Michael W. Belitz
NSF Postdoctoral Research Fellow in Biology
https://mbelitz.github.io/ michaelbelitz06@gmail.com
Google Scholar belitzmi@msu.edu

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

36. **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. *Journal of Animal Ecology*.
35. **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.* https://doi.org/10.1038/s44358-024-00014-9
34. 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*.

2025

33. 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. *Biological Conservation.* 302: 110969 (PDF)

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 AK. 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. Hilts, 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

1. Leuenberger, W., Doser J.W., **Belitz M.W.**, Ries L., Haddad N.M., Thogmartin W.E., Zipkin E.F. Three decades of declines restructure butterfly communities in the Midwestern U.S. Submitted.

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: University of Florida (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: Global Biodiversity Information Facility (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: Michigan State Uni. Ecology, Evolution, and Behavior Professional Horizons Grant	$750
2021: UF University Scholars Program, Center for Undergraduate Research (Mentor)	$1250
2020: UF Michael L. May Interdisciplinary Grant	$1000
2017: Central Michigan Uni. 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 with 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 them in math.

MENTORING EXPERIENCE

2023 – present Mentoring five graduate student researchers on scientific writing, data science, and modeling. Co-authored three papers with four graduate mentees.

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 two 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; mentee remains a current 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. Seminar for Natural History Museum of Los Angeles County.

Belitz, M.W. 2024. Uniting diverse data streams to advance conservation and natural-resource management. 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. 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 symposium. Montreal, QC.

Belitz, M.W. 2021. Addressing biases in citizen science data to document phenology patterns at broad spatial and taxonomic scales. WeDigBio. 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 symposium. Chicago, IL.

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., Zipkin E. 2024. The influence of regional climate on drivers of butterfly abundance patterns. The 8th Annual Ecology, Evolution, and Behavior Research Symposium. Michigan State University. East Lansing, MI.

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. University of Florida. 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.

SERVICE

Peer reviews

2025 *Nature Ecology and Evolution*
2024 *Ecology Letters*; *Ecology*; *Journal of Wildlife Management*; *Ecological Applications*; *Journal of Urban Ecology*; *Journal of Applied Ecology; Diversity and Distributions*
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
2018 – 2020 Tabling at Florida Museum of Natural History outreach events, showcasing how digitized natural history collection data can inform understanding of climate change
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

PROFESSIONAL MEMBERSHIPS

- Ecological Society of America
- Entomological Society of America
- Society for Conservation Biology

SELECTED PROFESSIONAL DEVELOPMENT

2023 Applied Hierarchical Modeling workshop by Ken Kellner & Marc Kéry, Michigan State U.
2021 AI in Biology, BSC6895, 3-credit course by Brian Stucky and Matt Gitzendanner, U. of Florida.
2019 Machine Learning in Python. Two-day workshop by USDA-ARS & U. of Florida.
2019 R for Geospatial Data. Two-day workshop by U. of Florida Software & Data Carpentries Club.