# Exploring Tiger Beetle Diversity Associated with Salt Domes across East Texas

Authors: Robert A.S. Laroche[1], Daniel P. Duran[2], Scott P. Egan[3]

**INTRODUCTION**. Saline habitats represent challenging environments for living organisms, but also amazing examples of organismal adaptation to those conditions, including plants, invertebrates, fish, and microbes (Oren, 2005; Gunde-Cimerman et al., 2018). These high salinity environments generate constraints at the molecular level that demand highly specialized adaptations in order for survival to be possible (Frolow et al., 1996). The goal of this Thicket of Diversity proposal is to explore the hidden, isolated and underexplored saline habitats distributed across the Big Thicket region for locally adapted populations of salt-associated tiger beetles.

In areas of relatively low elevation where large layers of salt are covered by layers of sedimentary rock, columns of salt can sometimes rise under the pressure caused by overlying layers, displacing the sediment above them (Jackson & Seni, 1984). These areas, known as salt domes, are found across the globe and have unique surface chemistry that varies greatly from the surrounding habitat (Jones et al., 1956; Jackson & Seni, 1984; Williams & Ranganathan, 1994). Thus, salt domes are a prime candidate for an environment where ecological adaptation and speciation may have led to organisms found nowhere else. In fact, part of the unique surface chemistry is actually already a result of the activity of bacteria specialized for these extreme environments (Machel, 1989). In Texas, a subterranean salt basin extends from the southern tip of the state up the gulf coast across most of East Texas to the state's northern border, encompassing the entire Big Thicket National Preserve. Across the range of this basin hundreds of salt domes of varying sizes have been documented (Jackson & Seni, 1984). Despite their frequency across such a large portion of the state, the biology of these habitats is greatly understudied and very little is known about the species that inhabit them or their relation to populations that live in the surrounding, less extreme environments.

Tiger beetles–family Cicindelidae–are a species rich and phenotypically diverse group that includes species which range across North America. In Texas, they can be found across the state, including in the salt basin region described above. Already, there is evidence that genetic divisions between some Texas tiger beetles are predicted by life history differences associated with geography (Duran et al., 2020). In particular, habitat surface chemistry is very relevant to tiger beetle ecology as they burrow and lay eggs in the ground, where larvae develop to adulthood. In fact, *Eunota* species are known to be associated with saline environments such as ocean shorelines and estuaries as well as the edges of rivers and lakes (Acciavatti, 2021). However, the extent to which populations of *Eunota* utilize the salt domes of East Texas and the relationships between these populations and others in surrounding environments are unknown. Early sampling by our lab has identified populations of *Eunota* on salt domes in coastal and more inland locations. The Big Thicket National Preserve represents a critical missing link to *Eunota's* range that connects the populations of salt dome-associated beetles already identified (Figure 1). Although salt domes are known to occur throughout this region, there currently has been little work documenting *Eunota* species across these isolated, extreme environments.

While tiger beetles have long been a charismatic and well studied group, they have historically been differentiated based on observable phenotypic differences. Recently, modern genetic techniques have revealed inaccuracies in the taxonomic classification of Texas tiger beetles (Duran & Gough, 2019; Duran et al. 2019; Duran et al., 2020). Thus, more work is needed to understand the true diversity of tiger beetles in East Texas, and *Eunota* species inhabiting unique saline environments offer an opportunity to document unexplored biodiversity and test evolutionary hypotheses about the role of novel habitat in driving speciation.

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Here we propose using multiple types of genetic data to **1) identify any novel species or subspecies of tiger beetle currently undescribed in the Big Thicket region, 2) describe the genetic structure and evolutionary relationships within and between populations of two salt-adapted tiger beetle species–*Eunota togata* and *Eunota circumpicta*–across East Texas with a specific focus on the region stretching from the Gulf coast through the Big Thicket National Preserve to northern East Texas, and 3) determine whether unique saline habitats offered by salt domes are associated with genetically divergent populations.**

**METHODOLOGY.** *Collection.* We aim to collect *Eunota togata* and *Eunota circumpicta* specimens from counties within and surrounding the Big Thicket region. Already, populations of both species have been identified and collected from inland counties where they had not been reported previously, including isolated salt flats in Gonzales, Red River, Brazos, Harris, and southern Hardin county, which is just south of the Big Thicket region (Figure 1). This proposal funds research in east Texas counties (Hardin, Jefferson, Orange, Jasper, Liberty, Polk, and Tyler Counties) where the Big Thicket National Preserve has a presence. It is understood the research will also be conducted elsewhere in the region. Collection methods will follow those used for previous studies (Duran et al., 2020). We will use data on the locations of known salt domes from historic geological surveys (Beckman & Williamson, 1990) combined with visual surveys of Google Earth to identify specific salt domes within these counties to target for collection. In each county, we will search for at least two localities from which we will collect specimens–one on a salt dome, and one on non-saline habitats. From each of these localities, we will collect 10-15 individuals of each species for a total of 40-60 specimens, equally split by males and females where possible, per county and 520-780 specimens overall. Research permits will be requested from all relevant groups including the Big Thicket National Preserve and all specimen collection will follow the protocols of these agencies. Additional collection of specimens in counties outside of the Big Thicket that have already been sampled and represent standard *Eunota* species–shown in red in Figure 1–will be conducted as necessary. We will also resurvey local museum samples at Texas A&M, as well as national collections at the Smithsonian and the American Museum of Natural History, where we have active collaborations, to look for historic samples of this region.

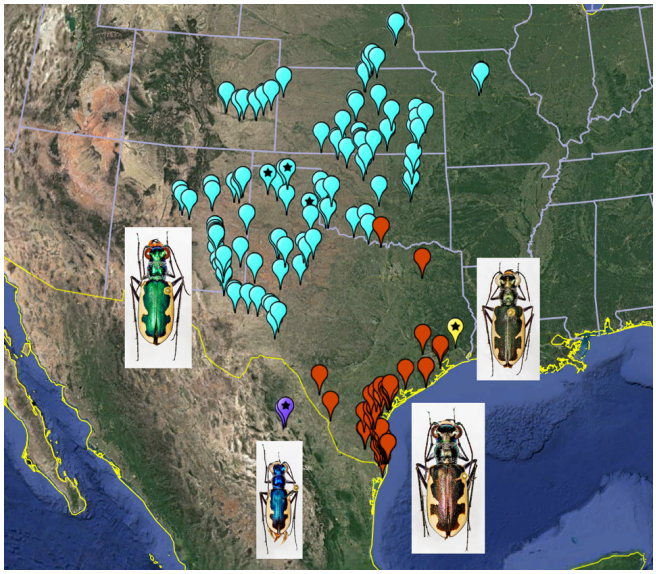

**Figure 1.** Map of locations where our research group has discovered *Eunota* populations. In red are the populations of interest for this proposal, with a clear gap in the Big Thicket region. The yellow marker indicates a *Eunota* population on the southern border of the Big Thicket.

*Molecular Work.* DNA will be extracted from up to 192 specimens of each unique locality–species combination using Qiagen DNeasy Blood and Tissue Kits and a non-destructive protocol in which the abdomen of the specimen is punctured 5-10 times before being soaked in lysis solution. Replicate specimens will be added when possible and if any extractions fail. Following DNA extraction, specimens will be rinsed and kept in 70% ethanol so they can later be pinned

and photographed. Two mitochondrial regions, a 1001 bp fragment of the mitochondrial genes cytochrome c oxidase subunit 1 (cox1) and subunit 2 (cox2) and a 424 bp region of the cytochrome b gene (cytb), will be amplified for at least one specimen from each locality. The primers and protocol for this were designed by a member of our research group and will be replicated from prior studies (Duran et al., 2020). Amplified genes will be sent to the University of Arizona's Genetics Core, where paired end reads will be produced via Sanger sequencing.
Multilocus genetic data will be produced using a restriction enzyme associated DNA sequencing (RAD-seq) approach. A single pooled library of up to 192 specimens will be prepared using a protocol developed by Parchman et al. (2012) and used since by our research group with other tiger beetle species (Duran et al., 2019). DNA sequencing of these libraries will be conducted by the University of Texas Genomic Sequencing and Analysis Facility using a full SP flow cell lane on the Illumina NovaSeq, with an expected yield of 350 million paired 100 bp reads.
*Bioinformatics*. Single locus sequences produced through Sanger sequencing will be compiled, aligned and processed through methods used previously (Duran et al., 2020). Processing of multilocus data will also be done in accordance with previous work, using ipyrad (https://ipyrad.readthedocs.io/), a toolkit for sequence assembly and analysis (Duran et al., 2020; Eaton & Overcast, 2020). Maximum likelihood phylogenetic trees will be constructed from mitochondrial genes using IQ-TREE v. 2.0 (Nguyen et al., 2015) and from multilocus nuclear data using raxML in order to assess the evolutionary relationships between populations. Further, STRUCTURE analyses will be conducted using multilocus data to identify the genetic structure of tiger beetles across the Big Thicket (Pritchard et al., 2000). Thus, both phylogenetic trees in addition to the STRUCTURE analysis will address our first aim. All methods for determining parameters for these analyses will follow Duran et al. (2020). To address our second aim, we will compare individuals collected on salt domes to those from other habitats and assess the extent to which they form a genetically distinct lineage among *Eunota*. If salt dome-associated individuals resolve separately from individuals of the same species from different habitats, this would suggest that the unique salt dome habitat may be driving genetic divergence between populations. Finally, if our analyses identify any individuals or populations we discover that are as genetically differentiated from one of our two focal species as the two focal species are from each other, this would provide evidence of undescribed biodiversity among tiger beetles within the Big Thicket region. Potential species that might be discovered to exist in this region include *Cicindelidia trifasciata, Cicindelidia ocellata, Eunota severa, and Ellipsoptera hamata*.

**TIMELINE**. The project will start in Summer 2022 and end the following Summer, 2023. This Summer start date will coincide with tiger beetle emergence, facilitating collection, which will take place June-August 2022. In the Fall, September and October will be spent completing molecular lab work, including DNA extraction, amplification of mitochondrial genes, and preparation of multilocus libraries for sequencing. November and December will subsequently be spent analyzing the data produced as described above. This will allow enough time to present results at The Society for Integrative and Comparative Biology's annual meeting in January, or an equivalent academic conference. The final months between January and May 2023 will be spent writing up the results of this research for publication in a competitive academic journal. All genetic data will be uploaded to public repositories such as GenBank after publication.

**BUDGET**.
**Category 1:** $6000 for Genetic laboratory work, mitochondrial gene amplification, and multilocus nuclear library preparation. Sequencing of both mitochondrial genes and nuclear

libraries is essential to identifying tiger beetle species. Work will be performed at cost of $33 per hour. Time and price estimates are based on previous experience with these protocols for a specimen count of ~200.

**Category 2:** $3600 at $12 an hour for undergraduate for specimen collection (travel to two sites in each unsampled county), bioinformatic analyses (training, ipyrad sequence assembly, raxML tree construction and STRUCTURE analyses), and pinning and photography (at 4 specimens an hour, it will take 50 hours to pin the ~200 specimens sequenced in this study).

**Category 3:** $2880 for gas ($800 with receipts) and rental car ($160 a day for a vehicle capable of transporting research supplies and multiple collaborators to sampling sites on back roads and off road if needed).

**TOTAL REQUESTED: $13,080**

## REFERENCES


Acciavatti, R. E. (2021). Taxonomic revision of Eunota togata (LaFerté-Sénectère,1841) (Coleoptera: Cicindelidae) in North America with a new subspecies from western Texas and New Mexico, United States. *Insecta Mundi*. https://journals.flvc.org/mundi/article/view/127955

Beckman, J. D., & Williamson, A. K. (1990). *Salt-dome Locations in the Gulf Coastal Plain, South-Central United States*. U.S. Geological Survey.

Duran, D. P., & Gough, H. M. (2019). Unifying systematics and taxonomy: Nomenclatural changes to Nearctic tiger beetles (Coleoptera: Carabidae: Cicindelinae) based on phylogenetics, morphology and life history. *Insecta Mundi*. https://journals.flvc.org/mundi/article/view/116715

Duran, D. P., Herrmann, D. P., Roman, S. J., Gwiazdowski, R. A., Drummond, J. A., Hood, G. R., & Egan, S. P. (2019). Cryptic diversity in the North American Dromochorus tiger beetles (Coleoptera: Carabidae: Cicindelinae): A congruence-based method for species discovery. *Zoological Journal of the Linnean Society*, *186*(1), 250–285. https://doi.org/10.1093/zoolinnean/zly035

Duran, D. P., Laroche, R. A., Gough, H. M., Gwiazdowski, R. A., Knisley, C. B., Herrmann, D. P., Roman, S. J., & Egan, S. P. (2020). Geographic Life History Differences Predict Genomic Divergence Better than Mitochondrial Barcodes or Phenotype. *Genes*, *11*(3), 265. https://doi.org/10.3390/genes11030265

Eaton, D. A. R., & Overcast, I. (2020). ipyrad: Interactive assembly and analysis of RADseq datasets. *Bioinformatics (Oxford, England)*, *36*(8), 2592–2594. https://doi.org/10.1093/bioinformatics/btz966

Frolow, F., Harel, M., Sussman, J. L., Mevarech, M., & Shoham, M. (1996). *Insights into protein adaptation to a saturated salt environment from the crystal structure of a halophilic 2Fe-25 ferredoxin*. *3*(5), 7.

Gunde-Cimerman, N., Plemenitaš, A., & Oren, A. (2018). Strategies of adaptation of microorganisms of the three domains of life to high salt concentrations. *FEMS Microbiology Reviews*, *42*(3), 353–375. https://doi.org/10.1093/femsre/fuy009

Jackson, M. P. A., & Seni, S. J. (1984). *Atlas of Salt Domes in the East Texas Basin*. https://www.beg.utexas.edu/publications/atlas-salt-domes-east-texas-basin

Jones, G. E., Starkey, R. L., Feely, H. W., & Kulp, J. L. (1956). Biological Origin of Native Sulfur in Salt Domes of Texas and Louisiana. *Science*. https://www.science.org/doi/abs/10.1126/science.123.3208.1124

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Nguyen, L.-T., Schmidt, H. A., von Haeseler, A., & Minh, B. Q. (2015). IQ-TREE: A fast and effective stochastic algorithm for estimating maximum-likelihood phylogenies. *Molecular Biology and Evolution*, *32*(1), 268–274. https://doi.org/10.1093/molbev/msu300

Oren, A. (2005). A hundred years of Dunaliella research: 1905–2005. *Saline Systems*, *1*(1), 2. https://doi.org/10.1186/1746-1448-1-2

Parchman, T. L., Gompert, Z., Mudge, J., Schilkey, F. D., Benkman, C. W., & Buerkle, C. A. (2012). Genome-wide association genetics of an adaptive trait in lodgepole pine. *Molecular Ecology*, *21*(12), 2991–3005. https://doi.org/10.1111/j.1365-294X.2012.05513.x

Pritchard, J. K., Stephens, M., & Donnelly, P. (2000). Inference of Population Structure Using Multilocus Genotype Data. *Gen.*, *155*(2), 945–959.

Williams, M. D., & Ranganathan, V. (1994). Ephemeral thermal and solute plumes formed by upwelling groundwaters near salt domes. *Journal of Geophysical Research: Solid Earth*, *99*(B8), 15667–15681. https://doi.org/10.1029/94JB00903

# Curriculum Vitae


## Robert Laroche

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832-576-4607


## EDUCATION

University of Houston, Houston, Texas
- Bachelor of Science
- Major in Biology
- Minor in Management
- GPA (Overall): 3.916/4.000
- GPA (In Major): 3.918/4.000
- Graduation Date: December 2018

Rice University, Houston, Texas
- Doctor of Philosophy
- Ecology and Evolution Graduate Program
- Start Date: May 2019
- GPA: 4.000/4.000

Relevant Course Work:

Undergraduate:
Honors Biology 1&2, General Chemistry 1&2, Organic Chemistry, Honors Genetics, Biochemistry, Biodiversity, Evolution, Cell Biology, General Chemistry Laboratory 1&2, Genetics Laboratory, and Biochemistry Laboratory.

Graduate:
Topics in Ecology: Processes in Microbial Ecology, Topics in Evolution: Ecological Speciation, Topics in Ecology: Ecology of Climate Change, Topics in Evolution: General Topics, Analysis and Visualization of Biological Data, Topics in Evolution: Plasticity

GRE Score:
Verbal Reasoning: **163/170** (93rd Percentile)
Quantitative Reasoning: **167/170** (91st Percentile)

## PUBLICATIONS

ACADEMIC

*Accepted:*

Duran, D. P., **Laroche, R. A.**, Gough, H. M., Gwiazdowski, R. A., Knisley, C. B., Herrmann, D. P., Roman, S. J., Egan, S. P. (2020). Geographic life history differences predict genomic divergence better than mitochondrial barcodes or phenotype. *Genes*. https://doi.org/10.3390/genes11030265

Titus, B. M., **Laroche, R.**, Rodríguez, E., Wirshing, H., & Meyer, C. P. (2020). Host identity and symbiotic association affects the taxonomic and functional diversity of the clownfish-hosting sea anemone microbiome. *Biology Letters*. https://doi.org/10.1098/rsbl.2019.0738

Titus, B. M., Benedict, C., **Laroche, R.**, Gusmão, L. C., Van Deusen, V., Chiodo, T., … Rodríguez, E. (2019). Phylogenetic relationships among the clownfish-hosting sea anemones. *Molecular Phylogenetics and Evolution*. https://doi.org/10.1016/j.ympev.2019.106526

*Manuscripts Under Revision (Available Upon Request):*

**Laroche, R.A.S.**, Doan, T.M., Hanke, M.H. The influence of habitat characteristics of created oyster reefs on female oystershell mud crabs *Panopeus simpsoni*. **Journal of Crustacean Biology.**

OTHER PUBLICATIONS

Op-eds on the Rice Baker Institute Blog

- The Unspoken Threat of the Anthropocene (http://blog.bakerinstitute.org/2020/03/05/the-unspoken-threat-of-the-anthropocene/)
- The Ones the COVID-19 Relief (CARES) Bill Left Behind (http://blog.bakerinstitute.org/2020/04/09/the-ones-the-covid-19-relief-cares-bill-left-behind/)

## RESEARCH EXPERIENCE

2019 Summer - Present. Graduate research in Dr. Scott Egan's Rice University evolution lab.

- Investigating the influence of biotic and abiotic factors on the dynamics of alternating reproductive tactics across generations of smallmouth bass (*Micropterus dolomieui*) in a pre-existing 10-year data set.

2018 Summer - Present. National Science Foundation Research Experience for Undergraduates at the American Museum of Natural History.

- Evolutionary, molecular, and systematic research on cryptic species of tropical sea anemones.
- Construction of the most robust phylogenetic dataset of Actinioidea
- First microbiome analyses of the clownfish-hosting anemone species

2017 Fall - Present. Research in Dr. Ricardo Azevedo's University of Houston computational evolution lab.

- Modeling the divergence of two lineages throughout Dobzhansky-Muller incompatibility driven speciation.
- Exploration of the properties of a novel Nk Model fitness landscape.

2017 Summer. Research focused study abroad trip to the Galapagos islands.

- Field surveys of dogs and sea lions to estimate population size and identify opportunity for potential transmission of disease via interspecies interaction.
- Recognition software-based identification and capture of green and hawksbill sea turtles to measure population movements and site return rates.
- Measurement of biomass within algae samples to determine the nutrient input of the algae and the relationship between the algae and ocean upwelling.
- Field surveys of tide pools to identify habitat characteristics most conducive of intertidal life.

2016 Summer. Summer Undergraduate Research Fellowship program at the University of Houston.

- Independent research on the influence of man-made oyster reef habitat characteristics on *Panopeus simpsoni* reproductive output.

2016 Summer. Research with Dr. Marc Hanke under the New Faculty Research Award grant.

- Field surveys of xanthid crabs for new species of Carcinonemertean worms.

## TEACHING EXPERIENCE

2021 Summer. Teaching Assistant for BioSciences Summer Research Institute

- Led discussions during a journal club organized for undergraduate students in summer research programs

2020, 2021 Spring. Teaching Assistant for Evolutionary Biology

- Presented multiple lectures and responded to questions on material throughout the course.
- (2021) Designed a final project to promote inquiry based learning as a component of the Inquiry-Based Learning Teaching Fellowship

## PRESENTATIONS

*Past Presentations*

2021. Oral Presentation. Is energetics or competition a stronger driver of the seasonal timing of reproduction by male smallmouth bass?

- January. Virtual Meeting, The Society for Integrative and Comparative Biology Annual Meeting

2020. Oral Presentation. The Influence of Energetics and Competition on Smallmouth Bass Reproductive Behavior.

- July. Virtual Meeting, Animal Behavior Society Virtual Conference

2020. Poster Presentation. Host identity and symbiotic association affects the genetic and functional diversity of the clownfish-hosting sea anemone microbiome.

- January. Austin, TX, The Society for Integrative and Comparative Biology Annual Meeting

2019. Poster Presentation. First characterization of the clownfish-hosting sea anemones microbiome across host and habitat.

- May. Houston, TX, 2019 Houston Regional Ecology and Evolution Symposium
- February. San Juan, Puerto Rico, Association for the Sciences of Limnology and Oceanography 2019 Aquatic Sciences Meeting: Planet Water Challenges and Successes
- January. Tampa, FL, The Society for Integrative and Comparative Biology Annual Meeting

2018. Oral and Poster Presentations. Phylogenetic relationships among the clownfish-hosting sea anemones.

- November. University of Houston, University of Houston System Board of Regents Meeting (selected from 300+ undergraduate researchers to present)

2018. Oral Presentation. Exploration of Kauffman's NK-model on a holey fitness landscape.

- November. University of Houston, Senior Honors Thesis public defense.

2018. Poster Presentation. Phylogenetic relationships among the clownfish-hosting sea anemones.

- October. University of Houston, Undergraduate Research Day

2018. Oral Presentation. Phylogenetic relationships among the clownfish-hosting sea anemones.

- October. Rice University, Gulf Coast Undergraduate Research Symposium
- August. American Museum of Natural History, 30$^{th}$ annual REU Biology Symposium

2016. Poster Presentation. The influence of habitat setting on *Panopeus simpsoni* reproductive output.

- December. New Orleans, LA, Restore America's Estuaries Summit
- October. University of Houston, Undergraduate Research Day
- September. University of Houston, Houston Scholars Showcase

2016. Oral Presentation. The influence of habitat setting on *Panopeus simpsoni* reproductive output.

- October. Rice University, Gulf Coast Undergraduate Research Symposium

## HONORS AND AWARDS

2021 Fall. Joe Davies Prize for Outstanding Service as a Teaching Assistant
2021 Spring. Texas Science Policy Fellowship
- Conducted policy research for memos and reports to legislators in support of SB 1353, which addresses inequities in vaccine distribution and which was subsequently signed into law

2021 Spring. Inquiry-Based Learning Teaching Fellowship
2019 Summer. University of Houston Outstanding Senior Honors Thesis Award
2019 Summer. 3rd Place Best Poster Presentation, Houston Regional Ecology and Evolution Symposium
2019 Summer. Worden Fellowship for the Ecology and Evolution Graduate Program at Rice University
2019 Summer. Rice University Academic Excellence Award
2018 Fall. Summa Cum Laude Graduate with University Honors and Honors in Major
- Student speaker at graduation ceremony

2018 Fall. Audience Favorite Poster Presentation Award, Undergraduate Research Day
2018 Summer. American Museum of Natural History NSF REU recipient
2018 Spring. University of Houston Goldwater Scholarship Campus Nominee
2018 Spring. Phi Beta Kappa Honors Society Member
2017 Spring. Albert Schweitzer Junior Fellowship
2017 Spring. University of Houston Udall Scholarship Campus Nominee
2016 Fall. Undergraduate Travel Fellowship
2016 Fall. Great Conversations Scholarship
2016 Summer. Selected for Smithsonian Summer Externship
- Externship Final Project and DC Experience, video links https://www.smithsonianofi.com/blog/2016/06/30/university-of-houston-externship-final-projects/

2016 Summer. Summer Undergraduate Research Fellowship
2016 Spring. Wayfinding Scholarship
2015-2018. Dean's Distinguished Scholars List
2015-2018. University of Houston Academic Excellence Scholarship
2015 Fall. PSLJ/Josie B Taylor Endow Scholarship
2015 Fall. Temple, TLL Endowed Leadership

## FUNDING ($15,000+)

2021 Diana McSherry and Patrick Poe Research Award in Ecology & Evolutionary Biology……..……....……$5,000
2021 Society for Integrative and Comparative Biology Meeting Charlotte Mangum Student Support …….....…….....$50
2020 Society for Integrative and Comparative Biology Meeting Charlotte Mangum Student Support …….....……...$115
2019 Association for the Sciences of Oceanography and Limnology 2019 Meeting Student Volunteer Stipend ...……...…....$100
2018 American Museum of Natural History Undergraduate Research Travel Funding ……..……...$2,285

2018 Society for Integrative and Comparative Biology Meeting Charlotte Mangum Student Support ……..…….……..$115
2018 Houston Scholars Program Scholarship…….…….....$5,000
2017 International Education Fee Scholarship..…….....….....$1,300
2016 Undergraduate Research Travel Fellowship..…….....$750
2016 Summer Undergraduate Research Fellowship Honors Houston Endowment ……...…..$3,500

## RELEVANT SKILLS

*Computational skills/experience*
R, Python, Geneious sequence alignment, QIIME2 Microbiome Analyses, Stacks and ipyrad RADseq assembly programs, Amira 3D visualization and segmentation of CT scans, Stratovan Checkpoint landmarking, Sequoia pedigree reconstruction software

*Laboratory skills/experience*
Gel electrophoresis, Qiagen DNeasy DNA extraction, PCR, PCR Exosap cleanup, Cycle sequencing reactions, Sephadex gel cleanup, Ethanol precipitation, RADseq Library, Preparation, Sangar sequencing, Next generation sequencing

*Miscellaneous*
Scuba certified, Bilingual (French)

## SERVICE AND OUTREACH

*2021. Houston Zoo Collaboration*
- Aided in the identification of an unknown beetle species discovered by Zoo personnel

*2021. Houston Regional Ecology and Evolution Symposium*
- Organized a symposium of talks from undergraduate, graduate, post-doctoral and keynote faculty researchers in Ecology and Evolution from universities in the Houston area.
- Partnered with Springer Textbooks to provide prizes for outstanding talks

*2021. University of Houston 'Time Management in Graduate School' Panelist*
- Served as a panelist at a webinar for undergraduates involved in research

*2019-Present. Rice Ecology and Evolutionary Biology (EEB) Outreach (Co-head)*
- Developed lessons and activities to teach concepts in ecology and evolution
- Coordinated with local teachers to visit and present to K-12 classrooms.

*2019-Present. EEB Graduate Student Association Representative*
- Conveyed departmental concerns to university-wide graduate student association

*2017-2018. Albert Schweitzer Fellowship 2017-2018*
- Implemented health initiative addressing dietary challenges in low-income housing facilities
- Organized weekly discussions, workshops targeting resident's diet-related health concerns

*2016-2018. Cultivate, a Bonner Gardening Initiative (Project Founder and Head)*
- Designed and constructed sustainable gardens and orchards in low income areas to offer access to green spaces and fresh produce.

- Organized outreach events and workshops on sustainability and urban farming.
- Project highlighted as “Drive” in a University of Houston video series showcasing attributes of students: https://www.youtube.com/watch?v=-oOw9qU1mCw

*2015-2018. University of Houston Bonner Leader Program (Leadership Council, Data/Analytics Head)*

- Nationwide service-learning program requiring dedication of 10 hours of service a week (over 300 hours total)

*2015-2018. University of Houston Campus Kitchen Project (Founding Member, Executive Team Member)*

- Recovered and served over 30,000 pounds of excess food from campus dining halls to low income housing residents in
- Developed nutrition education and food waste outreach events on campus and in the Third Ward

# Daniel P. Duran, Ph.D.

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609-412-7874 (cell)

## EDUCATION

| | |
|---|---|
| 2004 – 2010 | Ph.D., Biology – Evolution and Ecology; Vanderbilt University |
| 1998 – 2000 | M.S., Entomology; University of Missouri, Columbia |
| 1994 – 1998 | B.S., Environmental Science; Stockton University |

## TEACHING / WORK EXPERIENCE

| | |
|---|---|
| 2019 – present | Assistant Professor and Naturalist, Department of Environmental Science, Rowan University |
| 2018 – 2019 | Lecturer and Naturalist, Department of Environmental Science, Rowan University |
| 2016 – 2018 | Associate Teaching Professor, Department of Biodiversity, Earth, and Environmental Sciences/ Dept. of Biology, Drexel University |
| 2011 – 2016 | Assistant Teaching Professor, Department of Biodiversity, Earth, and Environmental Sciences/ Dept. of Biology, Drexel University |
| 2013 – present | Adjunct instructor (Ecology, Entomology courses), Arboretum School, The Barnes Foundation |
| 2007 – 2010 | Graduate Research Assistant, Department of Biological Sciences, Vanderbilt University |
| 2004 – 2006 | Graduate Teaching Assistant, Department of Biological Sciences, Vanderbilt University |
| 2004 | Co-investigator for USFWS grant (with C.B. Knisley), An mtDNA analysis of the Sacramento Valley Tiger Beetle, *Cicindela hirticollis abrupta*. |
| 2003 | Predoctoral Visiting Scientist Fellow, Smithsonian Tropical Research Institute |

## GRANTS & AWARDS

2021 Impacts of Industrial Hemp Production on Insect Biodiversity and Functional Guilds. Submitted on 5/15/2021 to Tindakan Corporation ($297,746, 2 yrs).
Role: PI
Under Review

2019 Impacts of Industrial Hemp Production on Insect Biodiversity and Functional Guilds. Submitted on 11/15/2019 to Tindakan Corporation ($314,300, 2 yrs).
Role: PI
Declined

2019 Museum-Based Phylogenomics as a Tool for Undergraduate Training: Understanding the Systematics and Evolution of Tiger Beetles. Submitted on 4/18/2019 ($341,021, 3 yrs).
Role: PI
Declined

2015 Pennsylvania Department of Environmental Protection Grant for Environmental Education and Stewardship - Awarded to Lansdowne Friends School, Lansdowne, PA. Drafted proposal on behalf of LFS. Award: $3000

2006 Theodore Roosevelt Memorial Grant, American Museum of Natural History. Award: $1,500

2004 Co-investigator on grant: Biology and Conservation of the Sacramento Valley Tiger Beetle. USFWS, Sacramento Field Office. Award: $11,000

## PUBLICATIONS

**Duran, D.P.** and S.J. Roman. 2021. Description of a new halophilic tiger beetle in the genus *Eunota* (Coleoptera, Cicindelidae, Cicindelini) identified using morphology, phylogenetics and biogeography. *PLOS ONE* (in press)

Smith, J.A., Rossner, KJ, and **Duran, D.P.** 2021. New opportunities for conservation of a rare tiger beetle on developed barrier island beaches. *Journal of Insect Conservation*; https://doi.org/10.1007/s10841-021-00339-2

**Duran, D.P.** and H.M. Gough. 2020. Validation of tiger beetles as distinct family (Coleoptera: Cicindelidae), review and reclassification of tribal relationships. *Systematic Entomology;* https://doi.org/10.1111/syen.12440

**Duran, D.P.** and S.J. Roman. 2020. A new tiger beetle from the Trans-Mexican Volcanic Belt (Coleoptera, Cicindelidae, Cicindelini). *ZooTaxa* 4810 (2): 375-382; https://doi.org/10.11646/zootaxa.4810.2.11

**Duran, D.P.**, R.A. Laroche, H.M. Gough, R.A. Gwiazdowski, C.B. Knisley, D.P. Herrmann, S.J. Roman, and S.P. Egan. 2020. Geographic life history differences predict genomic divergence better than mitochondrial barcodes or phenotype. *Genes* 11(3): 265; https://doi.org/10.3390/genes11030265

**Duran, D. P.**, and H.M. Gough. 2019. Unifying systematics and taxonomy: Nomenclatural changes to Nearctic tiger beetles (Coleoptera: Carabidae: Cicindelinae) based on phylogenetics, morphology and life history. *Insecta Mundi* 0727: 1-12.

**Duran, D.P.** and S.J. Roman. 2019. A new petrophilous tiger beetle from the Trans-Pecos region and revised key to the genus *Amblycheila* (Coleoptera: Carabidae: Cicindelinae). *ZooKeys* 893:125-134.

Gough, H.M., **D.P. Duran**, A.Y. Kawahara, and E.F. Toussaint. 2019. A comprehensive molecular phylogeny of tiger beetles (Coleoptera, Carabidae, Cicindelinae) challenges current classification. *Systematic Entomology* 44(2): 305-321.

**Duran, D.P.**, D.M. Herrmann, S.J. Roman, R.A. Gwiazdowski, J.A. Drummond, G.R. Hood, and S.P. Egan. 2019. Cryptic diversity in the North American *Dromochorus* tiger beetles (Coleoptera: Carabidae: Cicindelinae): A congruence based method for species discovery. *Zoological Journal of the Linnaean Society* doi.org/10.1093/zoolinnean/zly035

Jumean, Z., M.J. Oldham, K.J. Fleming, **D.P. Duran**, D.V. Beresford. 2017. Range updates for the tiger beetles (Coleoptera: Carabidae: Cicindelinae) of northern Ontario, Canada. *Coleopterist's Bulletin* 71(4): 707-720.

Pearson, D.L., C.B. Knisley, **D.P. Duran**, and C. J. Kazilek. 2015. *A field guide to the tiger beetles of the United States and Canada: Identification, natural history, and distribution of the Cicindelids (2nd Edition).* Oxford Univ. Press, NY.

**Duran, D.P.** and D.P. Herrmann. 2015. New distributional records for tiger beetles in the Texas Panhandle region. *Cicindela* 47(1): 11-14.

**Duran, D.P.** and S.J. Roman. 2014. A new species of the genus *Cicindelidia* from southeastern Arizona and Mexico (Coleoptera: Carabidae: Cicindelinae). *ZooKeys* 464: 35-47.

Moravec, J. and **D.P. Duran**. 2013. Taxonomic and nomenclatorial revision within the Neotropical genera of the subtribe Odontochilina. 6. *Odontocheila fraternum* sp. nov., a new species sister to *O. gilli* (Coleoptera: Cicindelidae). *Acta Entomologica Musei Nationalis Pragae* 53(2): 585-599.

**Duran, D.P.,** and J. Moravec. 2013. A new species of the genus *Pentacomia* from Panama (Coleoptera: Cicindelidae). *Acta Entomologica Musei Nationalis Pragae* 53(1): 49-57.

Pons, J., T.G. Barraclough, J. Gomez-Zurita, A. Cardoso, **D.P. Duran**, S. Hazell, S. Kamoun, W.D. Sumlin, A.P. Vogler. 2006. Sequence-based species delimitation for the DNA taxonomy of undescribed insects. *Systematic Biology* 55(4): 595-609. (Cited 1711 times as of October 20, 2020)

Hibbard, B.E., M. Higdon, **D.P. Duran**, Y.M. Schweikert, and M.R. Ellersieck. 2004. Role of egg density on establishment and plant-to-plant movement by western corn rootworm larvae (Coleoptera: Chrysomelidae). *Journal of Economic Entomology* 97(3): 871-882.

Hibbard, B.E., **D.P. Duran**, M.R. Ellersieck, and M.M. Ellsbury. 2003. Post-establishment movement of western corn rootworm larvae (Coleoptera: Chrysomelidae) in Central Missouri corn. *Journal of Economic Entomology* 96(3): 599-608.

Hibbard, B.E., E. Levine, **D.P. Duran**, N.M. Gruenhagen, and J.L. Spencer. 2002. Electroantennogram response of two western corn rootworm (Coleoptera: Chrysomelidae) adult populations to corn and soybean volatiles. *Journal of Entomological Science* 37(1): 69-76.

## PRESENTATIONS

Invited talks - Academic

2020 **Duran, D.P.** Tiger beetles as models for biodiversity science. University of Calcutta and Zoological Survey of India, June 29, 2020 (online).

2018 **Duran, D.P.** Cryptic diversity in the North American *Dromochorus* tiger beetles: A congruence based method for species discovery. School of Environmental and Biological Sciences Seminar, Rutgers University, November 30, 2018.

2018 **Duran, D.P.** Cryptic diversity in the North American *Dromochorus* tiger beetles: A congruence based method for species discovery. Keynote Speaker, Entomological Society of Pennsylvania Annual Conference, November 3, 2018.

2018 **Duran, D.P.** Cryptic diversity in the North American *Dromochorus* tiger beetles: A congruence based method for species discovery. Gettysburg College, Gettysburg, PA. April 3, 2018.

2017 **Duran, D.P.** Using tiger beetles (Coleoptera: Carabidae) as a model system for inferences about metapopulations, and gene flow. Stockton University. Galloway, NJ. March 3, 2017.

2013 **Duran, D.P.** Using molecular data to test applied ecological and phylogeographic hypotheses in *Dromochorus* tiger beetles. Rutgers University. New Brunswick, NJ. September 4, 2013.

2011 **Duran, D.P**. Inferring species limits in the North American *Cicindela sylvatica* group tiger beetles using an 'ecophylogeographic' approach. University of Delaware. September 19, 2011.

Invited talks - Non-academic

2021 **Duran, D.P.** The future of healthy forests: the need for successional planning. New Jersey Audubon Society panel discussion . August 16, 2021. (online)

2021 **Duran, D.P.** We can't see the woods for the trees: To save biodiversity we must change our views on forests. Native Plant Society of New Jersey. May 15, 2021 (online)

2021 **Duran, D.P.** Cultivating respect for our pollinators and other insects. Jersey Friendly Yards lecture series. March 9, 2021. (online)

2021 **Duran, D.P.** Cultivating respect for our pollinators and other insects. Gloucester County Nature Club annual meeting. February 11, 2021. (online)

2020 **Duran, D.P.** Tiger beetles as models for biodiversity science. Pinelands lecture series – New Jersey Pinelands Commission. November 12, 2020. (online)

2020 **Duran, D.P.** Tiger beetle biology and conservation. Citizens United to Protect the Maurice River. June 25, 2020. (online)

2019 **Duran, D.P.** Species discovery and the future of biodiversity exploration. Delaware County Audubon Society. December 11, 2019.

2019 **Duran, D.P.** An overview of the ecosystem services that insects provide. Penn State University Master Gardeners - GardenWise Conference. Plenary talk. York, PA. March 9, 2019.

2019 **Duran, D.P.** Breaking the agricultural paradigm: The prospects of growing native plants for food. Pennsylvania Horticultural Society – City Harvest Annual Meeting. February 20, 2019.

2019 **Duran, D.P.** Spray and pray: Misguided faith in pesticides isn't the answer to our mosquito and tick problems. Bowman's Hill Wildflower Preserve – Winter Lecture Series, New Hope, PA. February 3, 2019.

2018 **Duran, D.P.** Insect diversity in the Coastal Plain of New Jersey and Pennsylvania. Master Naturalist Program, Penn State University Extension, Urban Garden Education, Philadelphia, PA. November 8, 2018.

2018 **Duran, D.P.** Spray and pray: Misguided faith in pesticides isn't the answer to our mosquito and tick problems. Jenkins Arboretum lecture. Devon, PA. November 7, 2018.

2018 **Duran, D.P.** Beyond honeybees: Beetles, butterflies, bumblebees, and other pollinators. Awbury Arboretum Association Annual Meeting. Philadelphia, PA. November 4, 2018.

2018 **Duran, D.P.** Spray and pray: Misguided faith in pesticides isn't the answer to our mosquito and tick problems. Pennsylvania Audubon Society lecture series, Delaware Valley University, Doylestown, PA. February 7, 2018.

2017 **Duran, D.P.** Insect diversity in the Coastal Plain of New Jersey and Pennsylvania. Master Naturalist Program, Silver Lake Nature Center, Bristol, PA. September 26, 2017.

2017 **Duran, D.P.** Getting to the source of our native plants: Does provenance matter?. Annual Native Plants Seminar. Irvine Nature Center. Owings Mills, MD. August 26, 2017.

2017 **Duran, D.P.** Cultivating respect for our pollinators and other insects. Earth Day at the Barnes. Barnes Foundation. Philadelphia, PA. April 22, 2017.

2017 **Duran, D.P.** Getting to the source of our native plants: Does provenance matter?. Landscape Ethics Symposium. Delaware Valley University. March 11, 2017.

2016 **Duran, D.P.** Beyond honeybees: beetles, butterflies, bumblebees, and other pollinators. Philadelphia Botanical Club. Philadelphia, PA. November 17, 2016.

2016 **Duran, D.P.** An overview of the ecosystem services that insects provide, with special reference to species of the NJ Pinelands. Stockton University. Galloway, NJ. October 25, 2016.

2016 **Duran, D.P.** Tiger beetles as a model system for the discovery of new species. Newark Entomological Society. New Brunswick, NJ. October 22, 2016.

2016 **Duran, D.P.** Insect diversity in the Coastal Plain of New Jersey and Pennsylvania. Master Naturalist Program, Silver Lake Nature Center, Bristol, PA. September 27, 2016.

2016 **Duran, D.P.** An overview of the ecosystem services that insects provide, with special reference to species of the NJ Pinelands. Pinelands Research Series. Pinelands Commission. Pemberton, NJ. September 14, 2016.

2016 **Duran, D.P.** An overview of the ecosystem services that insects provide. Native Plants in the Landscape Conference. Millersville University. June 16, 2016.

2016 **Duran, D.P.** Getting to the source of our native plants: Does provenance matter?. Native Plants in the Landscape Conference. Millersville University. June 17, 2016.

2016 **Duran, D.P.** An overview of the ecosystem services that insects provide. Penn State University Home Gardeners Association. Brandywine, PA. April 16, 2016.

2015 **Duran, D.P.** Insect diversity in the Coastal Plain of New Jersey and Pennsylvania. Master Naturalist Program, Silver Lake Nature Center, Bristol, PA. October 20, 2015.

2015 **Duran, D.P.** Gardening with native plants for food. Native Plant Society of New Jersey – Southeastern Branch. Stockton University. Galloway, NJ. June 15, 2015.

2015 **Duran, D.P.** Introduction to Insects & Representative Species of the Mid-Atlantic. University of Nature Program, Schuylkill Center for Environmental Education. Philadelphia, PA. April 30, 2015.

2015 **Duran, D.P.** Assessing the real and perceived environmental impacts of Genetically Modified Organisms (GMOs). Earth Day Lecture, Sierra Club. Philadelphia, PA. April 22, 2015.

2015 **Duran, D.P.** Backyard butterflies, beetles, and other pollinators. Audubon Pennsylvania, Radnor, PA. April 22, 2015.

2015 **Duran, D.P.** Native plants in functioning ecosystems: The importance of source and genetic considerations. Ambler Earth Festival. Ambler, PA. April 18, 2015.

2015 **Duran, D.P.** Tiger beetles and the future of biodiversity exploration. Winter Lecture Series, Bowman's Hill Wildflower Preserve. New Hope, PA. Jan 25, 2015

2014 **Duran, D.P.** Native plants in functioning ecosystems: The importance of source and genetic considerations. Annual Fall Meeting, The Native Plant Society of New Jersey. Mountainside, NJ. November 15, 2014.

2014 **Duran, D.P.** Beyond honeybees: The role of native insects in ecosystem functioning. Temple University – Ambler. Ambler, PA. October 22, 2014.

2014 **Duran, D.P.** Insect diversity in the Coastal Plain of New Jersey and Pennsylvania. Master Naturalist Program, Silver Lake Nature Center, Bristol, PA. October 7, 2014.

2014 **Duran, D.P.** More than green: How insects and plants make ecosystems work. University of Nature program, Schuylkill Center for Environmental Education. Philadelphia, PA. September 27, 2014.

2014 **Duran, D.P.** The immeasurable value of insects: pollinators, pest control, and more. Annual Cradle of Birding Festival, John Heinz National Wildlife Refuge. Tinicum, PA. September 20, 2014.

2014 **Duran, D.P.** How do we define units of conservation?: An integrated genetic and ecological approach. Conservation Biology Course, Stockton University. Galloway, NJ. April 17, 2014.

2013 **Duran, D.P.** Insect diversity in the Coastal Plain of New Jersey and Pennsylvania. Master Naturalist Program, Silver Lake Nature Center, Bristol, PA. November 5, 2013.

2012 **Duran, D.P.** Insect diversity in the Coastal Plain of New Jersey and Pennsylvania. Master Naturalist Program, Silver Lake Nature Center. Bristol, PA. November 21, 2012.

2012 **Duran, D.P.** The future of biodiversity exploration. Philadelphia Science Festival, Philadelphia, PA. April 25, 2012.

2010 **Duran, D.P.** and R. A. Gwiazdowski. Historical distributions influence future conservation planning in New Jersey tiger beetles (Carabidae: Cicindelinae). American Entomological Society (AES), Philadelphia, PA. February 2010.

Mentored student presentations

2019 Chin, N. and D.P. Duran. Autumn olive (*Elaeagnus umbellata*) for three-dimensional printing. Oral presentation to Chemical Engineering Department. November 26, 2019.

2019 Alexander, K. and D.P. Duran. Chinese bush clover and the potential for 3-D printing. Oral presentation to Chemical Engineering Department. November 26, 2019.

Prior to Rowan

2014 O'Leary, V., and D.P. Duran. Niche modeling for management of an invasive crayfish. Poster for Drexel STAR Scholar's Program.

2012 Malhotra, R., D.P. Duran, and G.W. Hearn. New distributional records and potential undescribed species of beetles (Coleoptera) from the Island of Bioko, Equatorial Guinea, Central/West Africa. Drexel Research Day.

## TEACHING

Courses taught

Rowan University 2019 – present
EVSC 01.121.1 – Global Environmental Change (3 credits)
EVSC 01.210.1 – Foraging for Edible Plants (3 credits)

*Drexel University 2011 – 2018*

BIO 124 – Evolution & Organismal Diversity (4.5 credits)
BIO 126 – Physiology & Ecology (co-instructor) (4.5 credits)
BIO 141 – Essential Biology (4.5 credits)
BIO 224 – Form, Function & Evolution of Vertebrates (co-instructor) (4 credits)
BIO 225 – Form, Function & Evolution of Vertebrates Lab (2 credits)
BIO 280 – Pseudoscience in Medicine*
ENVS 212 – Evolution (4 credits)
ENVS 230 – General Ecology (3 credits)
ENVS 247 – Native Plants & Sustainability* (3 credits)
ENVS 254 – Invertebrate Morphology & Physiology (3 credits)
ENVS 255 – Invertebrate Morphology & Physiology Lab (2 credits)
ENVS T280 – Foraging for Edible Plants* (3 credits)
ENVS 284 – Physiological & Population Ecology (3 credits)
ENVS 287 – Community Ecology Laboratory (2 credits)
ENVS 393 – Entomology* (3 credits)
ENVS 394 – Entomology Lab* (2 credits)
ENVS 438/538 – Biodiversity (3 credits)
ARCH 320 – Sustainable Built Environment (co-instructor) (3 credits)
*Created new course

Advising and Mentorship of Rowan students

2019 Mentorship for invasive species research projects, field methods to Biology undergraduate student Natalia Chin, Rowan University.

2019 Mentorship for invasive species research projects, field methods to Environmental Studies undergraduate student Kevin Alexander, Rowan University.

## SERVICE

Review of Manuscripts

*Conservation Genetics*
*Genes*
*Molecular Phylogenetics and Evolution*
*Journal of Biodiversity Data*
*Journal of Insect Conservation*
*Deutsche Entomologische Zeitschrift*
*ZooTaxa*
*Diversity and Distributions*
*ZooKeys*
*Coleopterist's Bulletin*
*Molecular Ecology*
*Journal of Biogeography*

*Professional Societies*

American Entomological Society (Vice-president 2014 – 2018)
Native Plant Society of New Jersey (Advisory Committee: Insect Ecologist 2016-2018)
Society for the Study of Evolution
Society of Systematic Biologists
Entomological Society of America
Coleopterist's Society

Selected Other Service

2021 Made significant updates to popular nature identification app/website, iNaturalist, with respect to tiger beetle pages and restructured the taxonomy/systematics of the group. August – October 2021.

2018 Reviewed United States Fish & Wildlife Service proposal to list the Cobblestone tiger beetle (*Cicindelidia marginipennis*) as Legally Endangered under the Endangered Species Act of 1973. Made policy recommendations. November 2018.

2017 Reviewed NSF CAREER proposal (National Science Foundation, Division of Environmental Biology) in September 2017.

2017 Panel discussion moderator for Ecological Society of America - the future of biodiversity conservation in the North American Coastal Plain. April 22, 2017.

2016 Reviewed United States Fish & Wildlife Service proposal to list the Miami tiger beetle (*Cicindelidia floridana*) as Legally Endangered under the Endangered Species Act of 1973. Made policy recommendations.

2015 Drafted a proposal to Pennsylvania Department of Environmental Protection to re-landscape the Lansdowne Friends School (Lansdowne, PA) using native plants, along with educational signage. Proposal was accepted and fully funded ($3000) in April 2015.

2013 Created the first checklist of insects for John Heinz National Wildlife Refuge based on summer surveys with Drexel University undergrads

# SCOTT P. EGAN

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## ACADEMIC APPOINTMENTS

*Current*

2021 – present Associate Professor, Department of BioSciences, Rice University

2015 – present Faculty Associate, Institute of Biosciences and Bioengineering, Rice University

2017 – present Faculty Scholar, Mexico Center, Baker Institute of Public Policy, Rice University

2019 – present Member, Ken Kennedy Institute, Rice University

*Previous*

2014 – 2021 Assistant Professor, Department of BioSciences, Rice University

2013 – 2014 Huxley Faculty Fellow, Department of Ecology & Evolutionary Biology, Rice University

2010 – 2013 Research Assistant Professor, Department of Biological Sciences, University of Notre Dame

2010 – 2013 Faculty Fellow in Ecological Genetics, Advanced Diagnostics & Therapeutics Initiative, University of Notre Dame

## EDUCATION

| | | | |
|---|---|---|---|
| 2004 – 2010 | Ph.D. | Biology | Vanderbilt University |
| 2001 – 2004 | M.S. | Biology | Texas State University – San Marcos |
| 1995 – 1999 | B.S. | Biology | University of Texas at Austin |

## GRANTS

*Ongoing –*

Zaldívar Riverón, Alejandro & **S.P. Egan.** Biodiversidad y interacciones entre las avispas agalleras (Cynipidae) y sus inquilinos y parasitoides presents en la especie de encino *Quercus oleoides* (Fagaceae). ***Solicitud de apoyo para actividades de intercambio académico, convocatoria 2019.*** Coordinación de la Investigación Científica, Universidad Nacional Autónoma de México. $15,000 US.

Tank, J., D. Bolster, K. Bibby, A. Shogren, G. Lamberti, & **S.P. Egan.** Predicting eDNA transport and degradation in flowing waters: application of a conservation tool using integrated experimental, field, and modeling approaches, ***Strategic Environmental Research and Development Program (SERDP)*** –

Resource Conservation and Resiliency Program Area, Grant No. [RC19-C2-1276] – $1,500,000 (2019 – 2024).

Stadler, L. & **S.P. Egan**. Impacts of prescribed burning on performance and biological diversity of constructed wetlands. ***Resilience and Conservation Grant, DOW Chemical, Inc.*** Year 1: $209,170 guaranteed (2019-2020); Total: $627,510 estimated (2019-2022).

Wiegmann, D.D., **S.P. Egan**, & K.L. Weinersmith. Tactic expression and dynamics in a wild population of smallmouth bass. ***National Science Foundation – IOS – Animal Behavior*** - $250,000. (2018-2021)

Correa, A.M.S., **S.P. Egan**, & M. Brandt. Equipping U.S. Virgin Island managers with high and low-tech options for native reef fish and seagrass conservation: mitigating impacts of the invasive seagrass, *Halophila stipulacea*. ***National Oceanic and Atmospheric Administration (NOAA)*** - Domestic Coral Reef Conservation Grant - $138,337 (2018-2020).

*Recently finished –*

**Egan, S.P.,** & K. Weinersmith. Genome sequencing, assembly, and annotation of the crypt-keeper wasp, *Euderus set*. ***Genome Sequencing and Annotation Research Grant, Genentech Inc.***, Grant No. [SRA-18-0832] – $30,000 to Rice; $60,000 total **(**2018 – 2020).

Correa, A.S., **S.P. Egan**, P. Hartley, & C. Hakkenberg. The 'cost' of mangrove encroachment on tidal salt marsh habitat: quantifying the ecological and economic impacts. ***Rice University - IDEA Award -*** $70,000 (2018-2020).

**Egan, S.P.** & S. Carroll. RAPID: Testing the role of a dispersal-life history polymorphism as an important driver of rapid adaptive divergence. ***National Science Foundation – Evolutionary Processes*** – $103,000 (2017-2019).

Correa, A.S. & **S.P. Egan**. Quantifying the impacts of mangrove encroachment on commercially important salt marsh biodiversity through an environmental metagenetics approach. ***Rice University - Faculty Initiation Fund*** - $40,000 (2017-2019).

**Egan, S.P.** (PI), D. Bolster (coPI), C. Tanner (coPI), S. Ruggiero (coPI), J.L. Feder (coPI), J. Tank (coPI), A. Aubeneau (coPI), & E. Rosi-Marshall (coPI). Monitoring the dispersal of genetically engineered organisms and their byproducts using Light Transmission Spectroscopy II. ***United States Department of Agriculture - Biotechnology Risk Assessment Research Grants*** - $500,000 (2016 - 2020).

**Egan,S.P.**, A. Dunham, & L. Nakhleh. Monitoring tropical biodiversity through an environmental metagenetics approach. ***Rice University IDEA award*** - $80,000 (2016-2019).

Feder, J. (PI), **S.P Egan** (coPI), W. Yee (coPI), G.R. Ragland (coPI) and D. Schwarz (coPI). Host race formation or introduced invasion of *Rhagoletis pomonella* in the western U.S. – ***United States Department of Agriculture – Insects and Nematodes panel*** – $450,000. (2015-2019).

**Egan, S.P.** (PI), J.L. Feder (coPI), D.M. Lodge (coPI), C. Tanner (coPI), S. Ruggiero (coPI), J. Tank (coPI), S. Howard (coPI), & E. Rosi-Marshall (coPI). Monitoring the dispersal of genetically engineered organisms and their byproducts using Light Transmission Spectroscopy. ***United States Department of Agriculture - Biotechnology Risk Assessment Research Grants*** - $500,000 (2013-2017).

**Egan, S.P.** & L. Nakhleh. Integrating DNA diagnostics and population genomics to benefit society. ***IBB Hamill Innovations Awards - Hamill Foundation*** - $10,000. (2016-2017)

Ragland, G. (PI), **S.P. Egan** (coPI), J. Feder (coPI), & D. Hahn (coPI). Testing for functional and genetic independence of rapidly evolving life cycle components in the apple maggot, a model for seasonal adaptation – Collaborative Research – ***National Science Foundation – IOS – Organism-Environment Interactions*** – $1.0 million (2013-2017).

**Egan, S.P.** (PI), J. Feder (coPI), C. Jerde (coPI), M. Pfrender (coPI), S.Ruggiero (coPI), C. Tanner (coPI), & D.M. Lodge (coPI). Improving eDNA-Based Surveillance Programs for High Risk Potentially Invasive Species. ***Environmental Protection Agency - Great Lakes Restoration Initiative*** - $599,930 (2012-2015).

Feder, J. (PI), **S.P. Egan** (coPI), J. McLachlan (coPI), C. Linn Jr. (coPI), & A. Forbes (coPI). Does sequential speciation amplify biodiversity across trophic levels? – Collaborative Research – ***National Science Foundation – Evolutionary Processes*** – $1.1 million (2012-2014).

**Egan, S.P.** Building colaborations in ecology and evolutionary biology in Brazil. ***"Promoting Collaboration with Brazilian Universities" Faculty Travel Grant – Brazil@Rice -*** $5,000 (2015).

Johnson, C. (PI) and **S.P. Egan** (coPI). Environmental DNA detection of the critically endangered Houston toad (*Bufo houstonensis*). ***Houston Zoo Staff Conservation Fund*** (2013-2014).

*Pending* –

E. Martinson & **S.P. Egan**. Testing the evolutionary conservation and molecular mechanism of gall formation. ***National Science Foundation (DEB-IOS) - United States Department of Agriculture – Plant-Biotic Interactions*** - $690,000. * *revised full proposal to be resubmitted Winter 2021* *

**PUBLICATIONS –** Total publications = 90; h-index = 27

*2021* –

Martinson, E.O., J. Werren, & **S.P. Egan**. 2021. Tissue-specific gene expression shows cynipid wasps repurpose host gene networks to create complex and novel parasite-specific organs on oaks. ***Molecular Ecology***, *accepted*. (Preprint: ***Authorea***. *link*)

Calvert, M.B., M.M. Doellman, J.L. Feder, G.R. Hood, P. Meyers, **S.P. Egan**, T.H.Q. Powell, M.M. Glover, C. Tait, H. Schuler, S.H. Berlocher, J.J. Smith, P. Nosil, D.A. Hahn, & G.J. Ragland. 2021. The genomics of trait combinations and their influence on adaptive divergence. ***Journal of Evolutionary Biology***, *accepted*. (Preprint: ***bioRxiv*** 2020.06.19.161539)

Zhang, L., G.R. Hood, I. Carroo, J.R. Ott, & **S.P. Egan**. 2021. Context-dependent reproductive isolation: Host plant variability drives fitness of hybrid herbivores. ***American Naturalist***, *accepted*.

Drummond, J.A., E.R. Larson, Y. Li, D.M. Lodge, C.A. Gantz, M. Pfrender, M.A. Renshaw, A.M.S. Correa, & **S.P. Egan**. 2021. Diversity metrics are robust to differences in sampling location and depth for environmental DNA of plants in small temperate lakes. ***Frontiers in Environmental Science***, *accepted*.

Zhang, L., G.R. Hood, A.M. Roush, S. Shzu, M.S. Comerford, J.R. Ott , & **S.P. Egan**. 2021. Asymmetric, but opposing reductions in immigrant viability and fecundity promote reproductive isolation among host-associated populations of an insect herbivore. ***Evolution***, *accepted*.

Zhang, M., **S.P. Egan**, & J.R. Ott. 2021. One hundred and sixty years of taxonomic confusion resolved: *Belonocnema* Mayr (Hymenoptera: Cynipidae, Cynipini) gall wasps associated with live oaks in the USA. ***Zoological Journal of the Linnean Society*****,** *accepted***.**

*2020 –*

Duran, D.P., R.A. Laroche, H.M. Gough, R.A. Gwiazdowski, C.B. Knisley, D.P. Herrmann, S.J. Roman, & **S.P. Egan**. 2020. Geographic life history differences predict genomic divergence better than mitochondrial barcodes or phenotype. ***Genes*** 11: 265.

Weaver, A.K., G.R. Hood, M. Foster, & **S.P. Egan**. 2020. Trade-off between fecundity and survival generates stabilizing selection on gall size. ***Ecology & Evolution*** 10: 10207-10218.

Weinersmith, K.L., A. A. Forbes, A.K.G. Ward, P.F.P. Brandão-Dias, Y. Miles Zhang, & **S.P. Egan**. 2020. Arthropod community associated with the asexual generation of *Bassettia pallida* Ashmead (Hymenoptera: Cynipidae). ***Annals of the Entomological Society of America*** 5: 373–388.

Nguyen, B.N., E.W. Shen, J. Seemann, A.M.S. Correa, J.L. O'Donnell, A.H. Altieri, N. Knowlton, K.A. Crandall, **S.P. Egan,** W.O. McMillan, & M. Leray. 2020. Environmental DNA survey captures patterns of fish and invertebrate diversity across a tropical seascape. ***Scientific Reports*** 10: 6729.

Samaca-Saenz, E., **S.P. Egan**, A. Zaldivar-Riveron. 2020. Species diversity in the braconid wasp genus *Allorhogas* (Doryctinae) associated with cynipid galls on live oaks (Quercus: Fagaceae) using natural history, phylogenetics and morphology. ***Insect Systematics and Diversity*** Volume 4, Issue 5, September 2020, 3

Doellman, M.M., SaintJean, G., **S.P. Egan**, T.H.Q. Powell, G.R. Hood, H. Schuler, M.M. Glover, J.J. Smith, W. Yee, R. Goughnour, J. Rull, M. Aluja, & J.L. Feder. 2020. Evidence for spatial clines and mixed geographic modes of speciation for North American cherry-infesting *Rhagoletis* (Diptera:Tephritidae) flies. ***Ecology & Evolution*** 10: 12727-12744.

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*Recent highlights of press coverage or pop culture references of our lab's research –*

Samaca-Saenz, E., **S.P. Egan**, A. Zaldivar-Riveron. 2020. Species diversity in the braconid wasp genus *Allorhogas* (Doryctinae) associated with cynipid galls on live oaks (Quercus: Fagaceae) using natural history, phylogenetics and morphology. ***Insect Systematics and Diversity*** Volume 4, Issue 5, September 2020, 3.

Featured by: Futurity, Treehugger, Rice University News, Top 10 post in 2020 at Futurity New*

**Futurity story has over 175,000 views; their #2 most popular story in 2020.*

Our lab's work occasionally inspires art: American poet Robyn Schiff references our lab's discovery of the crypt-keeper wasp in her 2020 poem 'Oak Gall Wasp'.

LINK: https://poets.org/poem/oak-gall-wasp

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Radio interview on Quirks and Quarks Podcast

Podcast interview on Science . . . sort of.

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Egan, S.P. et al. 2015. ***Ecology Letters*** 18: 817–825. *Altmetric score = 70

Featured by: **Faculty of 1000 - Recommended**, **NSF *News from the field***, **Eco-Evo blog: "Speciation, genomes, & pancakes"**

Hood, et al. 2015. ***PNAS*** 112: E5980-E5989**.** *Altmetric score =100

Featured by: **Wall Street Journal** & ***National Geographic* – Italy**

## TEACHING/WORK EXPERIENCE

| | |
|---|---|
| Spring 2015 - 2017, 2019 - 2020 | *Evolution* (EBIO/BSC 334), Rice University |
| Fall 2015, 2016, 2017, 2018 | *Topics in Evolution* (EBIO 561), Rice University<br>2015 – *Speciation*<br>2016 – *Evolution of ecological specialization*<br>2017 – *Eco-evolutionary Dynamics*<br>2018 – *Evolution of ecological specialization II*<br>2019 – *Ecological Speciation* |
| Spring 2014 | *Field Ecology Lab* (EBIO 316); Rice University<br>*Behavior Lab* (EBIO 317); Rice University |
| 2003 – 2004 | 7$^{th}$ grade Science Teacher, Tippit Middle School, Georgetown I.S.D., TX |
| 1999 – 2001 | Permanent Substitute Teacher, Becker Elementary School, Austin I.S.D, TX |

## LECTURES / ACADEMIC PRESENTATIONS

*Invited lectures*

2020 **Egan, S.P.** *Natural history observations that lead to a new understanding of ecology and evolution*. 2020 Darwin Day invited lecture, Stephen F. Austin State University (*Feb. 2020*)

2019 **Egan, S.P.** *Natural history observations that lead to new understanding of ecology and evolution*. Instituto de Biología, Universidad Nacional Autónoma de México (UNAM), Mexico City, Mexico.

2019 **Egan, S.P.** *Divergent natural selection promotes reproductive isolation among herbivorous insect populations*. Biology Department, University of Mississippi (*graduate student invited speaker*)

2019 **Egan, S.P.** *Divergent natural selection promotes reproductive isolation among herbivorous insect populations*. Department of Entomology, University of Georgia, Athens, GA.

2019 **Egan, S.P.** *Divergent natural selection promotes reproductive isolation among herbivorous insect populations*. Department of Biology and Biochemistry, University of Houston, TX.

2018 **Egan, S.P.** *Divergent natural selection promotes reproductive isolation among herbivorous insect populations*. Instituto de Biología, Universidad Nacional Autónoma de México (UNAM), Mexico City, Mexico.

2018 **Egan, S.P.** *Ecological speciation in herbivorous insect populations*. Department of Biology, Texas Southern University, Houston, Texas.

2017 **Egan, S.P.** *How to study ecological speciation*. Department of Biology, Texas Southern University, Houston, Texas.

2016 **Egan, S.P.** *Divergent natural selection promotes reproductive isolation among herbivorous insect populations.* Dept. of Biology seminar series, University of Memphis.

2016 **Egan, S.P.** *Darwin and the five important elements in support of evolution.* 2016 Darwin Day Lecture, Lone Star College – Kingwood, TX. (Feb.)

2015 **Egan, S.P.** *Divergent natural selection promotes reproductive isolation among herbivorous insect populations.* Dept. of Biological Sciences, University of Notre Dame.

2015 **Egan, S.P.** *Parallel genomic change among insect ecotypes.* SKYPE SEMINAR- Ecological Genomics graduate course – University of Memphis.

2014 **Egan, S.P.** *Divergent natural selection promotes reproductive isolation among herbivorous insect populations.* EEB seminar series, Texas A&M University.

2014 **Egan, S.P.** *Divergent natural selection promotes speciation among herbivorous insect populations.* Department of Biology, Baylor University.

2013 **Egan, S.P.** *Divergent natural selection promotes reproductive isolation among herbivorous insect populations.* Department of Biological Sciences, University of Nevada – Reno.

2013 **Egan, S.P.** *Divergent natural selection promotes reproductive isolation among herbivorous insect populations.* Department of Ecology and Evolutionary Biology, Rice University.

2013 **Egan, S.P.** *Divergent natural selection promotes reproductive isolation among herbivorous insect populations.* Department of Biology, University of Louisiana – Lafayette.

2013 **Egan, S.P.** *Divergent natural selection promotes reproductive isolation among herbivorous insect populations.* Department of Entomology, Kansas State University.

2011 **Egan, S.P.** *Divergent natural selection promotes reproductive isolation among herbivorous insect populations.* Department of Biology, Texas State University – San Marcos.

2009 **Egan, S.P.** *Divergent host plant adaptation promotes reproductive isolation among populations of herbivorous insects*. Population Biology Seminar, University of Texas at Austin.

2009 **Egan, S.P.** *Divergent host plant adaptation promotes reproductive isolation among populations of herbivorous insects*. Department of Biological Sciences, University of Notre Dame.

*Oral presentations at professional meetings*

2019 **Egan, S.P.,** G.R. Hood, E. Wice, P. Brandao, M. Comerford, M. Burns, & L. Zhang. Niche width and range size predict host shifts across North American leaf beetles. Society for the Study of Evolution Annual Meetings, Rhode Island.

2017 **Egan, S.P.** Ecological speciation among herbivorous insect populations. Annual Meeting of the Society of Population Ecology. Kyushu University, Fukuoka, Japan. (*keynote speaker*)

2015 **Egan, S.P.**, G.R. Hood, J. Feder. Ecological divergence promotes reproductive isolation across the genus of *Rhagoletis*. Society for the Study of Evolution Annual Meeting, Brazil.

2015 **Egan, S.P.** Monitoring the dispersal of genetically engineered organisms and their byproducts using Light Transmission Spectroscopy. United States Department of Agriculture -Biotechnology Risk Assessment Research Meetings.

2014 **Egan, S.P.** Rapid invasive species detection by combining environmental DNA with Light Transmission Spectroscopy. EPA workshop – Molecular detection of invasive species, Deluth, MN.

2014 **Egan, S.P.,** L. Assour, S. Emrich, P. Nosil, & J.L. Feder. Experimental evidence of genome-wide impact of ecological selection during early stages of speciation-with-gene-flow. Society for the Study of Evolution Annual Meeting, Raleigh, NC.

2014 **Egan, S.P.** Monitoring the dispersal of genetically engineered organisms and their byproducts using Light Transmission Spectroscopy. United States Department of Agriculture -Biotechnology Risk Assessment Research Meetings.

2013 **Egan, S.P.,** G.R. Hood, and J.R. Ott. Divergent host plant adaptation promotes reproductive isolation among cynipid gall wasp populations. *Special Symposium*: Guy Bush and Santa Rosalia: Speciation with Gene Flow and the Extraordinary Diversity of Insects. Entomology Society of America Annual Meeting, Austin, TX.

2012 **Egan, S.P.,** L. Assour, S. Emrich, P. Nosil, & J.L. Feder. Genome-wide patterns of genetic divergence in response to host-associated selection experiments in *Rhagoletis pomonella* host races. Society for the Study of Evolution Annual Meeting, Ottawa, Canada.

2011 **Egan, S.P.,** G.R. Hood, & J.R. Ott. Divergent host plant adaptation promotes reproductive isolation among cynipid gall wasp populations. Ecology Society of America Annual Meeting, Austin, TX.

*Oral or poster presentations at professional meetings by students and collaborators (since 2015)*

2021 Characterizing the genomic architecture of divergence along the speciation continuum in the *Rhagoletis pomonella* species group**.** Meredith M. Doellman, TH Powell, Patrick O'Shea, Katherine Inskeep, Greg Ragland, **Scott P. Egan**, Steward Berlocher, Jeff Feder. Entomology Society of America

2021 Marielle Hollstein, Matt Comerford, **Scott P. Egan**, Lauren Stadler at IWA MEWE 2021 "16S rRNA gene sequencing analysis of 110-acre constructed wetland (CW) samples reveals significant differences in bacterial community structure in influent as well as a temporal community shift "

2021 Comerford, M.S., Carroll, S.P. & **Egan, S.P.** Spatial sorting drives rapid ecological adaptation of the soapberry bug. American Society of Naturalist meeting. Virtual Ansilomar 2021.

2021 Zhang, L., G.R. Hood, I. Carroo, J.R. Ott, & **S.P. Egan**. Context-dependent reproductive isolation: Host plant variability drives fitness of hybrid herbivores. American Society of Naturalist meeting. Virtual Ansilomar 2021.

2020 Laroche, RAS, K Weinersmith, LM Angeloni, DD Wiegmann, **SP Egan** Is energetics or competition a stronger driver of the seasonal timing of reproduction by male smallmouth bass? Animal Behavioral Society Annual meeting, Virtual.

2020 Brandão-Dias P. F. P.; Rosi, E; Shogren, A; Tank, J; Hamilton, S.; Malcolm; H.; Fischer, D.; **Egan, S.P.** Fate of Environmental Proteins (eProteins) From Genetically Engineered Crops In Experimental Streams. Annual Meeting of the Society for Environmental Toxicology and Chemistry, Virtual.

2020 Weinersmith KL, Forbes AA, Ward AKG, & **Egan SP**. Tales from the Crypt: A parasitoid manipulates the behavior of its gall wasp hosts. Special symposium on parasite manipulation of host behavior. XXVI INternational Congress on Entomology in Helsinki, Finland. (*forthcoming*)

2020 Comerford, M.S., Carroll, S.P. & **Egan, S.P.** Spatial sorting drives rapid ecological adaptation of the soapberry bug. Society for Integrative and Comparative Biology (SICB) Annual Meeting, Austin, Texas.

2020 Drummond, J., Brandao, P.B., Brandt, M.E., **Egan, S.P**, & Correa, S.P. Environmental DNA captures shifts in Caribbean fish communities associated with the invasive seagrass Halophila stipulacea. Society for Integrative and Comparative Biology (SICB) Annual Meeting, Austin, Texas.

2019 Weinersmith KL, Forbes AA, Ward AKG, & **Egan SP**. Tales from the Crypt: A parasitoid manipulates the behavior of its gall wasp hosts. 2019 Helminthological Society of Washington, Shenandoah University in Winchester, VA.

2019 Feder, J., M. Doellman', T.H.Q. Powell, **S.P. Egan**, G. Ragland, P. Meyers, G. Hood, J. Smith, & S. Berlocher. On the scent of speciation: a neurological reversal in chemosensory processing between the brains of the apple and hawthorn host races of *Rhagoletis* flies contributing to fruit odor discrimination behavior and premating reproductive isolation. Society for the Study of Evolution Annual Meetings, Rhode Island.

2019 Zhang, L. & **S.P. Egan.** Asymmetry in reinforcement between ecologically divergent host-associated populations of the gall-forming wasp, *Belonocnema treatae*. Society for the Study of Evolution Annual Meetings, Rhode Island.

2019 Comerford, M., S. Carroll, & **S.P. Egan**. Testing the role of dispersal polymorphism in the rapid adaptation (or maladaptation) of the red-shouldered soapberry bug. Society for the Study of Evolution Annual Meetings, Rhode Island.

2019 Driscoe, A., **S.P. Egan**, G.R. Hood, & J.R. Ott. Interactions between host associations and geography drive diversification in a specialist herbivore. Society for the Study of Evolution Annual Meetings, Rhode Island.

2019 Hood, G.R., L. Zhang, J.R. Ott, & **S.P. Egan.** Cascading reproductive isolation: Plant phenology drives temporal isolation among populations of a host-specific herbivore. Society for the Study of Evolution Annual Meetings, Rhode Island.

2018 Doellman, M., K. Inskeep, T.H.Q. Powell, **S.P. Egan**, G. Ragland, P. Meyers, G. Hood, J. Smith, S. Berlocher & J. Feder. Genomic differentiation during speciation-with-gene-flow: Comparing life history and geographic variation within and across species in the *Rhagoletis pomonella* complex. Annual Meeting of the Entomological Society of America, Vancouver, B.C.

2018 Feder, J., M. Doellman, G. Saint Jean, **S.P. Egan**, G. Hood, T.H.Q. Powell, W. Yee, J. Rull, J. Smith & M. Aluja. Partial ring species, clines, and disjunct geographic patterns of genetic differentiation reveal complex history of divergence for North American cherry-infesting *Rhagoletis* flies. Annual Meeting of the Entomological Society of America, Vancouver, B.C.

2018 Zhang, L., G. Hood, M. S. Comerford, J. R. Ott & **S. P. Egan**. Testing immigrant inviability as a reproductive barrier among different host-associated populations of the gall wasp *Belonocnema treatae*. Annual Meeting of the Ecology Society of America, New Orleans, LA.

2018 Comerford, M.S., S. Carroll, **S.P. Egan**. Rapid host-associated divergence in beak length and wing polymorphism of the red shouldered soapberry bug (*Jadera haematoloma*). Annual Meeting of the Ecology Society of America, New Orleans, LA.

2018 Larson, E., J. Drummond, Y. Li, D. Lodge, C. Gantz, M. Pfrender, M. Renshaw & **S.P. Egan.** Effects of Field Sampling Design on Environmental DNA Performance for Fish, Zooplankton, Zoobenthos in Temperate Lakes. Annual Meeting of the Society for Freshwater Science, Detroit, MI.

2017 Gregory Ragland, Glen Hood, **Scott Egan**, Meredith Doellman and Dan Hahn. Introduction to the symposium "Genomics of adaptation: Linking the next generation of genome-wide analysis to understand and manage complex traits". Annual Meeting of the Entomological Society of America, Denver, CO.

2017 Meredith Doellman, Thomas Powell, Katherine Inskeep, **Scott Egan**, Gregory Ragland, Peter Meyers, Glen Hood, James Smith, Stewart Berlocher and Jeffrey Feder. Genome-wide divergence parallels ecological variation within and across species in the *Rhagoletis pomonella* complex (Diptera: Tephritidae). Annual Meeting of the Entomological Society of America, Denver, CO.

2017 Ellen Martinson, Jack Werren and **Scott Egan**. Cynipid galler induces massive gene expression changes in oak gall. Annual Meeting of the Entomological Society of America, Denver, CO.

2017 Mattheau Comerford, Scott P. Carroll and **Scott Egan**. Texas populations of red- shouldered soapberry bug *Jadera haematoloma* tell a new evolutionary story. Annual Meeting of the Entomological Society of America, Denver, CO.

2017 Glen Hood, Thomas Powell, Andrew Forbes, **Scott Egan**, Alice Harada and Jeffrey Feder. Interspecific competition and temporal resource partitioning facilitate speciation. Annual Meeting of the Entomological Society of America, Denver, CO.

2017 Linyi Zhang, Glen Hood, Mattheau Comerford, Robert Busbee, Amanda Driscoe, James R. Ott and **Scott Egan**. Immigrant inviability promotes reproductive isolation among host-associated populations of the gall wasp *Belonocnema treatae*. Annual Meeting of the Entomological Society of America, Denver, CO.

2017 Feder, J.L., **S.P. Egan**, M. Doellman, G. Ragland. Experimental evidence natural selection affects genome-wide geographic and host-related differentiation during sympatric divergence. Evolution Meetings, Portland, OR.

2017 Hood, G.H., **S.P. Egan**, J.L. Feder. Interspecific competition and temporal resource partitioning facilitate speciation and the formation of community biodiversity. Evolution Meetings, Portland, OR.

2016 Gantz, C., M. Renshaw, D. Erickson, D. Lodge, & S.P. Egan. Environmental DNA (eDNA) detection of aquatic plant species in freshwater ecosystems. Oregon Lake Association Meeting. (talk)

2016 Zhang, L.-Y., Amanda Driscoe, Rebecca Izen, Ott, Jim R., & **S.P. Egan**. Immigrant inviability promotes reproductive isolation among host-associated populations of the gall wasp *Belonocnema treatae*. Annual Meeting of the Society for the Study of Evolution. Austin, Texas. (poster)

2016 Hood, G.H., **Egan, S.P.,** Forbes, A.A., & J.L. Feder. Sequential Divergence and the Multiplicative Origin of Community Diversity. Annual Meeting of the Society for the Study of Evolution. Austin, Texas. (talk)

2016 Feder, J.L., **Egan, S.P.,** & P. Nosil. Darwinian Punctuated Disequilibrium during Speciation in *Rhagoletis*. Annual Meeting of the Society for the Study of Evolution. Austin, Texas. (talk)

2016 Weinersmith, K.L, S. Liu, A. Forbes, & **S.P Egan**. Tales from the crypt: a parasitoid changes emergence behavior in a crypt-forming gall wasp. American Society of Parasitologists, Edmonton, Canada (talk).

2016 Larson, E.R., M.A. Renshaw, C.A. Gantz, J. Umek, S. Chandra, **S.P. Egan** & D.M. Lodge. A test of environmental DNA for benthic arthropods using the reciprocal invasive ranges the Rusty (Great Lakes) and Signal (California & Nevada) crayfishes. Society for Freshwater Science, Sacramento, CA (talk).

2015 Schuler, H., M.M. Doellmann, J.A. Lopez, G.R. Hood, **S.P. Egan**, J.L. Feder. Target enriched Double Digest RADseq: A novel approach for the high-resolution characterization of the endosymbiont *Wolbachia*. Ecological Genomics Symposium; Kansas State University. (poster)

2015 Schuler, H., M. Doellman, G. Hood, M. Glover, W. Yee, J. Rull, M. Aluja, **S.P. Egan** & J. Feder. The potential role of *Wolbachia* as an incompatibility factor between cherry infesting *Rhagoletis* fruit fly species. Entomology Society of America Annual Meeting, Minneapolis, MN (talk).

2015 Doellman, M., **S.P. Egan**, G. Hood, T.H.Q. Powell, G. Ragland, J.J. Smith & J. Feder. Characterizing the genomic architecture of divergence along the speciation continuum in the *Rhagoletis pomonella* species complex. Entomology Society of America Annual Meeting, Minneapolis, MN (talk).

2015 Hood, G., A.A. Forbes, T.H.Q. Powell, **S.P. Egan**, G. Hammerlinck, J.J. Smith, J.L. Feder & M. Doellman. Sequential speciation and the multiplicative origin of community diversity. Entomology Society of America Annual Meeting, Minneapolis, MN (talk).

2015 Dougherty, M.M., E.R. Larson, M.A. Renshaw, C.A. Gantz, **S.P. Egan**, D.M. Erickson & D.M. Lodge. Environmental DNA (eDNA) detects the invasive rusty crayfish (*Orconectes rusticus*) at low abundances. Society for Freshwater Science meeting, Milwaukee, WI (poster).

2015 Dougherty, M.M., E.R. Larson, M.A. Renshaw, C.A. Gantz, **S.P. Egan**, D.M. Erickson & D.M. Lodge. Environmental DNA (eDNA) detects the invasive rusty crayfish (*Orconectes rusticus*) at low abundances. American Fisheries Society Meetings, Portland, OR (poster).

2015 Hood, G.R., A. Forbes, T.H.Q. Powell, **S.P. Egan**, G. Hammerlinck, J.J. Smith, J. Feder & M. Doellman. Sequential speciation and the multiplicative origin of community diversity. Entomology Society of America Annual Meeting, Minneapolis, MN (talk).

2015 Shogren, A.J., J.L. Tank, D. Bolster, C. Jerde, **S.P. Egan**, C. Tanner, & S. Ruggiero. Determining the influence of substrate heterogeneity on the measurement and transport of environmental DNA using Notre Dame's Linked Ecosystem Experimental Facility. Ecology Society of America Annual Meeting, Baltimore, MD (talk).

2015 Gantz, C.A., D.M. Erickson, M.A. Renshaw, D.M. Lodge, & **S.P. Egan**. Ecological Forensics: Using eDNA to detect diverse taxonomic groups in aquatic ecosystems. Ecology Society of America Annual Meeting, Baltimore, MD (talk).

2015 Shogren, A.J., J.L. Tank, D. Bolster, C. Jerde, **S.P. Egan**, C. Tanner, & S. Ruggiero. Determining the influence of substrate heterogeneity on the measurement and transport of environmental DNA (eDNA) using Notre Dame's Linked Ecosystem Experimental Facility (ND-LEEF). American Fisheries Society Meetings, Portland, OR (talk).

2015 Ragland, G., Meyers, P., Doellman, M., Hood, G., **Egan, S.P.**, Powell, T.H.Q., Hahn, D., Nosil, P. & J. Feder. A test of genomic modularity among life history adaptations promoting speciation-with-gene-flow. Arthropods-Genomics Symposium, Kansas State University.

## SERVICE

*Mentorship* –

*Undergraduates* -

| | |
|---|---|
| Veronica Riggs – | EBIO 306 (2014) |
| Alex Espana – | EBIO 306 (2014) |
| Preeya Bhavsar – | EBIO 306 (2013);<br>Senior thesis student (2014-15);<br>Julian Huxley Award for Excellence (2015);<br>Distinction in Research and Creative Works Award (2015);<br>Graduating EEB Senior Best RURS poster award (2015). |
| Leah Topper – | EBIO 306 (2014);<br>Senior thesis student (2015-16);<br>EEB Undergraduate Summer Fellowship (2015);<br>Distinction in Research and Creative Works Award(2016);<br>Clark P. Read Award for Excellence (2016). |
| Gabby Zambrano – | Summer researcher (2015) |
| Sean Liu – | Summer researcher (2015);<br>EBIO 306 (2015);<br>EEB Undergraduate Summer Fellowship (2016). |
| Karthika Senthilkumar – | EBIO 306 (2015,6) |
| Mikey Foster – | EBIO 306 (2015) |
| Jake Jacobsen – | EBIO 306 (2015) |

| | |
|---|---|
| Mandy Weaver – | EBIO 306 (2016); Senior Thesis Student (2017) |
| Elaine Hu – | EBIO 306 (2018) |
| Steven Pappas – | Senior Thesis Student (2018) |
| Isaac Carroo – | EBIO 306 (2017), EBIO 403 (2018) |
| Zach Verne – | EBIO 306 (2018, 2019) |
| Katy Zhu – | EBIO 306 (2019) |
| Lilly Ivanov – | EBIO 306 (2019) |
| Sam Shzu – | EBIO 306 (2018),<br>Senior Thesis Student (2019) |
| Charles Davis – | EBIO 306 (2018),<br>Senior Thesis Student (2019) |
| Briley Mullin – | EBIO 306 (2018),<br>Senior Thesis Student (2019) |
| Amy Rousch – | EBIO 306 (2018),<br>EEB Undergraduate Summer Fellowship,<br>Senior Thesis Student (2019-2021) |
| Camila Vinson | EBIO 306 (2020) |
| Lily Ivanov | EBIO 306 (2020) |

*PhD committees* –
Juan Carlos Diaz
Shreyasi Biswas
Eslam ElSharat
Michelle Sneck
Therese Lamperty
Thomas (Siao) Ye
Eric Wice
Maddy Burns
Andrea Drager

*PhD Students* –
Linyi Zhang *completed PhD in 2020
Mattheau Comerford
Pedro Brandao
Robert Laroche

P*ostdoctoral Scholars* –
Glen Hood Rice University Academy of Fellows postdoc

*Faculty Committees* –
Greenhouse Committee (chair starting 2018)
EEB Graduate Recruitment and Evaluation Committee
Undergraduate Recruiting and Advising Committee
Huxley Fellow Search Committee (member -2016; chair- 2018)
Advisor, PSM program, Rice University

*Review of Manuscripts* –

| | |
|---|---|
| American Naturalist | Infection, Genetics and Evolution |
| Biology Letters | Journal of Biogeography |
| BMC Evolutionary Biology | Molecular Ecology |
| Current Biology | Nature Communications |
| Ecology and Evolution | |
| Evolutionary Ecology | Peer J |

European Journal of Entomology
Evolution
Evolutionary Ecology
Global Change Biology
Heredity
Philosophical Transactions of the Royal Society, B
PLoS Genetics
PLoS ONE
Proceedings of the Royal Society, B
Science Advances

*Review of Grant Proposals* –
Agence Nationale de la Recherche (French National Research Agency)
Natural Sciences and Engineering Research Council of Canada
USDA - Biotechnology Risk Assessment Program
U.S. National Science Foundation (ad hoc)
U.S. National Science Foundation – DEB – Evolutionary process panel
Swiss National Science Foundation

Co-organized a conference –
2018 - Southeast Texas Genetics and Genomics Symposium; Rice University. Regional conference linking expertise in all aspects of evolutionary genomics. LINK: https://stegg.hgsc.bcm.edu/

*Professional Societies* –
Member - Society for the Study of Evolution
Hamilton Award Volunteer Judge (Best student talk at annual meeting)
Member – American Society of Naturalists
Ruth Patrick Student Poster Award Volunteer Judge (Best student poster at annual meeting)
Member – Ecology Society of America
Member – Entomological Society of America
*Co-organized a symposium at the 2017 Annual meetings of the Entomological Society of America titled "Genomics of adaptation: Linking the next generation of genome-wide analysis to understand and manage complex traits"

*Public Outreach* –
2020 – Science in Spanish program linking public schools between Mexico and Texas; Collaboration between Rice and Texas Southern University Biology Department (research and seminars).
2019 – Grant funded exchange program between Mexico and U.S. Scientists (UNAM – Rice)
2018 – Science in Spanish program linking public schools between Mexico and Texas.
2018 – Bugs and Biodiversity presentations (3x) to 4$^{th}$ grade classes, Groves Elementary, Humble ISD.
2018 – Judge for Science Fair competition – Atascocita Springs Elementary – Humble ISD.
2017 – Science Café public lecture. Black Lab Pub (Rice College of Nat. Sci.)
2017 – Evolution lab at Westside High School related to NSF-RAPID grant.
2016 – Judge for Science Fair competition – Shadow Forest Elementary – Humble ISD.
2016 – Darwin Day Lecture – Lone Star College, Kingwood, Texas.
2015 – Judge for Science Fair competition – Pine Forest Elementary – Humble ISD.