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ANNOUNCEMENT

2017 Julie S Denslow & Peter Ashton Prizes for the Outstanding Articles published in *Biotropica*

Every year *Biotropica*'s Editorial Board selects two outstanding papers published in our journal in the previous calendar year as the recipients of the **Julie S. Denslow** and **Peter Ashton Prizes**, with which we honor the outstanding articles published in our journal in the previous calendar year. Criteria for selecting the papers to receive these awards include clarity of presentation, a strong basis in natural history, well-planned experimental or sampling design, and the novel insights gained into critical processes that influence the structure, functioning, or conservation of tropical systems. Below the authors of the award-winning articles describe what motivated their studies and how they hope the work will inspire other researchers; we hope you enjoy these insights into the process that led to their discoveries and ask that you join the Editorial Board of *Biotropica* and The Association for Tropical Biology and Conservation in congratulating the 2017 recipients.

Emilio M. Bruna, Editor-in-Chief
University of Florida,
Gainesville, U.S.A.

Julie S. Denslow Prize for the Outstanding Paper in *Biotropica*: Vencl, F. V., Ottens, K., Dixon, M. M., Candler, S., Bernal, X. E., Estrada, C. and Page, R. A. (2016), *Pyrazine emission by a tropical firefly: An example of chemical aposematism? Biotropica*, 48: 645–655.

In my field work 'prospecting' for unusual insect chemistry, I have made a habit of using my portable instruments—eyes, fingers, nose, mouth—to get a first impression of whether a new find has something new to offer. For example, if you pop a bug into your mouth and it tastes bitter, it may have some interesting alkaloids. If some creature sports yellow, black, or red in contrasting patterns, it might be displaying a warning about its noxious chemicals.

Fireflies taste bad. Temperate fireflies in the genus *Photinus* fireflies are known to synthesize steroidal pyrones, known as lucibufagens (LBGs), toxins that disrupt the Na+/K+ pump, an ion transporter whose function is absolutely essential for animal survival. Evidence has accumulated supporting the hypothesis that fireflies also employ the aposematic defense strategy, wherein predators, such as bats and jumping spiders, associate their charismatic bioluminescent sexual displays with unpalatability. Moreover, because they are unable to synthesize their own LBGs, *Photuris* fireflies, like the subject of our study, eavesdrop on *Photinus* courtships to prey on and to expropriate their LBGs. Unfortunately, we know next to nothing about the chemical ecology of tropical fireflies, despite the fact that their diversity far exceeds that of their temperate counterparts.

Fireflies also smell bad. When we handled and then sniffed the locally abundant firefly, *Photuris trivittata*, we were impressed by the strong, somewhat sweet odors emanating from these disturbed individuals. While being sniffed, the distressed fireflies were also flashing. Could these volatiles serve as an early warning signal, perhaps in conjunction with flash signals, to form an aposematic defense? To reveal the nature of these unknown odors, I asked Catalina Estrada to 'piggy-back' some samples on her GC-MS. This sort of chemical fishing trip is better known as 'exploratory research'. It paid off. We discovered a methoxy-pyrazine in the atmosphere surrounding the upset *Photuris* firefly. While she was at it, Catalina also washed some fireflies in solvent to see what dissolved into solution. Violà: species-specific hydrocarbon profiles for each species. These profiles may be more important in courtship than in defense: nobody in the world knows! Bioassays with ants showed that they avoided intact fireflies, but readily attacked solvent washed fireflies. Moreover, ants were extremely sensitive to pyrazine, being driven away from very desirable sugar resource by remarkably small amounts of it. These findings represented the first discoveries bearing on the chemical ecology of any Neotropical firefly. They also inspired us to inquire whether pyrazine might affect interactions with other important firefly enemies. Because the Smithsonian Tropical Research Institute is a tight-knit community where scientific networking is easy, Catalina and I approached Rachel Page and Ximena Bernal, respectively, our resident bat and toad experts. Along with their students, May Dixon, Sarah Candler, and Kristina Ottens, we were able to measure how pyrazine affected interactions with the two of the most important firefly enemies: bats and toads. We used mealworms coated with pyrazine to assess whether this chemical would repel these predators. Whereas toads found them acceptable, bats rejected intact fireflies. However, these predators had mixed responses to pyrazine. One bat species showed some reluctance to accept pyrazine-coated mealworms (but we think small samples sizes may have limited our ability to detect stronger reactions to pyrazine).

This study represents a fruitful collaboration that integrates bioassays, chemistry, and ecology that is the basis for further research to gain a deeper understanding of how different predators can impact the evolution of multiple resistance traits that form defense arsenals. But most of all, it was an opportunity for people who are passionate about tropical biology to work together. It also linked senior scientists with included early-career investigators that were engaged in all stages of the project—from experimental design to analysis to synthesis—which afforded them the gratification that comes from the process of discovery.

FIGURE 1. (*left to right*): F. Vencl, K. Ottens, M. Dixon, S. Candler, X. Bernal, C. Estrada, and R. Page.

FIGURE 2–3. Deusdedith Rugemalila (left) and Ricardo Holdo (right). (Photo by Hloniphani Mthunzi). T. Michael Anderson (left) and Thomas Morrison (right). (Photo by Oswald Nzunda)

As icing on the scientific cake, our message was enhanced by incredible visuals and Damon Kyllo's artwork on the journal cover. For my part, this was tropical biology at its best. . .nirvana! (Fig. 1).

Fredric V. Vencl
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Peter Ashton Prize for the Outstanding Paper in *Biotropica* by a Student: Rugemalila, D. M., Anderson, T. M. and Holdo, R. M. (2016), *Precipitation and elephants, not fire, shape tree community composition in Serengeti National Park, Tanzania. Biotropica*, 48: 476–482.

Becoming an ecologist has been my dream ever since I was in college at Sokoine University of Agriculture in Tanzania. This dream was influenced by my fieldwork in various places such as national parks, village lands practicing different management plans, natural, and plantation forests. In general, I liked hands on activities that involved vegetation sampling for determination of species abundance and distribution. The diversity of flora and fauna at sites we visited was fascinating and made me appreciate the importance of ecological diversity. The role of humans in negatively altering ecosystem equilibria was clear at some visited sites. Sites that were protected or had some sort of conservation programs, for example the forests of Mount Kilimanjaro, or the Kitulanghalo forest reserve in Morogoro—Tanzania, etc. were rich in biodiversity compared to places close to human settlements. This dichotomy increased my love for nature, and at the time I saw myself as wanting to become a restoration or conservation ecologist to help preserve this biodiversity.

In 2010, I began working in the Serengeti National Park in Tanzania as a research assistant for Dr. Michael Anderson (Wake Forest University). He was collaborating with Dr. Ricardo Holdo (currently at the Odum School of Ecology—University of Georgia) and later joined by Dr. Tom Morrison (currently at the University of Glasgow). I had never visited the Serengeti National Park before. The ecological beauty of the Serengeti Ecosystem was, and still is, overwhelming. Being a newbie in this ecosystem, my mind was filled with so many questions about things I observed. For instance, why is the southern part of the park mostly drier than the north?—and what are the consequences for


FIGURE 4–5. Eliška Padyšáková. (Photo by Š. Janeček). Štěpán Janeček. (Photo by E. Padyšáková)

this difference? Why are some species found in some places with no trace in other places? Why are there so many more wildebeest than any other herbivore?—and why do they always run? One of the more practical questions for me was why are people walking unguarded in this place filled with so many predators? I had so many whys and some were answered by my colleagues. Some answers made sense but others were either confusing or contradicted my expectations based on what I learned in college. On explaining how scientists made their inferences, they threw some terminologies such as 'mixed effect or Bayesian or hierarchical model were used' and other terms that confused me more than a 'chameleon in a bag of skittles'. My time in Serengeti geared my passion for science and research, and I became more interested in savanna ecosystem dynamics, tree—grass—herbivore + predator—prey interactions, ecosystems biodiversity, nature conservation, and climate change.

I think they were tired of my questions and decided to give me an opportunity to look for the answers myself. Therefore in 2012, I moved with my wife and two small kids to Missouri, U.S.A. and joined Dr. Holdo's laboratory to pursue a Masters degree at the University of Missouri. Before starting the project that eventually became the manuscript for this award, I had other projects to work on which were the core of my program and had been approved by my committee, and I regarded it as a side project.

As one African proverb postulates: 'A family is like a forest, when you are outside it is dense, when you are inside you see that each tree has its place'. Biomes are diverse and their structures can be a function of different biotic and abiotic factors. These factors have the potential to regulate species abundance and distribution. For instance, if you look closely at savanna ecosystems, you will discover that apart from the tree—grass dichotomy that most savanna ecologists focus on, there are differences in species composition across environmental gradients. So, the goal of this project was to understand what drives some of these changes in composition. When I received word that my manuscript has been named the recipient of the Peter Ashton Prize, I was filled with joy and encouragement to keep pursuing ecological research. I did not expect the prize, but now, I thought, I am somehow among the prize winners documented in an international scientific journal (Figs. 2 and 3).

I would like to thank my co-authors for their great support and involvement in this and other projects that I work on.

Deus Rugemalila
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Peter Ashton Prize for the Outstanding Paper in *Biotropica* by a Student: Padyšáková, E. and Janeček, Š. (2016), *Sunbird hovering behavior is determined by both the forager and resource plant. Biotropica*, 48: 687–693.

My first trip to tropical Africa took place back in the days of my master's study of European mammals at the University of South Bohemia. I joined the team of Czech botanists and ornithologists and their students who studied plant–pollinator interactions. For two months, we were alone on a mountain ridge in the open air with limited equipment except for basic cooking supplies, sleeping bags, bags of rice, microcapillary tubes, and pocket refractometers. These limitations taught me to deal with unstable conditions and the sometimes limited accessibility to needed equipment in Cameroon. I greatly appreciate the opportunity to do real science with such simple equipment and limited funds, and since then I was fascinated by the unique plant–pollinator relationships found there. When I later wondered what I would be doing during doctoral studies, there was no doubt it would be pollination ecology in the Cameroonian mountains. While many things were still simple, by then there were some new conveniences, including solar panels for charging batteries, gasoline generators, waterproof remote video recording systems, computers, and an Internet connection.

Our study area—the Bamenda Highlands of North-West Province, Cameroon—was once heavily forested. However, repeated cutting and burning had limited the forest to ravines or areas along the waterways and allowed grasslands to expand. Even though the area had maintained its wealth of plant and animal species, we were sad witnesses to dramatic changes to the landscape, including the loss of remnants of species-rich montane forest, the spread of *Pteridium aquilinum*, and the loss of the last remaining medium-sized mammals.

During our research, we discovered a pollination system that seemed adapted to hovering by birds, something that was thought to be unique to hummingbird pollination plants in the New World. With its long peduncle, *Impatiens sakeriana* is exclusively pollinated by two sunbirds—the Cameroon sunbird (*Cyanomitra oritis*) and the northern double-collared sunbird (*Cinnyris reichenowi*). Both sunbird species perched to exploit floral resources, but to our surprise, they also had a remarkable ability to hover at flowers. *Cyanomitra oritis* was a more frequent visitor and hovered more often than *C. reichenowi,* which preferred to perch while feeding on nectar and or robbed nectar by piercing the flower spur. Interestingly, *C. oritis* was an equally effective pollinator whether it hovered or perched. After observing that *C. oritis* hovered for 86% of its visits to another balsam on Mt. Cameroon—*Impatiens frithii*—we decided to test some common assumptions about how floral morphology influences bird hovering behavior: (1) that a plant's floral morphology (rather than active choice by birds) is what determines bird foraging strategy; (2) that sunbirds perch whenever possible; and (3) that birds heavier than 9 g should preferentially perch, because the energetic costs of hovering are higher than for perching. To test these ideas, we used a portable remote video recording system, which enabled us to accurately measure key variables such as the rate and duration of bird visits to flowers.

Our results showed that none of the common assumptions above applied to Cameroonian sunbirds. The choice of behavior mode at flowers is based on both plant architecture as well as optimal foraging—although *C. oritis* is the largest local sunbird (11.9 g), it often hovered at flowers where perches were available. This observation clearly indicated hovering is less problematic for sunbirds than was generally assumed. Similarly, adaptations in this Paleotropical plant to bird hovering bear a striking resemblance to the well-known and highly specialized hummingbird-pollinated systems in New World.

Unfortunately, sunbirds are studied far less than hummingbirds. This is especially true in tropical Africa, where (paradoxically) the most sunbirds occur. We hope that by drawing attention to these fascinating and understudies species, we will continue to see fascinating discoveries in the future (Figs. 4 and 5).

Eliška Padyšáková

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