

Michael W. Belitz

NSF Postdoctoral Research Fellow in Biology

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EDUCATION

University of Florida and Florida Museum of Natural History

Ph.D. 2023

Gainesville, Florida – Zoology

Dissertation: *Insects in a changing world: Life history traits and thermal niche condition responses to climate change and urbanization*

Advisor: Dr. Rob Guralnick

Central Michigan University

M.S. 2018

Mount Pleasant, Michigan – Biology

Thesis: *Applying biodiversity informatics and field study approaches to the conservation of Poweshiek skipperling (Oarisma poweshiek)*

Advisor: Dr. Anna Monfils

Knox College

B.A. 2014

Galesburg, IL – Biology & Environmental Studies

Honors Thesis: *Assessing the invertebrate composition of reconstructed prairies*

Advisor: Dr. Stuart Allison

ACADEMIC APPOINTMENTS

NSF Postdoctoral Fellow in Biology

2024 – present

Michigan State University and University of British Columbia

Mentors: Drs. Elise Zipkin and Katie Marshall

Postdoctoral Research Associate

2023 – 2024

Michigan State University

Mentor: Dr. Elise Zipkin

PEER-REVIEWED PUBLICATIONS

(† signifies equal authorship; * signifies undergraduate mentee)

In Press

34. **Belitz, M.W.**, Campbell C.J., Drum R., Leuenberger W., Morelli T.L., Nail K., Shirey V., Thogmartin W., Zipkin E.F. A case for assemblage-level conservation to address the biodiversity crisis. *Nature Reviews Biodiversity*. Accepted subject to minor revision.

32. Li, D., **Belitz M.W.**, Campbell L., Guralnick R.P. Extreme weather events have strong but different impacts on plant and insect phenology. *Nature Climate Change*. In press.

2024

32. **Belitz, M.W.**, Sawyer A.*, Hendrick L., Guralnick R. 2024. Temperature niche and body-size condition phenological responses of moths to urbanization in a subtropical city. *Ecology*. (PDF)

31. Idec, J., Bybee S., Ware J., Abbott J., Ferreira R.G., Suvorov A., Kohli M., Eppel L., Kuhn W., **Belitz M.W.**, Guralnick R. 2024. Interactions between sexual signaling and body size drive ecology and evolution of wing colors in Odonata. *Scientific Reports*. 14: 25034. (PDF)

30. Folk, R.A., Siniscalchi C.M., Doby J., Kates H.R., Manchester S.R., Soltis P.S., Soltis D.E., Guralnick R.P., **Belitz M.W.** 2024. Spatial phylogenetics of Fagales: Investigating the history of temperate forests. *Journal of Biogeography*. 51: 1518-1532. (PDF)

29. Folk, R.A., Maassoumi A.A., Siniscalchi C.M., Kates H.R., Soltis D.E., Soltis P.S., **Belitz M.W.**†, Guralnick R.P.† 2024. Phylogenetic diversity and regionalization in the temperate arid zone. *Journal of Systematics and Evolution*. (PDF)

28. **Belitz, M.W.**, Sawyer A.*, Hendrick L., Kawahara A., Guralnick R. 2024. Substantial urbanization-driven declines of larval and adult moths in a subtropical environment. *Global Change Biology*. 30: e17241 ([PDF](#))
 27. Federico, N.*, Guralnick R., **Belitz M.W.** 2024. Large uncertainty in trait responses across insects among overall declines in a subtropical city. *Insect Conservation and Diversity*. 17: 312-323. ([PDF](#))
 26. Larsen E., **Belitz M.W.**, Di Cecco G., Glassberg J., Hurlbert A., Ries L., Guralnick R. 2024. Overwintering strategy regulates phenological sensitivity with consequences for ecological services in a clade of temperate North American insects. *Functional Ecology*. 38: 1075-1088. ([PDF](#))
 25. Folk, R.A., Charboneau J.L.M., **Belitz M.W.**, Singh T., Kates H.R., Soltis D.E., Soltis P.S., Guralnick R.P., Siniscalchi C.M. 2024. Anatomy of a mega-radiation: Biogeography and niche evolution in *Astragalus*. *American Journal of Botany*. e16299. ([PDF](#))
- 2023
24. Campbell, C.J., Barve V., **Belitz M.W.**, Di Cecco G., Doby J., Hurlbert A., Seltzer C., Guralnick R. 2023. Identifying the identifiers: How iNaturalist facilitates collaborative, research-relevant data generation and why it matters for biodiversity science. *BioScience*. 73: 533-541. ([PDF](#))
 23. McCleery R., Guralnick R., Kang K., Beatty M., Potash A., Jones M., Campbell C., **Belitz M.W.**, Idec J., Fletcher R. 2023. Uniting experiments and big data to advance ecology and conservation. *Trends in Ecology and Evolution*. 38: 970-979. ([PDF](#))
 22. Guralnick R.P., Campbell L., **Belitz M.W.** 2023. Weather anomalies more important than climate means in driving insect phenology. *Communications Biology*. 6: 490. ([PDF](#))
 21. **Belitz M.W.**, Larsen E.A., Shirey V., Li D., Guralnick R.P. 2023. Phenological research based on natural history collections: practical guidelines and a Lepidopteran case study. *Functional Ecology*. 37: 234-24. ([PDF](#))
 20. Di Cecco, G.J., **Belitz M.W.**, Cooper R.J., Larsen E.A., Lewis W.B., Ries L., Guralnick R.P., Hurlbert A.H. 2023. Phenology in adult and larval Lepidoptera from structured and unstructured surveys across eastern North America. *Frontiers of Biogeography*. 15: e56346. ([PDF](#))
- 2022
19. Kalkman V.J., Boudot J.P., Futahashi R., Abbott J.C., Bota-Sierra C.A., Guralnick R., Bybee S., Ware J., **Belitz M.W.** 2022. Diversity of Palaearctic dragonflies and damselflies (Odonata). *Diversity*. 14: 966. ([PDF](#))
 18. Larsen E.A., **Belitz M.W.**, Guralnick R.P., Ries L. Consistent trait-temperature interactions drive butterfly phenology in both incidental and survey data. 2022. *Scientific Reports*. 12: 13370. ([PDF](#))
 17. Abbott J.C., Bota-Sierra C.A., Guralnick R., Kalkman V., Gonzalez-Soriano E., Novelo-Gutierrez R., Bybee S., Ware J., **Belitz M.W.** 2022. Diversity of Nearctic dragonflies and damselflies (Odonata). *Diversity*. 14: 575. ([PDF](#))
 16. Shirey V., Larsen E., Doherty A., Kim C., Al-Sulaiman F., Hinolan J., Itliong M., Naive M., Ku M., **Belitz M.W.**, Jeschke G., Barve V., Lamas G., Kawahara A., Guralnick R., Pierce N., Lohman D., Ries L. 2022. LepTraits 1.0 A globally comprehensive dataset of butterfly traits. *Scientific Data*. 9: 382. ([PDF](#))
 15. Donnelly, A. Yu R., Jones K., **Belitz M.W.**, Li B., Duffy K., Zhang X, Wang J., Seyednasrollah B, Gerst K., Li D., Kaddoura Y., Zhu K., Morisette J., Ramey C., Smith K. 2022. Comparing in situ phenology and remotely derived phenometrics across ecosystems. *Ecosphere*. 13: e3912. ([PDF](#))
- 2021
14. **Belitz, M.W.**, Barve V, Doby J.R., Hantak M.M., Larsen E.A., Li D., Oswald J.A., Sewnath N., Walters M., Narayani B., Earl K., Gardner N., Guralnick R. †, Stucky B.J. † 2021. Climate drivers of adult insect activity are conditioned by life history traits. *Ecology Letters*. 24: 2687-2699. ([PDF](#))

13. Di Cecco, G.J., Barve V, **Belitz M.W.**, Stucky B.J., Guralnick R.P., Hurlburt A.H. 2021. Observing the observers: How participants contribute data to iNaturalist and implications for biodiversity science. *BioScience*. 71: 1179-1188. ([PDF](#))
 12. Earl, E.†, **Belitz M.W.**†, Laffan S.W., Barve V., Barve N., Soltis D.E., Allen J.M., Soltis P.S., Mishler B.D., Kawahara A.Y., Guralnick R.P. 2021. Spatial phylogenetics of butterflies in relation to environmental drivers and angiosperm diversity across North America. *iScience*. 24: 102239. ([PDF](#))
 11. Shirey, V., **Belitz M.W.**, Barve V., Guralnick R.P. 2021. A complete inventory of North American butterfly occurrence data: narrowing data gaps but increasing bias. *Ecography*. 44: 1-11. ([PDF](#))
 10. Montgomery, G.A., **Belitz M.W.**, Guralnick R.P., Tingley M.W. 2021. Standards and best practices for monitoring and benchmarking insects. *Frontiers in Ecology and Evolution*. 8: 579193. ([PDF](#))
- 2020
9. Li, D., Barve N., Brenskelle L., Earl K., Barve V., **Belitz M.W.**, Doby J., Hantak M.M., Oswald J.A., Stucky B.J., Walters, M., Guralnick, R.P. 2020. Climate, urbanization, and species traits interactively drive flowering duration. *Global Change Biology*. 27:1-12. ([PDF](#))
 8. Monfils, A.K., Krimmel E.R., Bates J.M., Bauer J.E., **Belitz M.W.**, Cahill B.C., Caywood A.M., Cobb N.S., Colby J.B., Ellis S.A., Krejsa D.M., Levine T.D., Marsico T.D., Mayfield-Meyer T.J., Miller-Camp J.A., Nelson R.M., Phillips M.A., Revelez M.A., Roberts D.R., Singer R.A. Zaspel J.M. 2020. Regional Collections are an essential component of biodiversity research infrastructure. *Bioscience*. 70: 1045-1047 ([PDF](#))
 7. **Belitz, M.W.**, Larsen E.A., Ries L., Guralnick R.P. 2020. The accuracy of phenology estimators for use with sparsely sampled presence-only observations. *Methods in Ecology and Evolution*. 11: 1273-1285. ([PDF](#))
 6. **Belitz, M.W.**, Monfils M.J., Cuthrell D.L., Monfils A.K. 2020. Landscape-level environmental stressors contributing to the decline of Poweshiek skipperling (*Oarisma poweshiek*). *Insect Conservation and Diversity*. 13: 187-200. ([PDF](#))
 5. Barve, V, Brenskelle L., Li D., Stucky B., Barve N., Hantak M., McLean B., Paluh D., Oswald J., **Belitz M.W.**, Folk R.A., Guralnick R.P. 2020. Methods for broad-scale plant phenology assessments using citizen scientists' photographs. *Applications in Plant Sciences*. 8: e11315. ([PDF](#))
- 2019
4. Hackett, R.A., **Belitz M.W.**, Gilbert E.E., Monfils A.K. 2019. A data management workflow of biodiversity data from the field to data users. *Applications in Plant Sciences*. 7: e11310. ([PDF](#))
 3. **Belitz, M.W.**, Monfils M.J., Cuthrell D.L., Monfils A.K. 2019. Life history and ecology of the endangered Poweshiek skipperling *Oarisma poweshiek* in Michigan prairie fens. *Journal of Insect Conservation*. 23: 635-649 ([PDF](#))
 2. Hiltz, D.J., **Belitz M.W.**, Gehring T.M., Pangle K.L., Uzarski D. 2019. Climate change and nutria range expansion in the Eastern United States. *Journal of Wildlife Management*. 83: 591-598 ([PDF](#))
- 2018
1. **Belitz, M.W.**, Hendrick L.K.*, Monfils M.J., Cuthrell D.L., Marshall C.J., Kawahara A.Y., Cobb N.S., Zaspel J.M., Horton A.M., Huber S.L., Warren A.D., Forthaus G.A.*, Monfils A.K. 2018. Aggregated occurrence records of the federally endangered Poweshiek skipperling (*Oarisma poweshiek*). *Biodiversity Data Journal*. 6: e29081. ([PDF](#))

SUBMITTED PUBLICATIONS IN REVIEW/REVISION

2. **Belitz, M.W.**, Larsen E.A., Hurlbert A.H., Di Cecco G.J., Neupane N., Ries L., Tingley M.W., Guralnick R.P., Youngflesh C. Potential for bird-insect phenological mismatch in a tri-trophic system. In revision at *Journal of Animal Ecology*.

1. Steele Cabrera, S.R.†, **Belitz M.W.**†, Emmel T.C., Khazan E.S., Standridge M.J., Rossetti K., Daniels J. Long-term population dynamics of an endangered butterfly are influenced by hurricane-mediated disturbance. In review following minor revisions at *Biological Conservation*. (Preprint)

SOFTWARE

3. Campbell C., **Belitz M.W.** 2022. geoshift: Metric to compare temporally explicit species distribution models. R package release: <https://doi.org/10.5281/zenodo.7126857>
2. **Belitz, M.W.**, Campbell C., Li D. 2020. phenessse: Estimate phenological metrics using presence-only data. R Package version 0.1.2. <https://cran.r-project.org/package=phenesse>
1. Pearse, W.D., **Belitz M.W.**, Stemkovski M.S., and Davies T.J. 2018 phest: Calculate PHEnological ESTimates. R package version 1.0-0

FELLOWSHIPS, AWARDS & GRANTS

Fellowships

2024-2027: NSF Postdoctoral Research Fellowship in Biology	\$240,000
2019: UF Biodiversity Institute Fellowship	\$20,000
2018: UF Grinter Fellowship	\$6000
2016-2018: Central Michigan University College of Science and Engineering's Dean's Research Fellowship	\$40,000

Honors & Awards

2023: Florida Museum of Natural History Biodiversity Award for graduate student excellence	
2021: GBIF Young Researchers Award	€5000
2015: Jefferson County Public Schools Values Award – Exemplary Performance	
2014: Knox College's Inn-Siang Ooi Award	\$1000
2014: Knox College TRIO Achievement Program: Outstanding Senior Award	

Research Grants

2023: MSU Ecology, Evolution, and Behavior Professional Horizons Grant	\$750
2020: UF Michael L. May Interdisciplinary Grant	\$1000
2017: CMU Marion Whitney Summer Graduate Scholarship	\$2000
2014: Knox College Richter Scholarship	\$1000

Grants in review

USGS Midwest Climate Adaptation Science Center: *Estimating and forecasting population and community dynamics to advance climate adaptation strategies for butterflies across the Midwest* (Led writing for Co-PI Zipkin; \$412,032)

TEACHING EXPERIENCE

Co-instructor

June 2022 Dragonfly biodiversity from the field to lab workshop. Pereira, Colombia

Teaching assistant

Fall 2020 Integrated Principles of Biology I Laboratory. U. of Florida BSC 2010L (Online)
 Spring 2019 Integrated Principles of Biology I Laboratory. U. of Florida BSC 2010L

Guest lecturer

Fall 2019 Introduction to Quantitative Biology. 1 lecture. Central Michigan U. BIO105

K-12 Education

2015-2016 Substitute teacher for math and science at Sitka High School, Sitka School District, Sitka, AK.
 2014-2015 Leadership Advisor at Mt. Blue Sky Outdoor Lab, Jefferson Co. Public School District, Evergreen, CO. Taught courses in the Biosphere and Geosphere to 6th grade students

attending a week-long outdoor public school; supervised high school interns and tutored high school interns taking online math courses.

MENTORING EXPERIENCE

- 2023 – Present Mentoring four graduate student researchers on scientific writing, data science, and modeling. I am a co-author of one paper led by these graduate students.
- 2018 – 2024 Mentored eight undergraduate researchers in data collection, data science in R, scientific writing, insect identification, and field ecology. Co-authored three papers with 2 undergraduate mentees, including a paper led by one undergraduate mentee.
- 2016 – 2018 Mentored two undergraduate researchers in the field of ecology and biodiversity informatics. Co-authored one paper with both undergraduate researchers. Supported one mentee in successful application for NSF Graduate Research Fellowship Program Award; mentee remains an active collaborator.

INVITED PRESENTATIONS

- Belitz, M.W.** 2024. From local observations to global insights: Integrating collections and community science to understand the effects of global change on insects. Invited Seminar for Natural History Museum of Los Angeles County.
- Belitz, M.W.** 2024. Uniting diverse data streams to advance conservation and natural-resource management. Invited Seminar for School of Natural Resources and Environment. University of Nebraska.
- Belitz, M.W.** 2022. Career with butterflies: a popular science talk series. Big Butterfly Month India. Invited virtual presentation sponsored by Nature Mates.
- Belitz, M.W.,** Larsen E.A., Shirey V., Li D., Guralnick R. 2022. Phenological research based on natural history collections: practical guidelines and a Lepidopteran case study. Ecological Society of America. Invited symposium.
- Belitz, M.W.** 2021. Addressing biases in citizen science data to document phenology patterns at broad spatial and taxonomic scales. WeDigBio. Invited Virtual Presentation.
- Belitz, M.W.** 2019. Digitization and the contribution of small natural history collections to global change biology. Society for the Preservation of Natural History Collections Annual Meeting. Chicago, IL. Invited symposium.

SELECTED PRESENTATIONS

- Belitz, M.W.** Drum R., Leuenberger W., Morelli T.L., Nail K., Warner S., Thogmartin W., Zipkin E. 2024. Informing conservation in a rapidly changing world: Opportunities presented by a community approach to data analysis and management interventions. North American Congress for Conservation Biology. Vancouver BC, Canada.
- Belitz, M.W.** Data quality issues associated with iNaturalist data. 2022. 6th Annual digital data in biodiversity research conference. Virtual Presentation.
- Belitz, M.W.,** Barve V, Doby J.R., Hantak M.M., Larsen E.A., Li D., Oswald J.A., Sewnath N., Walters M., Narayani B., Earl K., Gardner N., Guralnick R., Stuck B.J. 2022. Climate drivers of adult insect activity are conditioned by life history traits. 4th Annual collaborations in biodiversity research symposium. Gainesville, FL.
- Belitz, M.W.,** Barve V, Doby J.R., Hantak M.M., Larsen E.A., Li D., Oswald J.A., Sewnath N., Walters M., Narayani B., Earl K., Gardner N., Guralnick R., Stuck B.J. 2021. Climate drivers of adult insect activity are conditioned by life history traits. Ecological Society of America. Virtual Presentation.
- Belitz, M.W.,** Larsen E.A., Ries L., Guralnick R. 2021. Addressing biases in community science data to document phenology patterns at broad spatial and phylogenetic scales. Northeast Natural History Conference. Virtual Presentation.

Belitz, M.W., Barve V., Doby J., Larsen E., Guralnick R.P., Hantak M., Oswald J., Sewnath N., Walters M., Stucky B. 2020. Interactions among climate, urbanization, and life-history traits determine the timing of adult insect activity across broad spatial and taxonomic scales. Entomology. Virtual Annual Meeting.

Belitz, M.W., Monfils M.J., Cuthrell D.L., and Monfils A.K. 2018. Applying biodiversity informatics and field study approaches to the conservation of Poweshiek skipperling (*Oarisma poweshiek*). Poweshiek skipperling Research Working Group. Webinar.

PROFESSIONAL SERVICE

Peer review activity

- 2024 – Ecology Letters; Ecology; Journal of Wildlife Management; Ecological Applications, Journal of Urban Ecology, Journal of Applied Ecology
- 2023 – Ecosphere; Ecology and Evolution; Insect Conservation & Diversity; Journal of Wildlife Management; Scientific Reports; American Journal of Botany
- 2022 – Nature Ecology and Evolution; Ecography; Ecology and Evolution; Agricultural and Forest Meteorology
- 2021 – Ibis; Insects; Ecology and Evolution
- 2020 – Ecological Entomology

UNIVERSITY AND DEPARTMENTAL SERVICE

2024 – present Search Committee Member: Vertebrate Curator, Michigan State University
 2021 – 2022 Vice President, UF Biology Graduate Student Association
 Served as graduate student representative as a voting member at faculty meetings
 2019 – 2020 iDigTRIO Biological Sciences Career Conference & Fair
 Invited speaker to TRIO students on developing a passion of biology research and conservation
 2017 – 2018 BioBuds Chair, CMU Biology Graduate Student Association
 Coordinate Science Education in Mount Pleasant 3rd grade classrooms
 Serve on Biology Graduate Student Association's Executive Board

SELECTED PROFESSIONAL DEVELOPMENT

Spring 2019 R for Geospatial Data Workshop
 Fall 2019 Fundamentals of Machine Learning in Python Workshop
 Spring 2021 AI in Biology Semester Long Course
 Fall 2023 Applied Statistical Modeling Workshop