



Notes from the Field

Fall
2020

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PC Laura Jones, Jenn Harris

New Ecology Students Fall 2020



Edward Amoah I work in David Hughes PlantVillage Lab. We are developing a system for pest insect's biodiversity monitoring in Africa. We are exploring how we can use innovative technologies like AI, and Satellite data for the prediction of pest insects' movements, and prevalence. The other major side of our work is using the power of crowdsourcing to monitor and track pest insects. I am currently working on quality control and assurance model for our crowdsourcing platform. I was born in Kumasi, the capital city of the Asante Empire in Ghana.



Chris Custer After earning a couple bachelor's in wildlife ecology (Florida, 2010) and statistics (North Florida, 2013), I moved across the country to earn my Master's in statistics from the University of Alaska Fairbanks (2015). I then spent a few years as a statistician in industry before deciding to return to school and pursue my doctorate in ecology. I am broadly interested in quantitative fisheries, particularly applied research motivated by management and conservation efforts. At Penn State, I will be studying stream fish communities across Pennsylvania through Joint Species Distribution Models. I'm also hopeful to incorporate stock assessment methodology into my dissertation research. Some of my favorite free time activities include fishing, hiking and cooking.



Lilly Germeroth Lilly is pursuing a Master's in Dr. Sara Hermann's lab of Arthropod Ecology and Trophic Interactions at Penn State. She earned a BS in Biological Sciences from the Missouri University of Science and Technology in Rolla, Missouri in May 2020. Her previous research experience is with tropical leaf litter ant community biodiversity. Her current research interests center on plant-insect and predator-prey interactions, and how these can impact functional traits, particularly in the monarch-milkweed system. In her free time, she enjoys reading, hiking, and caving.



Kaley Hallmark Kaley is a Master's student housed in the department of Entomology under research advisors Dr. Rudolf Schilder and Dr. Jared Ali. She aspires to conjoin her interests in chemistry and biology and work within an ecological framework on plant-insect interactions and chemical communication between organisms (i.e. chemical ecology). Kaley came to Penn State from Oklahoma City and is the youngest of three daughters in her family. She loves to travel to see new places and desires to experience different cultures around the world. After finishing her Master's, she plans to pursue a PhD. outside of the United States.



Christina Harden I am a PhD student and a J. Lloyd Huck Graduate Fellow. Broadly, my interests lie at the intersection of anthropogenic land use and zoonotic disease emergence—particularly that of viral hemorrhagic fevers in sub-Saharan Africa. Prior to Penn State, I received my MPH in Epidemiology of Microbial Diseases from the Yale School of Public Health, where I conducted research on re-emerging arboviruses and COVID-19. I received my Bachelor's degree from Cornell University in environmental science and applied population biology in 2016. In my spare time, I enjoy all things that grow, and tend to a large collection of potted plants. Beyond State College, my other homes are Chicago and Wyoming, where I continue to enjoy life as a seasonal ski instructor, music enthusiast, and mother to two annoying felines.



Jenn Harris I'm a PhD student co-advised by Liana Burghardt and Estelle Couradeau. Climate change is the underlying theme in my research, but my favorite ways to think about it are through the lenses of plant-microbe interactions, soil microbial ecology and nutrient cycling. I studied Biological Sciences and Environmental Studies at Wellesley College and graduated in 2019. Before coming to Penn State, I worked at a sustainable agriculture startup, and plan to focus my research on emissions in ag systems and the evolutionary ecology that maintains them. I moved around a lot during my childhood, but now I consider Boston, MA to be my hometown. As is fitting for someone from Boston, I enjoy running and skiing, as well as painting landscapes.



Julissa I. Irizarry is a PhD student. She has a Master's Degree in Zoology from North Carolina State University, and has previously worked for the Puerto Rico Department of Natural and Environmental Resources, and served as Executive Director of the Puerto Rico Ornithological Society. Her primary research interests are in avian conservation, particularly in heavily fragmented, human dominated landscapes. She is a member of Dr. Tomás Carlo's Lab at Penn State, and focuses on urban ecology of residential neighborhoods in Puerto Rico. Her ultimate goal is to design effective urban restoration projects that incorporate local communities in the conservation process.



João Vitor S. Messeder I'm an international PhD student (from Belo Horizonte, Brazil) with a Fulbright scholarship. I've completed a Master's in Plant Biology and a Bachelor's in Biological Sciences both at Universidade Federal de Minas Gerais (Brazil). Broadly speaking, for my PhD I intend to investigate the ecology and evolution of fruit-frugivore interactions, asking questions about how different frugivore groups can shape the evolution of interactions and fruit traits. I'm advised by Dr. Tomás Carlo and co-advised by Dr. Hong Ma. Along with my academic career, I have always tried to combine research with my other great passion: rock and roll! I'm a musician, playing acoustic and electric guitar since 2005. Please reach out if you would like to jam! ;)



Madeline Luthard Driven by my background in Geochemistry and Ecology, I am broadly interested in nutrient dynamics in agroecosystems. Specifically, I am interested in how shallow soil management practices impact nitrogen cycling and retention, and hope to provide effective decision support for farmers through my research. Born and raised in the Bay Area in California, I am looking forward to experiencing some real weather here in State College!



Joe Moran I grew up in the small rural town of Jeffersonville, NY, completed my BS at Unity College in Maine, and my Master's at Memorial University of Newfoundland. My research interests focus on the spread and management of disease in wildlife populations using mathematical models. My current research is on the transmission and control of Chronic Wasting Disease (CWD) in Pennsylvania's White-tailed deer. In my free time I enjoy archery, trapping, and playing pool.



Emma Rice My research focuses on weed ecology. I am specifically interested in examining the role of root functional traits in weed-crop interactions and how weed-cover crop competition influences provisioning of ecosystem services. Prior to arriving at Penn State, I worked as a Research Associate in a molecular ecology lab investigating the genetic response of invasive aquatic plants to different management strategies. In my free time I like to get outside to hike, bike, kayak, and travel.



Sarah Richards I am a first year PhD student. My hometown is in New Hampshire, which is probably why I love mountains, lakes and oceans. But a passion for microbes and all the crazy, weird, fantastic things they can do came a little later in life, at the University of New Hampshire. In 2016 I graduated with a B.S in microbiology and began a research position at a startup company called Indigo Agriculture, which was harnessing microbiomes to improve crop health and reduce synthetic inputs in agriculture. Here at Penn State, I am pursuing research questions like: How does the loss of certain ecological types impact the function of microbial assemblages?



Ryan Trexler I studied Biology at Juniata College, earned a M.Sc. in Environmental Science from Ohio State University, and worked as a Lab Manager in Terrence Bell's lab at Penn State. Experience in molecular methods, 'omics techniques, and bioinformatics have led me to investigate projects spanning a broad range of systems including aquatic, deep subsurface, crop-hosted, and soil environments. Currently, I am pursuing a PhD in the Ecology Program and Biogeochemistry dual-title program where I am excited to explore how the interactions and ecology of biocrust microorganisms effect biogeochemical cycling of nutrients.

Victoria Braithwaite to be memorialized with new ecology research award



Penn State's Ecology graduate degree program is creating an award named for Victoria Braithwaite, a beloved faculty member and researcher who died in 2019. The new award will reward student research excellence, by recognizing the student who is lead author on the best ecology paper published in the previous year, as determined by a committee of faculty and students.

The program has a history of endowed awards for students but this is the first for research excellence. An anonymous lead donors have pledged \$6,000 towards a \$20,000 goal which would permanently endow the award. Various founding donors has also moved us a long way towards this goal. The Ecology program is currently in the process of raising the remaining funds, and donations can be contributed at this [link](#)

Braithwaite was an inspiring scientist and mentor. She received her PhD from Oxford and taught at universities in Scotland before joining Penn State faculty in 2007. Her research focused on animals' cognitive behavior, and Braithwaite's groundbreaking work on fishes' ability to feel pain has influenced animal welfare standards in the fishing industry in multiple countries.

The full article on this award is available [here](#)

Virtual Outreach and Education with Monarch Caterpillars

By Jenn Harris (she/her) with Contributions from Lilly Germeroth (she/her)



*Author Bios can be viewed in the New Ecology Students Section
Contact: jeh6121@psu.edu*

After hearing about Lilly Germeroth's outreach project with Monarchs this fall I interviewed her about her experience and thoughts about doing outreach during a pandemic. Lilly is an 1st year Master's student in the Ecology program working in Dr. Sara Hermann's Arthropod Ecology and Trophic Interactions Lab.

Lilly's research focuses on how the type of milkweed monarchs feed on can influence monarch larvae behavior. Monarchs are toxic due to the sequestration of cardenolide compounds in the milkweed tissue. However, different milkweed genotypes have variation in cardenolide concentration so, monarch's toxicity varies by the milkweed type they consume. More toxic or less toxic monarchs might behave differently which would have implications for predator prey dynamics.

Lilly's interests are broader than predator-prey interactions, she also values science communication, and education. A huge benefit of doing work in the monarch-milkweed system is that it has a charismatic fauna often used for outreach. In collaboration with the Graduate Women in Science Lilly made an informational outreach video for Radio Park Elementary School's Science Fair. In her video, linked [here](#), she shows the monarch life cycles and look at some of the daily activities of grad student at Penn State.

Naturally, outreach and education projects look different during a pandemic. Although some schools in PA have been in person to various degrees this Fall, much k-12 education is happening virtually. Radio Park Elementary School's in person Science Fair was canceled this year, and instead multiple grad students sent in videos for elementary students to view. Lilly notes how there are benefits to this kind of engagement because it can make outreach content like hers widely accessible. The video has been passed on by multiple teachers in the region because as Lilly notes "You only need an electronic device to view this, students don't need to visit Penn State or have their elementary schools host science fairs or scientists". However, Lilly also mentions how "You really can't



replace the experience of holding a monarch in your hand". After 9 months of a pandemic, I'm sure it resonated with many of us that there are things lacking in a remote education.



Lilly's favorite fun fact about monarchs is that they have tentacles, which are not true antennae. Monarch larvae can't see very well, so tentacles are used for sensory information.

Broadly, virtual learning will likely exacerbate learning gaps for students that the education system has historically not served like low-income students and student of color. Much of success in school is dependent on family background in socioeconomic status ¹. Finding ways to uplift marginalized students was something Lilly reflected on in making this project. She and Radio Park teachers planned to make the video widely accessible to students and teachers across PA. Lilly's thoughts centered around making content that engages with students regardless of the background they bring to class. With guidance from the Hermann lab's postdoc, Jessica Kansman, Lilly included scenes in her video showing her doing lab work, and the look at the lab itself. For young students seeing a young woman leading in science, and what a research environment looks like are important, maybe more so than the content sometimes.

Lilly encourages other students not to feel intimidated by making content like this! Making and editing videos is easy and free in windows movie maker. In the future Lilly intends to make more content and engage with both high school students and senior citizens as these groups are often overlooked in much engagement. Lilly plans to take advantage of the technology to zoom into a k-12 classroom, and to start a dialog with the master naturalists' group at Penn State where she could contribute and learn from their experiences.

¹ Anna J. Egalite, "How Family Background Influences Student Achievement," *Education Next* 16, no. 2 (2016), <https://www.educationnext.org/how-family-background-influences-student-achievement/>.

A diamond in the pumpkin patch

By Laura Jones (*she/her*)

Laura is a PhD Candidate in the Ecology Program in the Department of Entomology Advised by Margarita López-Uribe and Rudolf Schilder. Contact: ljj33@psu.edu



Laura in the field at Rock Springs looking for squash bees in winter squash flowers. Photo credit: Caylon Yates 2020

I visit pumpkin farms across Pennsylvania to investigate host-pathogen dynamics in bee communities. In pumpkin fields, we typically see three bee species foraging – honey bees, wild bumble bees and wild squash bees. Haven't heard of squash bees before? These are incredibly important, solitary bees that specialize on the pollen of pumpkin and squash. In fact, they are some of the best pollinators for pumpkin crops in Pennsylvania! Unlike social honey bees and bumble bees where only females bring food back to the hive, both male and female squash bees forage on flowers for nectar, and the females collect pollen for their offspring. Female and male squash bees also behave differently; the females spend much of their time collecting pollen to bring back to their nests, whereas the males frequent many flowers during the morning in search of females and occasionally nectar. Because of these sex-specific behaviors, identifying squash bees by sex is critical to understanding their independent roles in host-pathogen dynamics. However, last year I learned that this isn't always as simple as it seems.

Squash bees live by the motto, “the early bee gets the nectar,” often starting their day well before sunrise. In order to study them, we have to live by a similar motto, “the early researcher gets the bee.” On one particular day, my labmate Ginamaría Roman-Echevarría and I drove to Butler, PA, starting our journey as usual, at about 3:00AM. In fact, everything about the start to our day was as it usually was: we drank too much coffee, sang along to our field work playlist, and then collected bees in the all-too-cold morning weather. When collecting squash bees, we try to confirm their sex from a few key characters. The males have long antennae and a yellow spot on their face. The females have bushy hind legs covered in long setae that they use to transport pollen back to their nests. When in the flower, we identify these busy mothers the fastest since their legs look enlarged and bright yellow from the pollen they've collected. I remember finding one such female, though strangely, only one leg looked pollen-ified. I noticed she was indeed collecting pollen, even if

only successfully on one leg, so I scooped her up and labeled her as female. When we were satisfied with the day's haul we drove back to the lab. The hard part was over, or so we thought.



Male squash bee in a pumpkin flower in 2014. Photo credit: Hadel Go.

At the lab, I first confirm our field identifications before determining pathogen loads. When going through the bees to confirm their identifications this particular day, I noticed something strange. One female-labeled bee, the inefficient pollen-collector, had a long antennae. Then I noticed, she had a yellow spot on one side of her face. Lastly, I realized I had unfairly judged her pollen-packing abilities in the field – her left leg didn't have the long setae it needed to hold pollen! What I was looking at, ladies and gentleman, was a half-lady, half-gentleman. Her head was split as left-female, right-male, yet her body was split right-female, left-male. We had found a mosaic gynandromorph, where male and female characters are patchily distributed throughout the body. These bees are very rare to find in the field and the mechanisms that lead to their development

are not well known. In other organisms, gynanders can develop due to external stressors such as pollution, or even parasitism! We may never know what caused this particular bee to develop into a gynandromorph. However, we hope that with more documentation of these individuals in wild systems, we may be able to capture the frequency of their occurrence, and potentially identify what stressors may result in their development.

To learn more about this particular specimen or the potential developmental and environmental mechanisms of gynandromorphism in insects, look out for our article in the *Journal of Melittology*!



Laura at Rock Springs looking for squash bees in winter squash flowers. Photo credit: Caylon Yates 2020

Jones, L.J.; Kilpatrick, S.K.; López-Uribe, M.M. Gynandromorph of the squash bee *Eucera (Peponapis) pruinosa* (Hymenoptera: Apidae: Eucerini) from an agricultural field in western Pennsylvania, United States of America. *Journal of Melittology*. Accepted November 2020.

Reflection on Shirley Malcom's Distinguished Lecture

By Jenn Harris Contact: jeh6121@psu.edu

This October our Program was fortunate to hear Shirley Macolm, PhD speak about "Reimagining the University as a Place Where Inclusion Is the Norm: What Will It Take?". Shirley Malcom is the Director of Education and Human Resources Programs at the American Association for the Advancement of Science, the world's largest general science organization.



Dr. Macolm spoke about her path pursue a higher education as a black woman during the 1960 and 1970s. Dr. Malcom grew up in Birmingham, Alabama, the location of the 1963 Birmingham Campaign of Peaceful protest lead by Martin Luther King Jr, and subsequent conflicts between protestors and civic authorizes. A familiar scene this year as well. Malcom received her B.S. at the University of Washington and M.S. in 1967 at the University of California, Los Angeles both for zoology. In 1974, she received her PhD from Pennsylvania State University in ecology.

She is a leader in efforts to improve access of girls and women to education and careers in science and engineering. Dr. Malcom is a former member of the National Science Board, the policymaking body of the National Science Foundation, and served on President Clinton's Committee of Advisors on Science and Technology, and holds 16 honorary degrees.



She spoke about her current efforts in Equity and Inclusion in STEM through the STEM Equity Achievement (SEA) Change. SEA Change is housed in the American Association for the Advancement of Science (AAAS), an

international non-profit organization dedicated to advancing science, technology, and innovation for the benefit of all people. The goals of SEA Change is effecting institutional transformation in support of diversity and inclusion. The program created a community where institutional members committed to diversity can communicate best evidence-based practices. Additionally, it includes an award system that requires intuitions to self assess barriers to inclusion, plan to address barriers which are assessed by independent experts. In my opinion this system addresses the gaps that Dr. Macolm described such as measurable goals, and a lack intuition wide multilateral initiatives.

One of my takeaways from her talk was multilateral DEI activities are important to program success not just individual departments. Likewise, I found an emphasis in her talk about communicating what works and what doesn't. With that in mind I've collected a series of updates about the action of the Ecology department's DEI committee as well as updated from home department committees that Ecology students and faculty participate in. Please view committee updates and reflections on the following page.

Updates on Diversity, Equity and Inclusion Initiatives and Committees

This is by no means a complete list, but I think there is value in beginning a place to share ideas with each other and the Ecology Program community as a whole.

Statements collected by Jenn Harris, PhD student in Ecology



Image credit Andy Brunning/Compound Interest

Ecology Diversity Equity and Inclusion Committee

Update by Sara Hermann, PhD, Assistant Professor Department of Entomology

The Ecology DEI committee is just starting to ramp up, we have 25 members right now and had our first group meeting a little over a month ago. Many of our members are also involved in the committees of their home department as well, which we view as a strength! It is nice to have the perspective of those that are engaged in DEI in many areas to achieve that multilateral aspect that Dr. Malcom discussed. At our recent meeting we identified a few initial goals for the committee:

Objectives/Overall Goals:

1. DEI statement on program page
2. Published Strategic Plan - updated regularly.
3. Incorporating DEI in our core courses

We are in the process of finalizing the DEI statement for committee review so that it may be posted on the website for the program. It will also be included in the student handbook. As for the second goal, we have developed a longer-term strategic plan that describes several action items for us all to work through. Many of these items are shared across DEI committees (like entomology, for example) to reduce redundancy and to ensure efficient implementation. Once finalized, we will publish this plan and update it regularly for accountability and transparency. Lastly, we are dedicated to incorporate DEI in our core courses, this is something that was done this fall semester and has been explicitly conveyed to the instructors for future offerings as well.

In addition to these action items, we have begun hosting some DEI sponsored trainings, beginning with a workshop on Anti-Racism in Ecology hosted by David Muñoz in early November. There will be future offerings on more topics related to DEI! On the horizon, we will also be sponsoring a screening of the film “Picture a Scientist” early next semester for the ecology program with a nice zoom discussion following the screening.

Even though we are just getting started, it is clear that we have a passionate community and I am sure that we will make nice strides as we move forward.

Ecosystem Science and Management Diversity Equity and Inclusion Committee

Contributions from:

David Muñoz, PhD, Research and Equity Specialist

Estelle Couradeau, PhD, Assistant Professor of Soils and Environmental Microbiology

David Miller, PhD, Assistant Professor of Wildlife Population Ecology

Department of Ecosystem Science and Management,

Here is a summary the Ecosystem Science and Management DEI committee’s accomplishments this year:

- David Miller and Allyson Muth taught the graduate course WFS/FOR 597 Equity and Inclusion in the Ecological Profession, which was a 2-credit course
- The diversity committee collected the funds to hire a part-time equity specialist that started in August of 2020 (David Munoz)
- We have offered trainings/workshops for ESM and the Ecology program on Anti-racism in environmental fields. Between these two events we had 86 registered attendees across faculty, staff, and graduate students.
- The committee is hosting a workshop for ESM faculty who want to incorporate diversity, equity, and inclusion into their course's curriculum. We created a new curriculum guide that addresses DEI in course content, engagement, and assessment.

Our next workshop will focus on creating an inclusive culture in our programs. We will also be working with our newly hired department head to incorporate DEI into the strategic plan for the department.

New Plant Pathology Diversity Equity and Inclusion Committee

By **Sarah Richards**, PhD student in Ecology

What a crazy year! As this is the Ecology newsletter, most of you are likely familiar with the field of fire ecology and the special adaptations of pyrophytic plants like lodgepole pine or Eucalyptus that can only germinate after a burning event. It’s a beautiful concept, that out of a force as brutal, destructive, and unyielding as fire, something new, young, and full of life can only take root because of it. For many of us, this year has been a time of reflection on what’s truly important and essential in our lives. It’s also been a time of assessment, of ourselves and our communities, and in particular, the social injustice that persists within them. Perhaps this disruptive year provides a new fire in our lives, one that can break down stale barriers caused by racism and help us cultivate a status quo of social equality for our future.

The PPEM DEI Committee was founded this semester, Fall 2020. We are a group of graduate students, administrators, and undergraduates devoted to nurturing a community in which everyone can reach their full

potential. Our mission is to empower everyone in our reach, most especially within our department and on our campus to contribute to the breakdown of barriers caused by social injustice, inequality, and racism. Our first official meeting was last month during which we discussed goal setting, milestones and future events we'd like to hold. If anyone is interested in getting involved or would like to collaborate on events, please feel free to reach out to our committee president Matt Black. Otherwise, keep your eyes peeled for exciting events next semester!

New Plant Sciences Diversity Equity and Inclusion Committee

Contributions from:

Elsa Sanchez, PhD Professor of Horticultural Systems Management,

***Liana Burghardt**, Assistant Professor Department of Plant Sciences*

The Plant Science Equity, Diversity, Inclusion committee formed summer 2020, and is led by interim co-chairs Elsa Sanchez and Liana Burghardt. Their 13-member group bridges faculty, staff and students, which they believe is a strength of the group. Given the committee is so recent much of their work this semester has focused on crafting vision, and mission statements, as well as building a strategic plan. As a group they have done a series of diversity and inclusion trainings led by Shakoor Ward is the University's Professional Development Coordinator in the Affirmative Action Office (AAO). The committee's future plans include department-wide training events and a curriculum initiative at the undergraduate level.

Department of Biology's Climate and Diversity Committee

Contributions from:

***Mathew Ferrari**, PhD, Committee Chair, Associate Professor of Biology*

Our major activities, in addition to the college charge, have traditionally been postdoctoral mentoring and coordinating staff appreciation. We normally do post-doc mentoring luncheons but haven't done one this semester; it just got away from us. But we are planning one now that will focus on maintaining connections with your lab in the online environment — even though we all hope this current crisis will end as soon as possible, we are all learning more about how to conduct research and collaborate remotely; this also will allow us to be more flexible about accommodating staff and trainee needs in the future. We're going to host a round-table discussion with department post-docs and some faculty about lessons learned, not just during the pandemic, but by faculty who have successfully mentored students and run labs while on sabbatical.

We are also in the midst of organizing our annual staff gift. This is normally done in person, with hand signed cards for all of our staff. We're doing it all virtually this year, but still have virtual group cards (and cash gifts) for the faculty to sign to express their gratitude to the staff who have supported us all through the year ... and a helluva year it was.

Going forward, we are working on how to set measurable goals for the DEI component of our strategic plan. We feel that it is important to be both aspirational and accountable. We think the latter has been hard to come by, so we're working on trying to set goals that are both realistic and measurable.

Inclusion, Diversity, and Equity in Anthropology

Update from:

Laura S Weyrich, PhD, Associate Professor of Anthropology

The Department of Anthropology formed the IDEA - Inclusion, Diversity, and Equity in Anthropology - Committee in 2020, which is composed of representatives from all members of the department, including professors at each level, staff, teaching faculty, students, and researchers. The IDEA committee identified key areas of improvement and developed a strategic plan, led two Department wide colloquium discussion sessions on inclusion and diversity topics, submitted a funding application for a new summer school initiative to benefit students from underrepresented backgrounds, and worked to improve diversity and opportunities in graduate student recruitment initiatives within the Department and more broadly.

Award and Publications²

Congratulations to:

Liana Burghardt who was awarded the Tansley Medal for excellence in plant science

Abrams, M. D., & Nowacki, G. J. (2020). Native American imprint in palaeoecology. *Nature Sustainability*, 3(11), 896-897.

Hanberry, B. B., **Abrams, M. D.**, Arthur, M. A., & Varner, J. M. (2020). Reviewing fire, climate, deer, and foundation species as drivers of historically open oak and pine forests and transition to closed forests. *Frontiers in Forests and Global Change*. 3: Article 56., 3, 56.

Ali, J. G., Casteel, C. L., Mauck, K. E., & **Trase, O.** (2020). Chemical ecology of multitrophic microbial interactions: plants, insects, microbes and the metabolites that connect them. *Journal of Chemical Ecology*, 46(8), 645-648.

Herr, M. **W.**, **Avery, J. D.**, Langkilde, T., & Howey, C. A. (2020). Trade-off Between Thermal Quality and Predation Risk at Timber Rattlesnake Gestation Sites. *Journal of Herpetology*, 54(2), 196-205.

Tylan, C., Horvat-Gordon, M., **Bartell, P. A.**, & Langkilde, T. (2020). Ecoimmune reallocation in a native lizard in response to the presence of invasive, venomous fire ants in their shared environment. *Journal of Experimental Zoology Part A: Ecological and Integrative Physiology*.

Vohsen, S. A., Anderson, K. E., Gade, A. M., Gruber-

Vodicka, H. R., Dannenberg, R. P., Osman, E. O., ... & **Baums, I. B.** (2020). Deep-sea corals provide new insight into the ecology, evolution, and the role of plastids in widespread apicomplexan symbionts of anthozoans. *Microbiome*, 8(1), 1-15.

Reich, H. G., Kitchen, S. A., Stankiewicz, K. H., Devlin-Durante, M., Fogarty, N. D., & **Baums, I. B.** (2020). Genotypic similarity among algal symbionts corresponds to associations with closely related coral hosts.

Bell, T. H., Yergeau, E., Maynard, C., Juck, D., Whyte, L. G., & Greer, C. W. (2013). Predictable bacterial composition and hydrocarbon degradation in Arctic soils following diesel and nutrient disturbance. *The ISME journal*, 7(6), 1200-1210.

Terrence H Bell, Thomas Bell, Many roads to bacterial generalism, Accepted: 25 November 2020. *FEMS Microbiology Ecology*

Vaudo, A. D., **Biddinger, D. J.**, Sickel, W., Keller, A., & López-Urbe, M. M. (2020). Introduced bees (*Osmia cornifrons*) collect pollen from both coevolved and novel host-plant species within their family-level phylogenetic preferences. *Royal Society open science*, 7(7), 200225.

Reilly, J. R., Artz, D. R., **Biddinger, D.**, Bobiwash, K., Boyle, N. K., Brittain, C., ... & Ellis, J. D. (2020). Crop

² Publications from Google scholar August-December. Only included if a Penn State Ecology Faculty 1st through 4th author or Last author. Sorry if anyone was missed!

production in the USA is frequently limited by a lack of pollinators. *Proceedings of the Royal Society B*, 287(1931), 20200922.

Vaudo, A. D., **Biddinger, D. J.**, Sickel, W., Keller, A., & López-Urbe, M. M. (2020). Introduced bees (*Osmia cornifrons*) collect pollen from both coevolved and novel host-plant species within their family-level phylogenetic preferences. *Royal Society open science*, 7(7), 200225.

Morin, E., **Bird, R. B.**, & **Bird, D.** (2020). Mass procurement and prey rankings: insights from the European rabbit. *Archaeological and Anthropological Sciences*, 12(11), 1-14.

Bliege **Bird, R.**, & **Bird, D. W.** (2020). Climate, landscape diversity, and food sovereignty in arid Australia: The firestick farming hypothesis. *American Journal of Human Biology*, e23527.

Liebhold, A. M., Björkman, C., Roques, A., **Bjørnstad, O. N.**, & Klapwijk, M. J. (2020). Outbreeding forest insect drives phase synchrony among sympatric folivores: Exploring potential mechanisms. *Population Ecology*, 62(4), 372-384.

Giles, J. R., zu Erbach-Schoenberg, E., Tatem, A. J., Gardner, L., **Bjørnstad, O. N.**, Metcalf, C. J. E., & Wesolowski, A. (2020). The duration of travel impacts the spatial dynamics of infectious diseases. *Proceedings of the National Academy of Sciences*, 117(36), 22572-22579.

Giles, J. R., zu Erbach-Schoenberg, E., Tatem, A. J., Gardner, L., **Bjørnstad, O. N.**, Metcalf, C. J. E., & Wesolowski, A. (2020). The duration of travel impacts the spatial dynamics of infectious diseases. *Proceedings of the National Academy of Sciences*, 117(36), 22572-22579.

Herzog, C. M., de Glanville, W. A., Willett, B. J., Cattadori, I. M., Kapur, V., Hudson, P. J., ... & **Bjørnstad, O. N.** (2020). Peste des petits ruminants virus transmission scaling and husbandry practices that contribute to increased transmission risk: an investigation among sheep, goats, and cattle in Northern Tanzania. *Viruses*, 12(9), 930.

Yang, N., Zhang, J., Liu, J., Liu, G., **Boyer, E. W.**, Guo, L., & Wang, G. (2020). Concentration–Discharge

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Looking for fun game this Holiday Season? Want to reflect on some common experiences this Fall? You should play:

Fall 2020 Bingo

Pandemic Edition

You voted	Someone talks on call and they are muted	Got a flu vaccine	Increased your plant collection	Made soup
Did lab work	Someone's audio doesn't work	Did field work	You played Among Us	Went to an EGSO event
Went to an Ecology Social Event	Got randomly selected to get a covid test	 Free! <small>Zoom at Penn State</small>	Got a covid test	Rearranged your furniture
Did field work with lab mates (6 ft apart)	Went to a zoom happy hour	Went for a Hike	Rearranged your furniture again	Adopted a pet
Did a zoom thanksgiving	Cooked something new	Voted by mail	Were inundated with canvas notifications	Had to explain to an older family member how to video call.

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