

# Erin L. McCullough

Department of Biology, Clark University  
ermccullough@clarku.edu  
<http://wordpress.clarku.edu/mcculloughlab>

## ACADEMIC POSITIONS

**Assistant professor**, 2022 - present

Department of Biology, Clark University, Worcester, Massachusetts, USA

**Postdoctoral research fellow**, 2018 - 2021

Center for Reproductive Evolution, Syracuse University, Syracuse, New York, USA

Advisors: Dr. Scott Pitnick and Dr. Steve Dorus

**Postdoctoral research fellow**, 2014 - 2018

Centre for Evolutionary Biology, University of Western Australia, Perth, Western Australia

Advisor: Prof. Leigh Simmons

## EDUCATION

**Ph.D., Organismal Biology and Ecology**, 2008 - 2014

Division of Biological Sciences, University of Montana, Missoula, Montana, USA

Dissertation: "Elaboration and diversification of rhinoceros beetle horns"

Advisor: Dr. Douglas Emlen

**B.S., Biology *summa cum laude***, August 2002 - 2006

University of Puget Sound, Tacoma, Washington, USA

## PUBLICATIONS

\*Asterisk denotes undergraduate co-author

31. Lane, S. M. and **McCullough, E. L.** 2024. The prevalence of weapon damage: a proportional meta-analysis. *Animal Behaviour*, in press.
30. Kochensparger, S. K.\*, Painting, C. J., Buzatto, B. A., and **McCullough, E. L.** 2024. Are weapon allometries steeper in major or minor males? A meta-analysis. *Behavioral Ecology* 35: arae069.
29. **McCullough, E. L.**, Whittington, E., Singh, A., Pitnick, S., Wolfner, M. F., and Dorus, S. 2022. The life history of *Drosophila* sperm involves molecular continuity between male and female reproductive tracts. *Proceedings of the National Academy of Sciences* 119: e2119899119. Cover article (March 15, 2022)  
*Highlighted in EurekAlert!, ScienceDaily, and Newswise*
28. Sherratt, E., **McCullough, E. L.**, and Painting, C. J. 2022. Commentary: The ecological and evolutionary implications of allometry. *Evolutionary Ecology* 35: 431-437.
27. **McCullough, E. L.** and O'Brien, D. M. 2022. Variation in allometry along the weapon-signal continuum. 2022. *Evolutionary Ecology* 35: 591-604.
26. McDonough-Goldstein, C. E., Whittington, E., **McCullough, E. L.**, Buel, S. M., Erdman, S., Pitnick, S., and Dorus, S. 2021. Pronounced postmating response in the *Drosophila* female reproductive tract fluid proteome. *Molecular and Cellular Proteomics* 20: 100156.

25. **McCullough, E. L.**, Chou, C.-C., Backwell, P. R. Y. 2020. Cost of an elaborate trait: a trade-off between attracting females and maintaining a clean ornament. *Behavioral Ecology* 31: 1218-1223.
24. **McCullough, E. L.**, McDonough, C. E., Pitnick, S., and Dorus, S. 2020. Quantitative proteomics reveals rapid divergence in the postmating response of female reproductive tracts among sibling species. *Proceedings of the Royal Society B* 287: 20201030.
23. **McCullough, E. L.**, Verdeflor, L., Weinsztok, A., Wiles, J. R., and Dorus, S. 2020. Exploratory activities for understanding evolutionary relationships depicted by phylogenetic trees: united but diverse. *American Biology Teacher* 82: 333-337.  
*Winner of the 2020 T.H. Huxley Award for outreach and education from the Society for the Study of Evolution*
22. Dyson, M. L., Perez, D. M., Curran, T., **McCullough, E. L.**, Backwell, P. R. Y. 2020. The role of claw color in species recognition and mate choice in a fiddler crab. *Behavioral Ecology and Sociobiology* 74: 116.
21. O'Brien, D. M., Boisseau, R. P., Duell, M., **McCullough, E. L.**, Powell, E. C., Somjee, U., Solie, S., Hickey, A. J., Holwell, G. I., Painting, C. J., and Emlen, D. J. 2019. Muscle mass drives cost in sexually selected arthropod weapons. *Proceedings of the Royal Society B* 286: 20191063.
20. Chou, C.-C., Perez, D. M., Johns, S., Gardner, R., Kerr, K. A., Head, M. L., **McCullough, E. L.**, and Backwell, P. R. Y. 2019. Staying cool: the importance of shade availability for tropical ectotherms. *Behavioral Ecology and Sociobiology* 73: 106.
19. **McCullough, E. L.**, Buzatto, B. A., and Simmons, L. W. 2018. Population density mediates the interaction between pre- and postmating sexual selection. *Evolution* 72: 893-905.
18. **McCullough, E. L.** and Emlen, D. J. 2018. The research bias is unfortunate but also unsurprising: a comment on Tinghitella et al. *Behavioral Ecology* 29: 798.
17. **McCullough, E. L.**, Buzatto, B. A., and Simmons, L. W. 2017. Benefits of polyandry: molecular evidence from field-caught dung beetles. *Molecular Ecology* 26: 3546-3555.
16. **McCullough, E. L.**, Miller, C. W., and Emlen, D. J. 2016. Why sexually selected weapons are not ornaments. *Trends in Ecology and Evolution* 31: 742-751.  
*Cover article (October 2016)*
15. **McCullough, E. L.** and Simmons, L. W. 2016. Selection on male physical performance during male-male competition and female choice. *Behavioral Ecology* 27: 1288-1295.
14. **McCullough, E. L.**, Ledger, K. J.\*, O'Brien, D. M., and Emlen, D. J. 2015. Variation in the allometry of exaggerated rhinoceros beetle horns. *Animal Behaviour* 109: 133-140.
13. **McCullough, E. L.**, Ledger, K. J.\*, and Moore, T. Y. 2015. Variation in cross-sectional horn shape within and among rhinoceros beetle species. *Biological Journal of the Linnean Society* 115: 810-817.
12. **McCullough, E. L.**, Tobalske, B. W., and Emlen, D. J. 2014. Structural adaptations to diverse fighting styles in sexually selected weapons. *Proceedings of the National Academy of Sciences* 111: 14484-14488.  
*Highlighted in National Geographic, ScienceNow, Nature World News, ScienceDaily, and ScienceNews*
11. **McCullough, E. L.** 2014. Mechanical limits to maximum weapon size in a giant rhinoceros beetle. *Proceedings of the Royal Society B* 281: 20140696.  
*Highlighted in ScienceNews and American Scientist*

10. Johns, A., Gotoh, H., **McCullough, E. L.**, Emlen, D. J., and Lavine, L. C. 2014. Heightened condition-dependent growth of sexually selected weapons in the rhinoceros beetle, *Trypoxylus dichotomus* (Coleoptera: Scarabaeidae). *Integrative and Comparative Biology* 54: 614-621.
9. Najera, D. A., **McCullough, E. L.**, and Jander, R. 2014. Honeybees use celestial and/or terrestrial compass cues for inter-patch navigation. *Ethology* 120: 1-9.
8. **McCullough, E. L.** and Emlen, D. J. 2013. Evaluating the costs of a sexually selected weapon: big horns at a small price. *Animal Behaviour* 86: 977-985.  
*Highlighted in Nature, ScienceNews, and Inktfish*
7. **McCullough, E. L.** and Zinna, R. A. 2013. Sensilla density corresponds to the regions of the horn most frequently used during combat in the giant rhinoceros beetle *Trypoxylus dichotomus* (Coleoptera: Scarabaeidae: Dynastinae). *Annals of the Entomological Society of America* 106: 518-523.
6. **McCullough, E. L.** and Tobalske, B. W. 2013. Elaborate horns in a giant rhinoceros beetle incur negligible aerodynamic costs. *Proceedings of the Royal Society B* 280: 20130197.  
*Highlighted in BBC Nature, ABC Science, LiveScience, and Quirks & Quarks*
5. **McCullough, E. L.** 2013. Using radio telemetry to assess movement patterns in a giant rhinoceros beetle: Are there differences among majors, minors, and females? *Journal of Insect Behavior* 26: 51-56.  
*Highlighted in BBC News*
4. **McCullough, E. L.**, Weingarden, P. R.\*, and Emlen, D. J. 2012. Costs of elaborate weapons in a rhinoceros beetle: How difficult is it to fly with a big horn? *Behavioral Ecology* 23: 1042-1048.
3. Najera, D. A., **McCullough, E. L.**, and Jander, R. 2012. Interpatch foraging in honeybees: Rational decision making at secondary hubs based upon time and motivation. *Animal Cognition* 15: 1195- 1203.
2. Bai, M., **McCullough, E.**, Song, K-Q., Liu, W-G., and Yang, X-K. 2011. Evolutionary constraints in hind wing shape in Chinese dung beetles (Coleoptera: Scarabaeinae). *PLoS ONE* 6: e21600.
1. **McCullough, E.**, Wright, K. M., Alvarez, A., Clark, C. P., Rickoll, W. L., and Madlung, A. 2010. Photoperiod-dependent floral reversion in the natural allopolyploid *Arabidopsis suecica*. *New Phytologist* 186: 239-250.

## GRANTS & AWARDS

- 2024 NSF Building Research Capacity of New Faculty in Biology proposal, "BRC-BIO: Sexual selection across the invaded range of an exotic dung beetle" (\$468,601, pending)  
Nominated for Outstanding Undergraduate Teacher Award, Clark University  
Clark University Faculty Development Grant (\$2,500)
- 2020 Thomas Henry Huxley Award for outreach and education achievement from the Society for the Study of Evolution
- 2017 Japan Society for the Promotion of Science Postdoctoral Fellowship (¥11,888,000, equivalent to approximately \$107,500, declined)
- 2016 International Society for Behavioral Ecology Travel Award (\$1,900)
- 2014 Warner Clyde Allee Award for Best Student Paper, Animal Behavior Society (\$1,000)  
NSF Postdoctoral Research Fellowship in Biology (\$187,200)
- 2013 NSF Doctoral Dissertation Improvement Grant (\$18,078)

- 2012 Bertha Morton Graduate Fellowship, University of Montana (\$3,000)  
 Graduate Student Travel Award, Society for Integrative and Comparative Biology (\$1,055)  
 Honorable Mention for W.D. Hamilton Award for Outstanding Student Presentation,  
 Society for the Study of Evolution
- 2011 Sigma Xi Grant-in-Aid of Research (\$1,000)  
 Teaching Innovation Award, University of Montana OREOS (\$1,000)
- 2010 Sigma Xi Grant-in-Aid of Research (\$800)
- 2009 NSF Graduate Research Fellowship (\$125,000)  
 National Academy of Sciences Ford Foundation Diversity Fellowship (\$66,000)  
 NSF East Asia and Pacific Summer Institute Fellowship, Taiwan (\$8,610)

### **ADVISEE AWARDS**

- 2024 Luna Pagan, Clark University Penn Summer Research Award (\$4000)  
 Sydney Kochensparger, Clark University SURE Award (\$3500)  
 Beatrice Altopp, Clark University SURE Award (\$1750)
- 2023 Sydney Kochensparger, Clark University Penn Summer Research Award (\$4,000)

### **INVITED SEMINARS & CONFERENCE PRESENTATIONS**

- 2024 Animal Behavior Society meeting, London, Ontario, Canada
- 2023 University of Montana, Ecology and Evolution Program  
 Oklahoma State University, Department of Integrative Biology  
 Animal Behavior Society meeting, Portland, Oregon  
 Clark University, Department of Biology
- 2021 University of Nebraska at Omaha, Biology Department  
 Clark University, Department of Biology
- 2019 Biology of Spermatozoa meeting, Nynäshamn Sweden
- 2018 Royal Society Theo Murphy international scientific meeting on “Sexual selection: patterns in the history of life”, Buckinghamshire, UK  
 Oklahoma State University, Department of Integrative Biology  
 University of Georgia, Odum School of Ecology  
 UC Riverside, Department of Evolution, Ecology, and Organismal Biology
- 2017 Clemson University, Department of Biological Sciences
- 2016 International Society for Behavioral Ecology congress, Exeter, UK  
 UC San Diego, Department of Ecology, Behavior, and Evolution
- 2015 University of British Columbia, Department of Zoology  
 International Ethological Conference, Cairns, Queensland, Australia  
 UC Santa Barbara, Department of Ecology, Evolution, and Marine Biology
- 2014 Washington State University, Department of Entomology  
 Society for Integrative & Comparative Biology meeting, Austin, Texas  
 Animal Behavior Society meeting, Princeton, New Jersey  
*\*\*Warder Clyde Allee Award for Best Student Paper*

- 2013 Society for Integrative & Comparative Biology meeting, San Francisco, California  
*Highlighted in American Scientist (March-April 2013)*
- 2012 Joint Congress on Evolutionary Biology, Ottawa, Ontario, Canada  
*\*\*Honorable mention for W.D. Hamilton Award for Outstanding Presentation*  
*Highlighted in Science (July 27, 2012)*  
Society for Integrative & Comparative Biology meeting, Charleston, South Carolina  
*Highlighted in ScienceNews (February 11, 2012)*
- 2010 Society for Integrative & Comparative Biology meeting, Seattle, Washington

## TEACHING

*Courses taught as the instructor of record:*

**Evolution (Biology 105, with lab)**, Clark University

Core course for the Biology major and Environmental Science (Conservational Biology) major

Fall 2024: 35 students

Spring 2024: 32 students

Spring 2023: 32 students

**Animal Behavior (Biology 242)**, Clark University

Seminar course and possible capstone for the Biology major

Fall 2024: 23 students

Fall 2023: 23 students

Fall 2022: 23 students

**Behavior and Evolution (Biology 406, with discussion)**, University of Montana

Seminar course for the Ecology and Organismal Biology major

Spring 2011: 35 students

## MENTORING

### **Undergraduate student research advisor:**

Charlie Fox-Whelpton (2024-present, Clark University)

Lauren Bostwick (2024-present, Clark University)

Maddie McInnis (2024-present, Clark University)

Luna Pagan (2024-present, Clark University)

Sydney Kochensparger (2023-present, Clark University)

Beatrice Altopp (2023-present, Clark University)

Lauren Woolner (2019, Syracuse University)

Kimberly Ledger (2013-2014, University of Montana)

Paul Weingarden (2011-2012, University of Montana)

### **Master's student committee member:**

Sofie Irons (2024-present, Clark University)

Matt O'Connell-Vale (2024-present, Clark University)

Max Leslie (2024, Clark University)

Julia Beebe (2024, Clark University)

Emma McClellan (2024, Clark University)

### **PhD student committee member:**

Max Olson (2022-present, Clark University)

Joe Nelsen (2022-present, Clark University)

## OUTREACH

“The dung beetle census is a window into their ecosystem.” NPR’s All Things Considered, November 2024

“Love is a battlefield.” Challenge Change Podcast, February 2024

“Sex and death. A love story.” ClarkNOW, September 2023

Organizer of Clark University’s “Biology as Art” Competition, 2023-present

## SERVICE

**Reviewer for manuscripts:** American Naturalist (3), Anatomical Record (1), Animal Behaviour (4), Annals of the Entomological Society of America (1), Behavioral Ecology (3), Behavioral Ecology and Sociobiology (1), Behaviour (1), Behavioral Processes (1), Biological Journal of the Linnean Society (2), Biology Letters (2), Biological Reviews (2), Communications Biology (2), Current Zoology (3), Ecology and Evolution (1), Ethology (3), European Journal of Entomology (1), Evolution (6), Evolutionary Ecology (2), Functional Ecology (4), Insects (6), Integrative and Comparative Biology (1), Journal of Animal Ecology (2), Journal of Applied Ecology (2), Journal of Evolutionary Biology (2), Journal of Insect Conservation (1), Journal of Insect Science (1), Journal of Morphology (3), Molecular Ecology (2), Nature Physics (1), Proceedings of the National Academy of Sciences (2), Proceedings of the Royal Society B (10), and Scientific Reports (3)

**Reviewer for proposals:** National Science Foundation (4), National Academy of Sciences Ford Foundation Fellowship (panelist), National Science Centre Poland (1)

**Guest editor:** Special issue on “Evolutionary and ecological implications of allometry” in *Evolutionary Ecology*

### University and Departmental service:

Faculty advisor to the Women in STEM club (2024-present)

Biology department curriculum committee (2023-present)

Biology department Lyerla and Hastings fellowship review committee (2023-present)

Faculty Fellow in Clark University’s Curriculum & Careers Initiative (2023)

### Professional membership:

Animal Behavior Society

Society for the Study of Evolution

## PROFESSIONAL DEVELOPMENT

Participant, Write winning grant proposals NSF focus workshop, Clark University Office of Sponsored Programs and Research, January 2023

Participant, (Re)Designing courses for equity and career readiness workshop, Clark University Center for Excellence in Teaching and Learning, November 2023

Participant, Pathways to scientific teaching workshop, University of Montana, December 2010

*Last updated: November 2024*