. *Genome Biology and Evolution*. <https://doi.org/10.1093/gbe/evad095>
4. Heffernan, E., A. Markee., M. R. Truglio, **M. Barkdull**, S. Steele Cabrera, J. Daniels. 2023. Population Genetic Structure of a Rare Butterfly in a Fragmented South Florida Ecosystem. *Insects* <https://doi.org/10.3390/insects14040321>
5. Williams, K.M., **M. Barkdull**, M. Fahmy, E. Hekkala, M. E. Siddall, S. Kvist. 2020. Caught red handed: iDNA points to wild source for CITES-protected contraband leeches. *Eur J Wildl Res*. <https://doi.org/10.1007/s10344-020-01419-5>
6. Siddall, M. E., **M. Barkdull**, M. Tessler, M. R. Brugler, E. Borda., & E. Hekkala. 2019. Ideating iDNA: Lessons and limitations from leeches in legacy collections. *PLoS one* <https://doi.org/10.1371/journal.pone.0212226>

### In revision:

Manuscripts available upon request.

1. Donaldson, M.†, **Barkdull, M.**, & C. S. Moreau. Variation in aggression across ants (Hymenoptera: Formicidae) is linked to natural selection on neurotransmitter receptor and cuticular hydrocarbon synthesis genes. *Invited submission to Annals of the Entomological Society of America*.

## Grants, Fellowships & Awards

### Research grants (Total amount: \$17,500)

- Society for the Study of Evolution, Rosemary Grant Advanced Award (\$3,500)
- Cornell University, Andrew W. Mellon Student Research Grant (\$1,000)
- Sigma Xi, Cornell Chapter, Research Grant (\$1,000)
- American Society of Naturalists, Student Research Award (\$2,000)
- Society for Integrative and Comparative Biology, Grant-in-aid of research (\$1,000)
- Cornell University Graduate School, Research Travel Grant (\$2,000)
- Cornell University, Graduate Student Research Fund (\$4,000)
- Cornell University, Richard G. Harrison Fund (\$3,000)

### Conference travel grants (Total amount: \$1,250)

- Cornell University, Graduate School Conference Travel Grant (\$600)
- Cornell University, Graduate School Conference Travel Grant (\$500)
- Cornell University, Orenstein Fund (\$750)

### Fellowships (Total amount: \$244,487)

- Cornell University Insect Collection, Summer Stipend Award (\$10,832)
- National Science Foundation Graduate Research Fellowship (\$138,000)
- Cornell Fellowship (\$33,241)
- National Merit Scholar (\$62,414)

### Awards

- Book Award for Best First-Year Symposium Presentation (\$50)

## Talks

Dagger (†) indicates presenter.

### Invited seminars:

1. Natural History Museum of Los Angeles County (2024). **Barkdull, M†**. Evolutionary insights from complex traits in ants.
2. Essig Brunch Seminar Series, University of Berkeley, Berkeley, CA. (2023). **Barkdull, M†**. and Moreau, C. Genomic causes and consequences of worker caste polymorphism in the ants.

### Oral presentations:

1. Evolution, Montreal, QB. (2024) **Barkdull, M†**. and Moreau, C. One genotype, many phenotypes: Evolutionary insights from complex traits in ants.
2. Evolution, Albuquerque, NM. (2023) **Barkdull, M†**. and Moreau, C. Social traits modulate genome evolution in ants.
3. Cornell Department of Ecology and Evolutionary Biology Winter Symposium, Ithaca, NY. (2022). **Barkdull, M†**. and Moreau, C. Social traits shape genome evolution in ants.
4. Social Insects in the Northeast Region meeting, Brooklyn, NY. (2020). **Barkdull, M.†** and Moreau, C. Formicidae caste determination: single cell and functional genomic techniques. \*\*Cancelled due to COVID19.
5. Cornell Department of Ecology and Evolutionary Biology Winter Symposium, Ithaca, NY. (2019). **Barkdull, M.†**, Williams, K.M., Tessler, M., Siddall, M.E. What's in a leech? A diversity of potential for leech-derived iDNA.
6. AMNH REU Summer Symposium, Manhattan, NY. (2017). **Barkdull, M†.**, Tessler, M., and Siddall, M.E. What's in a leech? A haemadispid by any other name would reveal as much.

### Posters:

1. Biology of Genomes meeting, Cold Spring Harbor Laboratory, NY. (2022). **Barkdull, M†**. and Moreau, C. Social traits modulate genome evolution in ants.
2. International Symposium on Molecular Insect Science, Barcelona, Spain. (2019). E.V Heffernan†, **M. Barkdull**, and A. Markee. The role of gene flow in connecting populations of endangered skipper butterflies in the United States: using genetic data to inform management strategies.
3. Entomological Society of America meeting, St. Louis, MO. (2019). Markee, A.N†., Saarinen, E. V., **Barkdull, M.** Conservation genetics of the Florida duskywing skipper (*Ephyriades brunnea*): a multi-population assessment of a rare South Florida butterfly.
4. Imperiled Butterflies Working Group meeting, Miami, FL. (2017). Ash, M†., **Barkdull, M†.**, Elmir, G.† Are endangered Dakota Skipper populations infected with Wolbachia?

## Research Positions

### Ph.D. researcher

MOREAU LAB

*Cornell University*

*August 2018–ongoing*

- Investigated the genetic basis and consequences of worker caste polymorphisms using genome sequencing, comparative genomic methods, and transcriptomics.
- Conducted multiple field excursions to collect ant specimens to support research program.

### Post-baccalaureate intern

ZAMUDIO LAB

*Cornell University*

*September 2018–August 2019*

- Conducted conservation genetics research on a number of reptile and amphibian species.
- Responsible for assisting all lab members with wet lab work, including DNA extractions, microsatellite sequencing, Sanger sequencing, and library prep for MiSeq.
- Collaborated with Dr. Fábio de Sá to describe the genetic mating system of the saxicolous Brazilian frog \**Cycloramphus boraceiensis*\*.

### Hawkmoth Sensory Behavior volunteer

RAGUSO LAB

*Cornell University*

*September 2018–December 2018*

- Participated in weekly hawkmoth colony care tasks (feeding, plant care, pupae counts etc.).
- Ran experiments testing the role of floral humidity in hawkmoth feeding choice.

### Birdsong Evolution, research assistant

DRS. ARAYA-SALAS AND ODOM

*Cornell Lab of Ornithology*

*May 2018–May 2019*

- Coded individual song elements in birdsong spectrograms for downstream data analysis.
- Created analysis protocol and generate graphics for future researchers on the project.

### Florida Duskywing Genetics Project, research assistant

HEFFERNAN LAB

*New College of Florida*

*August 2017–May 2018*

- Carried out a population genetics analysis of the threatened Florida Duskywing skipper butterfly to inform conservation policy.
- Performed next-generation sequencing in order to develop novel microsatellite markers

## NSF Research Experiences for Undergraduates Intern

DEPARTMENT OF INVERTEBRATE ZOOLOGY

- Used genetic techniques (Sanger sequencing etc.) to identify the hosts of terrestrial bloodfeeding leeches.
- Conducted fieldwork to collect invertebrate (leeches, crayfish) for related lab projects.

*American Museum of Natural History*

*May 2017–August 2017*

## Dakota Skipper Wolbachia Status, research assistant

HEFFERNAN LAB

- Conducted DNA extractions and PCR amplifications of Wolbachia pathogen genes from the endangered Dakota Skipper butterfly to identify pathogen strains.

*New College of Florida*

*January 2017–May 2017*

# Curatorial Skills & Experiences

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## From Nabokov's Net exhibit contributor

CORNELL UNIVERSITY INSECT COLLECTION AND MANN LIBRARY

*September 2023–March 2024*

- Collaborated with CUIC and Mann library staff to design an exhibit featuring the butterfly specimens collected by Vladimir Nabokov during his time at Cornell.
- Designed visuals and wrote content for exhibit component focused on butterfly conservation and the role of natural history collections in conservation research.

## Six-Legged Science: Unlocking the Secrets of the Insect World exhibit contributor

CORNELL UNIVERSITY INSECT COLLECTION AND MUSEUM OF THE EARTH

*January 2022–March 2022*

- Helped design components of public-facing museum exhibit, including pulling specimens, databasing, and design work
- This exhibit reached 18,592 in-person visitors.

## Social Media co-manager

CORNELL UNIVERSITY INSECT COLLECTION

*January 2022–Present*

- Co-managed the CUIC's Instagram and Twitter pages, designing and posting content to engage the broader community with the work of the CUIC.

## Collections Management Workshop, participant

CORNELL UNIVERSITY INSECT COLLECTION

*January 2021–May 2021*

- Participant in a semester-long workshop series, led by Drs. Jason Dombroskie and Corrie Moreau, which focused on practical discussion of topics related to the care and management of natural history collections, including museum mission statements, managing loans, permits, managing volunteers and students, databasing, and outreach.

## Collection Databasing, graduate supervisor

CORNELL UNIVERSITY INSECT COLLECTION

*August 2020–Present*

- Responsible for databasing specimens in the CUIC's Formicidae collection, from data entry to interfacing with Specify.
- Hired, trained, and supervised undergraduate and graduate students on how to conduct databasing in the the collection.
- Designed training materials for other databasing workers.

## Entomological Collections Network annual meeting, attendee

*November 2020–NA*

- Virtually attended conferences sessions on a wide range of entomological collections management topics.

# Teaching

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## Introduction to Evolution and Diversity Writing in the Major guest lecturer

BIOEE 1780

*Cornell University*

*October 2023–NA*

- Invited to give a guest lecture on my dissertation research and path to graduate school in Jasmine Peters' Writing in the Majors course.

## Conservation Biology guest lecturer

BISC 4575

*Forham University*

*April 2023–NA*

- Invited to give a guest lecture on conservation genetics and my research to Dr. Evon Hekkala's conservation biology seminar course.

## Introduction to Evolution and Diversity grader

BIOEE 1781

*Cornell University*

*August 2022–December 2023*

- Responsible for grading weekly assignments for online evolution and diversity course.

## Introduction to Evolution and Diversity teaching assistant

BIOEE1780

- Taught three weekly discussion/lab sections.
- Assisted with course transition to an online format due to COVID-19.

Cornell University

January 2020–May 2020

## Comparative Physiology teaching assistant

BIOG1440

- Taught three weekly discussion/lab sections, leading hands-on investigations of physiological concepts covered in lectures.
- Created extensive, novel course review materials; available on my GitHub.

Cornell University

August 2019–December 2020

## Foundations of Biology teaching assistant

BIOL2100

- Led review sessions prior to tests and quizzes.
- Met individually with students to address performance questions.

New College of Florida

August 2017–December 2017

## Cellular Biology teaching assistant

BIOL3500

- Led content-delivery and problem-solving review sessions once per week.
- Assisted in exam grading and clerical tasks.

New College of Florida

August 2016–December 2016

# Mentoring Experiences

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## Eduardo Guzman

HIGH SCHOOL SUMMER INTERN

- Co-mentored Eduardo as he gained exposure to a variety of entomological and collections-based research approaches, including field collecting, ant specimen curation, databasing, DNA extraction, PCR, and scientific communication.

Cornell University

June 2024–NA

## Mahalia Donaldson

PAID RESEARCH INTERN

- Conducted a research project to the evolution of genes related to aggression in ants spanning a range of aggression phenotypes.
- Learning scientific programming skills including Bash and R scripting, Git and Github version control
- Results of this project are in prep for an invited submission to Annals of the Entomological Society of America.

Cornell University

August 2022–Present

## Seyde Delgado

PAID RESEARCH INTERN; BIOLOGY 2990 INDEPENDENT RESEARCH EXPERIENCE STUDENT

- Conducted a research project to understand the relationship between herbivory and molecular evolution in ants.
- Learning scientific programming skills including Bash and R scripting, Git and Github version control

Cornell University

May 2022–Present

# Service

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## Graduate Student Association treasurer

DEPT. OF ECOLOGY & EVOLUTIONARY BIOLOGY

- Manage funding from the university for graduate student and some department events.

Cornell University

August 2022–August 2023

## Graduate Student Association co-president

DEPT. OF ECOLOGY & EVOLUTIONARY BIOLOGY

- Liase between graduate student body and faculty leadership to communicate and address graduate student concerns
- Participated in the formation of working groups focused on assessing and improving diversity, equity and inclusion in the department.

Cornell University

July 2020–August 2022

## Cornell Diversity Preview Weekend volunteer

DEPT. OF ECOLOGY & EVOLUTIONARY BIOLOGY

- Volunteered for the workshops “Crafting a CV” and “Fellowships and Personal Statements” providing peer review to participants for the 2020 DPW event.
- Served as a peer mentor to a DPW participant during the Fall 2020 semester.
- Answered participant questions as a panelist for the workshop “Crafting a CV” for the 2021 DPW event.

Cornell University

September 2020 and summer 2021–NA

## EvoDay Planning Committee

\* POSTPONED TO SPRING 2022 DUE TO COVID19

- Identify and invite speakers for a day-long symposium on the theme of “Evolution in Deep Time”.

Cornell University

Spring 2020–NA

## Department Seminar Series Committee

DEPT. OF ECOLOGY & EVOLUTIONARY BIOLOGY

Cornell University

August 2019–August 2020

- This committee plans and coordinates the department's weekly seminar series
- Responsible for soliciting speaker nominations, constructing schedule of speakers, and assisting host labs with managing their speaker visits.
- While on this committee, I initiated a push to increase the diversity of our invited speakers, based on the best practices identified by Hagan et al. (2020).

## Journal referee:

- Integrative and Comparative Biology, editorial reviewer
- PCI-EvolBio, ad hoc reviewer
- Molecular Ecology, ad hoc reviewer
- Genome Biology and Evolution, ad hoc reviewer
- Evolution, ad hoc reviewer
- Insectes Sociaux, ad hoc reviewer

## Society membership:

- Society for the Study of Evolution (SSE)
- Society for Open, Reliable, and Transparent Ecology and Evolutionary Biology (SORTEE)
- Society for Integrative and Comparative Biology (SICB)
- Society for Molecular Biology and Evolution (SMBE)
- Entomological Society of America (ESA)

## Outreach

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### Guest presenter for second grade class unit on arthropods

VOLUNTEER

Ferndale Elementary School

January 2024–NA

- Presented ant fun facts to 60 second grade students, and answered student questions about ants.

### Volunteer instructor for Ithaca Children's Garden summer camp

EVENT VOLUNTEER

Ithaca Children's Garden

July 2023–NA

- Led 6-10 year old campers through hands-on activity focused on the ant life cycle and on insect collecting.

### Panelist for "Women in Entomology: Meet the Superheroes of Insect Science"

PUBLIC TALK

WSKG/PBS

October 2022–NA

- Discussed research and insect conservation.
- Panel can be viewed at <https://www.youtube.com/watch?v=HZ0WdZk84wM>

### Guest blogger for the Paleontological Research Institute/Museum of the Earth

GUEST BLOGGER

Paleontological Research  
Institute/Museum of the Earth

July 2022–NA

- Guest blogged for the Paleontological Research Institute and Museum of the Earth. \*\*Barkdull, M.\*\* (2022). Insects under threat: the role of natural history collections in biodiversity conservation. <https://bit.ly/3ph2lsm>

### "Meet an Entomologist" volunteer

EVENT VOLUNTEER

Six-legged Science Exhibit, Museum  
of the Earth

July 2022–NA

- Answered questions from visitors to the Museum of the Earth's Six-legged Science exhibit.

### Panelist for "Exploring Insect Evolution: A Panel on New Research"

PUBLIC TALK

Darwin Days Week, Museum of the  
Earth

February 2022–NA

- Gave a research talk for the event \*Exploring Insect Evolution: A Panel on New Research\* as part of the Museum of the Earth's Darwin Days events.
- Talk can be viewed at <https://bit.ly/3s4jOGB>

### Cornell Insectapalooza volunteer

EVENT VOLUNTEER

Dept. of Entomology, Cornell  
University

October 2019, 2022, 2023–NA

- Manned a table on ant diversity and discussed all things ant with members of the public, including young children, teens and adults.

