
Dr. Sean F. Ryan

Curriculum Vitae

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EDUCATION

- 2015 Ph.D., Ecology and Evolution, University of Notre Dame, Notre Dame, IN
- 2010 M.S., Ecology and Evolutionary Biology, Bowling Green State University, Bowling Green, OH
- 2007 B.S., Conservation Biology (emphasis in Entomology), San Jose State University, San Jose, CA

APPOINTMENTS

- 2017–present USDA NIFA Postdoctoral Fellow, University of Tennessee, Knoxville, TN
Citizen Science Fellow, North Carolina State University, Raleigh, NC
- 2015–2017 Research Geneticist, USDA-ARS, Gainesville, FL (Fire Ant Unit)
- 2010–2015 Research/Teaching Assistant, University of Notre Dame, Notre Dame, IN
Department of Biology
- 2008–2010 Teaching Assistant, Bowling Green State University, Bowling Green, OH
Department of Biology

GRANTS & FELLOWSHIPS

- 2018 College of Agriculture and Life Sciences “Big Ideas” Innovation Program
Funds to convene working group on the topic of “The Role of Citizen Science in the
History and Future of Agriculture and Food” (**\$1,500**; PI)
- 2018 Museum of Life and Sciences, Durham, NC
“Predicting the future with butterflies” Pilot citizen science project (**\$1,200**; PI)
- 2017 AFRI-NIFA (USDA) postdoctoral fellowship
“Using citizen science to assess and monitor genetic variation in a globally invasive
agricultural pest and associated pathogens (baculoviruses)” (**\$152,000**; PI)
- 2015 Environmental Change Initiative, University of Notre Dame
“Pieris Project: a partnership between scientists and the public to address important
questions about how human activities affect biodiversity” (**\$2,000**; PI)
- 2014 John J. Reilly Center for Science, Technology and Values minigrant
“Pieris Project: 50 schools, 50 States Initiative” (**\$5,000**; PI)
- 2014 Crowdfunding on Experiment.com
“Pieris Project: using citizen science to learn how species will respond to climate change”
(**\$6,570**; PI)
- 2013 Environmental Change Initiative, University of Notre Dame

- “Evaluating the efficacy of the RADseq method for use with historic specimen to elucidate the effects of climate change on the population genomics of a butterfly hybrid zone” (**\$6,950**; PI)
- 2011 GLOBES fellowship (NSF IGERT fellow)
(~**\$26,000** stipend; **\$1,000** research supplies)
- 2010 Sigma Xi Grants-in-Aid of Research
“Assessing the impacts of recent warming on the functional genetics of a butterfly hybrid zone” (**\$600**; PI)
- 2010 NSF travel grant (DEB-0939500)
"Drought, water-ecosystem services, and environmental justice: case studies and research needs in a changing world" (**\$2,000**)
- 2009 Sigma Xi Grants-in-Aid of Research
“Investigating how intraspecific changes in natal host chemistry affect host selection of a generalist and specialist herbivore: a test of the chemical legacy hypothesis using transgenic *Arabidopsis thaliana* genotypes” (**\$790**; PI)

AWARDS

- 2012 Outstanding Graduate TA Award (Kaneb Center for Teaching and Learning, University of Notre Dame) (\$150)
- 2012 People’s Choice Award (Ecological Society of America’s Student Section photo contest) (\$150)
- 2009 2nd place in California Native Plant Society poster competition (\$300)

PUBLICATIONS

(* = undergraduate student, † = high school student)

In Review

Ryan, S. F., Lombaert, E., Espeset, A., Vila, R., Talavera, G., Dinca., V., Renshaw, M. A., Eng, M. W., Doellman, M. M., Hornett, E. A., Li, Y., Pfrender, M. E., Shoemaker, D. D. **The global invasion of the world's most successful pest butterfly: a citizen science population genomics study. a preprint can be found on bioRxiv** doi: <https://doi.org/10.1101/506162>

Published

Ryan, S. F., Adamson, N. L., Aktipis, A., Andersen, L. K., Austin, R., Barnes, L., Beasley M. R., Bedell, K. D., Briggs, S., Chapman, B., Cooper, C. B., Corn, J. O., Creamer, N. G., Delborne, J. A., Domenico, P., Driscoll, E., Goodwin, J., Hjarving, A., Hulbert, J. M., Isard, S., Just, M. G., Kar Gupta, K., López-Urbe, M. M., O’Sullivan, J., Landis, E. A., Madden, A. A., McKenney, E. A., Nichols, L. M., Reading, B. J., Russell, S., Sengupta, N., Shapiro L. R., Shell, L. R., Sheard, J. K., Shoemaker, D. D., Sorger, D. M., Starling, C., Thakur, S., Vatsavai, R. R., Weinstein, M., Wilmfrey, P., Dunn, R. R. **2018. The role of citizen science in addressing grand challenges in food and agriculture research. *Proceedings of the Royal Society B***. DOI:10.1098/rspb.2018.1977

Ryan, S. F., Deines, J. M., Scriber, J. M., Pfrender, M. E., Jones S. E., Emrich S. J., Hellmann, J. J. **2018. Climate-mediated hybrid zone movement revealed with genomics, museum collection, and simulation modeling. *Proceedings of the National Academy of Sciences***, 201714950; DOI: 10.1073/pnas.1714950115

McKinley, D. C., Miller-Rushing, A. J., Ballard, H. L., Bonney, R. E., Brown, H., Evans, D. M., French, R. A., Parrish, J. K., Phillips, T. B., **Ryan, S. F.**, Shanley L. A., Shirk, J. L., Stepenuck, K. F., Weltzin, J. F., Wiggins, A., Boyle, O. D., Briggs, R. D., Chapin III, S. F., Hewitt, D. A., Preuss, P. W. and Soukup, M. A. **2017. Citizen Science Can Improve Conservation Science, Natural Resource Management, and Environmental Protection.** *Biological Conservation*, 208:15-28.

Ryan, S. F., Fontaine, M. C., Scriber, J. M., O'Neil, S. T., Pfrender, M. E., Hellmann, J. J. **2017. Patterns of divergence across the geographic and genomic landscape of a butterfly hybrid zone associated with a climatic gradient.** *Molecular Ecology*, 26(18): 4725–4742.

Ryan, S. F., Scriber, J. M., Valella, P., Thivierge, G.*, Aardema, M. L. **2017. The role of latitudinal, genetic and temperature variation in the induction of diapause of *Papilio glaucus* (Lepidoptera: Papilionidae).** *Insect Science*, DOI 10.1111/1744-7917.12423

McKinley, D. C., Miller-Rushing, A. J., Ballard, H. L., Bonney, R. E., Brown, H., Evans, D. M., French, R. A., Parrish, J. K., Phillips, T. B., **Ryan, S. F.**, Shanley L. A., Shirk, J. L., Stepenuck, K. F., Weltzin, J. F., Wiggins, A., Boyle, O. D., Briggs, R. D., Chapin III, S. F., Hewitt, D. A., Preuss, P. W. and Soukup, M. A. **2015. Can Investing in Citizen Science Improve Natural Resource Management and Environmental Protection?** *Issues in Ecology*, 19:1-28.

Ryan, S. F., and Bidart-Bouzat, G. **2014. Natal insect experience with *Arabidopsis thaliana* plant genotypes influences plasticity in oviposition behavior.** *Entomologia Experimentalis, et Applicata* 3:216-227.

Fontaine, M., Roland, K., Calves, I., Austerlitz, F., Palstra, F., Tolley, K., **Ryan, S. F.**, Ferreira, M., Jauniaux, T., Llavona, A., Ozturk, B., Ozturk, A., Ridoux, V., Rogan, E., Sequeira, M., Siebert, U., Vikingsson, G., Borrell, A., Michaux, J., and Aguilar, A. **2014. Postglacial climate changes and rise of three ecotypes of harbor porpoises, *Phocoena phocoena*, in western Palearctic Waters.** *Molecular Ecology*, 23:3306-3321.

Sharma, A., Bouchard, F., **Ryan, S. F.**, Parker, D., and Hellmann, J. J. **2013. Species are the Building Blocks of Ecosystem Services and Environmental Sustainability.** *Ethics, Policy & Environment*, 16:1.

Ryan, S. F.*, and Lambrecht, S. **2011. Seed soaking and age play a factor in heat-stimulated germination of two maritime chaparral *Ceanothus* (Rhamnaceae) species.** *Fremontia*, 290-298.

In Prep

Boggs, L. M.*, Flores, Z. A. *, Shoemaker, D. D., **Ryan, S. F.** **RADmining as a tool for screening RADseq datasets for the endosymbiont Wolbachia.**

Flores, Z. A. *, Boggs, L. M.*, Dunn, R. R., **Ryan, S. F.** **Evaluation of a RADmining approach for metagenomic studies: a cautionary tale.**

Nanugonda, T.†, Dunn, R. R., **Ryan, S. F.** **Predicting the future with butterflies: citizen scientists can help collect vital life history data for insects.**

Ryan, S. F., Wade, E., Shoemaker, D. D. **Host specificity drives divergence in a social parasite.**

Ryan, S. F., Jones, S., Madrid, M.*, Richman, S. K., Scriber, J. M., Hellmann, J. J. **Spatial and temporal variation in climate interact to affect the evolutionary trajectory of interbreeding species.**

TEACHING EXPERIENCE (~17 sections spanning 10 courses)

- (ND) BIOS 30305: **Evolution lecture** – 1 section (teaching assistant)
 - The mechanisms and processes involved in the production of life as we know it today, as well as a discussion on the impact current events may have upon life in the future.
- (ND) BIOS 30312: **General Ecology lecture** (teaching assistant; **part of a teaching certification program where I designed and led various portions of the course**) – 1 section
 - The study of populations and communities of organisms and their interrelations with the environment.
- (NCSU) AEC 400: **Applied Ecology lecture** – 1 section (guest lecturer, two classes covering competition module)
 - Global climate change, overfishing, habitat loss, altered nutrient cycles, and the spread of invasive species are among the world's pressing global environmental issues. Solutions to these problems are complex but firmly rooted in the fundamental tenets of ecological theory. This course will provide an overview of the field of applied ecology, working from the individual to global level, the course will provide a broad perspective on the field of applied ecology.
- (ND) Biol 31312: **General Ecology lab** – 1 section (teaching assistant)
- (ND) Biol 40411: **Biostatistics lab** – 1 section (teaching assistant)
 - Basic principles of statistical analysis and their application to biological problems, including statistical inference, analysis of variance, regression, non-parametric approaches, and introduction to statistical computing.
- (BGSU) Biol 204: **General biology lab** – 2 sections (teaching assistant)
 - Introduction to ecological and evolutionary biology, Mendelian and population genetics, and the major groups of plants, animals and microbes.
- (ND) Biol 1162: **Biological Sciences II lab** – 3 sections (teaching assistant)
 - This is the second semester of a two-semester course for first year students contemplating a career in biology, medicine, or related areas of life science. The topics presented in the second semester in the context of modern evolutionary theory include biological diversity, ecology, and organismal physiology.
- (ND) Biol 30423: **Genomics: Sequence to Organism lecture** (guest lecturer on the topic of genome wide association studies)
- (BGSU) Biol 101: **Environment of Life (non-majors) lab** – 5 sections (teaching assistant)
 - Basic ecology and current environmental problems of air, water and land pollution; human reproduction and population dynamics.
- (BGSU) Biol 420: **Animal behavior lab** – 1 section (teaching assistant)
 - Mechanisms and evolution of animal behavior: including its neural, hormonal, and genetic substrates.

- (Osher Life Long Learning Center; NCSU) **Citizen Science: democratizing discovery** lecture – 1 section (one of six guest lecturers; topic: citizen science in agriculture/food science)
 - This six-week course will consider the history of citizen science and a range of efforts to make new discoveries while also engaging the public.

CERTIFICATIONS

- 2015 GLOBES Certificate (NSF-IGERT program, University of Notre Dame)
- 2015 **Striving for Excellence in Teaching Certificate** (Kaneb Center, University of Notre Dame)
- 2015 **Advanced Teaching Scholar Certificate** (Kaneb Center for Teaching and Learning, University of Notre Dame)

MENTORING EXPERIENCE

(* presented their work at a professional society, † coauthors on manuscripts)

15. Thanujeet Nanugonda (2018) † – high school student
14. Tillian Teske (2016-2017) – high school student
13. Zoe Flores (summer 2018) † – undergraduate
12. Laura Boggs (summer 2018) † – undergraduate (community college)
11. Miranda Madrid (2012-2015) *† – undergraduate
10. Tyler Wagner (2012-2015) * – undergraduate
9. Gabrielle Thivierge (summer 2014) *† – undergraduate
8. Riley Parrot (Spring 2014) * – undergraduate
7. Tracy VandeWater (Spring 2013) * – undergraduate
6. Nimit Dave (Fall 2012) – undergraduate
5. Brian Semanek (2011-2012) * – undergraduate
4. Patrick Fitzgerald (2011-2012) – undergraduate
3. Thomas Murphy (Fall – Spring 2010) * – undergraduate
2. Sarah Richman (summer 2011) † – research technician
1. Jasmine Snowden (summer 2009) * – undergraduate

PRESENTATIONS

Co-organized Symposia

- Ryan, S. F.**, Sorger, M., Florio, J. The role of citizen science in the history and future of agriculture and food science. Program Symposium: Citizen Science in a Changing World: Successes and Challenges Across Projects and Institutions. Entomological Society of America Annual meeting in Vancouver, British Columbia. (2018)

Invited Symposia

- Ryan, S. F.**, Talavera, G., Dinca, V., Vila, R., Espeset, A., Renshaw, M., Doellman, M., Hornett, E., Pfrender, M. E., Shoemaker, D.D. Invasion biology meets the 21st century: Harnessing the power of citizen science in the genomics era. Symposium: Applying Emerging Genomic Techniques to Control Invasive Species. Entomological Society of America Annual meeting in Denver, Colorado. (2017)
- Ryan, S. F.**, and Hellmann, J. J. Hybridization in the context of a changing climate. Symposium: Climate Change Impacts and Insect Population Dynamics. International Congress of Entomology in Orlando, Florida. (2016)
- Ryan, S.F.**, and Shoemaker, D.D. Reconstructing the global invasion routes of the cabbage white butterfly using citizen science assisted genomics. Symposium: How Human Activities Shape the Global Distribution of Insects. International Congress of Entomology in Orlando, Florida. (2016)
- Ryan, S. F.** Pieris Project: a partnership with the public to explore evolutionary responses to environmental change through a globally distributed butterfly. Symposium: Citizen Scientists Contribute to Conservation. Entomological Society of America Annual meeting in Minneapolis, Minnesota. (2015)
- Ryan, S. F.** Pieris Project: using citizen science to achieve population-level sampling of an invasive butterfly on a global scale. Symposium: Entomology Literacy: Research in the Human Dimensions of Entomology Education, Extension, and Citizen Science. North Central Branch Entomological Society of America meeting in Manhattan, Kansas. (2014)
- Ryan, S. F.**, Fontaine, M., Emrich, S. J., Pfernder, M. E., and Hellmann, J. J. Evaluating the efficacy of the RADseq method for use with historic specimen to explore long-term changes in the population genomics of a butterfly hybrid zone. Ecological Genomics as an Emerging Field: Opportunities for Non-Model Organisms. Ecological Society of America annual meeting in Sacramento, California. (2014)

Contributed Oral

- Ryan. S. F.** Using genomics and citizen science to assess and monitor genetic variation in a globally invasive agricultural pest and associated pathogen (baculovirus). *FY2018 NIFA Fellows PD Meeting*. Washington, D.C. (2018)
- Ryan. S. F.**, Wade, E. J., Bouwman, A. M., Calcaterra, L., Shoemaker, D. D. Genetic variation in the ant social parasite *Solenopsis daguerrei* predicts host specificity at a micro-geographic scale. *Evolution*. Austin, Texas. (2016)
- Ryan, S. F.**, and Hellmann, J. J. Shifts in genetic and morphological clines of a butterfly hybrid zone may be a response to a 30 year period of climate change. *Ecological Society of America*. Minneapolis, Minnesota. (2013)
- Ryan S. F.**, and Hellmann J. J. Are changes in the genetic and morphological composition of butterfly hybrid zone over a 30 year period the result of climate change? *Midwest Ecology and Evolution annual meeting in South Bend, Indiana*. (2013)

Invited Academic (Department Seminars)

- Ryan, S. F.** Combining Big Data and Public Engagement to Understand Insect Ecology and Evolution in a Changing Environment. Department of Entomology and Plant Pathology, University of Tennessee, Knoxville, Tennessee. (2018)

Ryan, S. F. Combining Big Data and Public Engagement to Understand Insect Ecology and Evolution in a Changing Environment. Department of Bioagricultural Sciences & Pest Management, Colorado State University, Fort Collins, CO. (2017)

Ryan, S.F. Exploring how butterflies respond to changes in climate: looking back and looking forward. Wildlife Society Chapter, Ball State University, IN. (2015)

Invited General Public

Ryan, S. F. How citizen science is revolutionizing science and why you should be a part of that revolution. Public lecture at Ideas on Tap. Goshen, Indiana. (2013)

Ryan, S. F. Plant chemistry and insect choices: how experience may alter an 'herbivore's dilemma. Public lecture for Potawatomi Conservatories, Mishawaka Indiana. (2012)

Poster

Boggs L.*, Dunn R. R., **Ryan S. F.** Evaluating the use of RADseq to screen for endosymbionts. *17th Annual Summer Undergraduate Research & Creativity Symposium*. Raleigh, North Carolina. (2018)

Flores Z.*, Dunn R. R., **Ryan S. F.** Evaluating the use of RADseq data to characterize metagenomic communities. *17th Annual Summer Undergraduate Research & Creativity Symposium*. Raleigh, North Carolina. (2018)

Ryan S. F., Madrid, M.*, and Hellmann J. J. Using NPN observations to validate a simulation model that explores the effects of climate change on the phenology and voltinism of a butterfly hybrid zone. *Ecological Society of America annual meeting*. Sacramento, California. (2014)

Ryan, S. F., and Hellmann, J. J. Are changes in the genetic and morphological composition of butterfly hybrid zone over a 30 year period the result of climate change? *Midwest Ecology and Evolution Conference*. Notre Dame, Indiana. (2013)

VandeWater, T.*, **Ryan, S. F.**, and Hellmann J. J. Exploring the “citizen science landscape” across the United States: assessing the field-to-date and identifying potential gaps. *Midwest Ecology and Evolution Conference*. Notre Dame, Indiana. (2013)

Wagner, T.*, **Ryan S. F.**, and Hellmann J. J. Has an allele putatively involved in adaptation to climate in a butterfly hybrid zone shifted in response to recent warming? *Midwest Ecology and Evolution Conference*. Notre Dame, Indiana. (2013)

Madrid, M.*, **Ryan S. F.**, and Hellmann J. J. Exploring the effects of host plant phenology and climate on the voltinism of two hybridizing species, *Papilio glaucus* and *Papilio canadensis*, using an individual-based simulation model. *Midwest Ecology and Evolution Conference*. Notre Dame, Indiana. (2013)

Ryan, S. F., and Hellmann, J. J. Recent climatic warming may be leading to discordant shifts in wing morphology in a butterfly hybrid zone. *Ecological Society of America*. Portalnd, Oregon. (2013)

Ryan, S. F., and Bidart-Bouzat, G. Intraspecific Variation in Natal Plant Genotype Chemistry Influences Oviposition Preferences of a Generalist and Specialist Moth Species. *Ecological Society of America*. Pittsburgh, Pennsylvania. (2010)

Ryan, S. F.*, Baxter, E.* and Lambrecht, S. Effects of moisture and heat on the germination and of two *Ceanothus* species (Rhamnaceae). *California Native Plant Society Conservation: Strategies and Solutions*. Sacramento, California. (2009)

ADDITIONAL EXPERIENCE/OUTREACH**Graduate**

- 2013–2014 Coach for 5-7th graders at Stanley Clark school, South Bend, IN for Science Olympiad competition (students made it to Nationals both years)
- 2012 Bioblitz in Pittsburgh PA – worked with an urban community in downtown Pittsburgh to help collect and characterize local flora and fauna
http://www.esa.org/applied/ESA_Applied_Ecology_Section/2010_bioblitz.html
- 2009–2010 President of the Biological Graduate Student Association (BGSU)

Undergraduate

- 2005–2006 Cataloged the entire San Jose State University insect and bird collection for digitization
- 2006–2008 Elected president of the San Jose State University Entomology Club

MEDIA COVERAGEPieris Project***Blogs***

- Your Wild Life: <http://www.yourwildlife.org/2014/09/wings-of-change/>
- The Citizen Biologist: <http://citizenbiologist.com/tag/butterfly/>
- Entomology Today: <http://entomologytoday.org/2014/10/30/citizen-science-project-wants-you-to-collect-cabbage-white-butterflies/>
- Discover Magazine: <http://blogs.discovermagazine.com/citizen-science-salon/#.Vuh89uaYKOU>
- Mustard the Dinosaur Blog: <http://mustardthedinosaur.weebly.com/blog/category/citizen-science>

Articles

- Bay Nature magazine: “Plain” Cabbage White Butterflies are Anything but Ordinary <https://baynature.org/article/plain-cabbage-white-butterflies-are-anything-but-ordinary/>
- National Geographic: 10 Easy Ways You Can Help Scientists Study the Earth <http://news.nationalgeographic.com/2017/04/citizen-science-projects-environment-climate-change-weather/>
- The Jakarta Post
- <http://www.thejakartapost.com/life/2018/10/14/seven-ways-to-give-earth-a-hand.html>
- Monarch Butterfly New Zealand Trust (pg.3): http://www.monarch.org.nz/monarch/wp-content/uploads/2014/11/MBNZT_Issue-11_Summer-2014_online.pdf
- Crowdfunding Science: Sharing Research with an Extended Audience. CSCW '15 Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing, pages 31-43.

Other publicity

- Featured/Focal project on SciStarter
- The North American Butterfly Monitoring Network: <http://www.nab-net.org/program/pieris-project>
- Sciencelearn.org: <http://sciencelearn.org.nz/Science-Stories/Butterflies/Citizen-scientists>

- Ecological Society of Australia blog: <https://www.ecolsoc.org.au/news/2015/12/get-involved-pieris-project>

Interviews

- Break Through Radio: Third Eye Weekly interview: <https://www.youtube.com/watch?v=9a6Hc5rX2gA>
- South Bend Voice interview: <http://southbendvoice.com/2014/11/03/video-pieris-project-studies-effects-of-climate-change-on-butterflies/>

RELEVANT SKILLS

- Extensive experience in R, Matlab, Bash and C shell languages; working to include Python
- DNA extractions (including historic DNA), RADseq, Sanger and Illumina sequencing, bioinformatics (population/phylo-genomics related), qPCR, microsatellite marker development
- Extensive experience in plant and insect husbandry in both the lab and field
- Design, implementation, and coordination of large-scale citizen science projects

PROFESSIONAL SOCIETIES

Sigma Xi
Ecological Society of America
Entomological Society of America
Society for the Study of Evolution
American Association for the Advancement of Science (AAAS)

REFERENCES

Jessica Hellmann, Professor and Director of the Institute on the Environment
Department of Ecology, Evolution and Behavior, University of Minnesota
hellmann@umn.edu
612-301-9194
Relationship: PhD adviser

Rob Dunn, Professor
Department of Applied Ecology, North Carolina State University
Natural History Museum of Denmark, University of Copenhagen
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Relationship: Postdoctoral adviser

DeWayne Shoemaker, Professor and Chair
Department of Entomology and Plant Pathology
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Relationship: Postdoctoral adviser