

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

32. **McCullough, E. L.**, Altopp, B.A.*, McInnis, M.S.*, and Pagan, L.J.* 2025. Seasonal activity and sexual selection in an urban dung beetle. *Annals of the Entomological Society of America*, 118: 495-501.

Cover article (November 2025)

Highlighted in Entomology Today

31. Lane, S. M. and **McCullough, E. L.** 2025. The prevalence of weapon damage: a proportional meta-analysis. *Animal Behaviour*, 222: 123117.

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 Inkfish
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 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 to take position at Syracuse University)
- 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

- 2025 Maddie McInnis, Clark University Penn Summer Research Award (\$4000)
Daniel Kellogg, Clark University Biology SURE Award (\$3500)
Beatrice Altopp, Clark University Geller Award (\$2000)
- 2024 Luna Pagan, Clark University Penn Summer Research Award (\$4000)
Sydney Kochensparger, Clark University Biology SURE Award (\$3500)
Beatrice Altopp, Clark University Biology SURE Award (\$1750)
- 2023 Sydney Kochensparger, Clark University Penn Summer Research Award (\$4,000)

INVITED SEMINARS & CONFERENCE PRESENTATIONS

- 2025 Fordham University, Department of Biological Sciences
- 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

Spring 2025: 36 students

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:

Daniel Kellogg (2024-present, Clark University)

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 (2023-2025, 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 (2024-2025, Clark University)
Matt O'Connell-Vale (2024-2025, 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 (2022-2025, Clark University)

OUTREACH

"Battles beneath the city park: What urban dung beetles reveal about sexual selection."
Entomology Today, November 2025
"The secret life of beetles." Ware River Nature Club, April 2025
"Searching for the tiny dung beetles that clean the vast forest floor." National Public Radio,
November 2024.
"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 (5), Annals of the
Entomological Society of America (1), Behavioral Ecology (4), 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 (7), 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 (3), 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), PNAS Nexus (1), 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)

Professional membership:

Animal Behavior Society

Entomological Society of America

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 2022

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

Last updated: November 2025