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## SPEAKERS

**Dave Beamer** is the Lead Researcher and a Biology Instructor at Nash Community College in Rocky Mount, NC, where he teaches Introduction to Biology for science majors' students. In addition, he teaches Regional Natural History and Field Biology courses that provide an opportunity to showcase the spectacular floral and faunal diversity of North Carolina to students. He is dedicated to providing opportunities to undergraduate students to conduct original research projects that help forward the knowledge and understanding of North Carolina's salamander diversity. One of his goals as an instructor and mentor is to foster an appreciation of biodiversity and a stronger understanding of science and the scientific process amongst his students. He is currently funded by the National Science Foundation to study speciation processes in dusky salamanders. As part of the broader impacts of this grant, and through support by a Duke Energy grant, he has been conducting a year-long after school K-12 program entitled "Using Biotechnology to Uncover Biodiversity."

**Jeff Beane** is Herpetology Collection Manager for the North Carolina State Museum of Natural Sciences in Raleigh, where he has been employed since 1985. A native of Asheboro, he holds a B.S. in Zoology from North Carolina State University (1982). A hard-core member of NCHS since 1982, he has served as its newsletter editor since 1986, and has served on most of the Society's committees. An old-school naturalist, he is active in several other natural history and conservation groups and initiatives, including NCPARC, Wake Audubon, and Sandhills Natural History Society. He is a frequent contributor to *Wildlife in North Carolina* magazine, and has authored numerous popular and scientific publications. His interests include virtually anything pertaining to natural history or conservation, especially sandhills/longleaf pine ecosystem ecology and the natural history, zoogeography, and conservation of amphibians and reptiles in North Carolina and the Southeast. He enjoys reading, writing, photography, wood-carving, music, observing the interactions of living things, and learning stuff. It is entirely possible that he has spent too much time alone with coachwhips.

**Andrew Durso** is a post-doctoral researcher at the University of Geneva in Switzerland. He was born in New York and grew up catching snakes in North Carolina, where he has been an NCHS member since 1999. He earned a B.S. in Ecology from the University of Georgia in 2009, an M.S. in Biology from Eastern Illinois University in 2011, and a Ph.D. in Ecology from Utah State University in 2016. He writes a blog about snakes called "Life is Short, but Snakes are Long." Andrew's interests include snake ecology, predator-prey interactions, behavior, evolution, and human-snake interactions, as well as birdwatching and cycling. He currently chairs the NCHS Grants Committee.

**Mike Martin** is a technician for North Carolina Wildlife Resources Commission and has been working with wild herps in the Carolinas for over 10 years. He holds a B.S. in Zoology from North Carolina State University and spent some time in graduate school at the University of South Carolina. His current work is mostly focused on the threatened and endangered herpetofauna of the North Carolina Sandhills, and much of his past work focused on researching the threatened and endangered herpetofauna of the South Carolina Lowcountry. He also has interest in captive husbandry of reptiles and amphibians, having worked as curator of a private collection as well as having once maintained a large personal collection of geckos. Mike has a passion for photography and a sweet spot for natural history. He can sometimes be found staring at animals while trying to figure out why they do what they do.

**John Roe** is an Associate Professor at the University of North Carolina at Pembroke. He studies wildlife interactions with their habitat, with the aim of helping to guide natural resource managers and conservationists in maintaining biodiversity. He uses reptiles and amphibians as model organisms. His current research focuses on examining box turtle responses to prescribed fire in the longleaf pine forests of North Carolina. He is also part of a team studying state-wide trends in box turtle populations of North Carolina as part of the Box Turtle Connection network. At UNC-Pembroke, he teaches courses in Zoology, Ecology, Field Techniques, and Environmental Science. He graduated from Davidson College (B.S.), Purdue University (M.S.), and the University of Canberra, Australia (Ph.D.).

**Nathan Shepard** is an Eastern Regional Field Biologist with the North Carolina Natural Heritage Program, working on various topics related to conservation of rare and uncommon animal, plant, and natural communities within North Carolina. He holds a B.S. in Zoology from North Carolina State University (2006) and an M.S. in Biology from Marshall University (2011). Currently NCHS Vice-President, his main area of interest is with the natural history and conservation biology of reptiles and amphibians. His herp work largely focuses on species endemic to the longleaf pine forest of the Carolinas. He works through agency partners and land managers to help maximize management efforts for at-risk species. Species of interest include eastern diamondback rattlesnakes, eastern tiger salamanders, Carolina gopher frogs, Mabee's salamanders, Pine Barrens treefrogs, and rare upland snakes. He is also interested in the natural history and biology of reptiles and amphibians in Latin America.

**Eric Teitsworth** is a Master's graduate student at North Carolina State University, working under the direction of Dr. Krishna Pacifici. His current research is a coordinated effort with the North Carolina Wildlife Resources Commission to determine the distribution, occupancy, and abundance of the Neuse River waterdog (*Necturus lewisii*) in eastern North Carolina. His research is born from a desire to understand how amphibians interact with a human-disturbed landscape and how that knowledge might inform management and conservation decisions, particularly for data-deficient species. Eric grew up in the Philadelphia suburbs and graduated with a B.S. in Wildlife and Fisheries Sciences from The Pennsylvania State University in 2014. He spent the following four years working as a research technician on projects ranging from timber rattlesnakes, to vegetation communities, to stream restoration, and, most prominently, for two years as Lab Manager for the Miller Applied Population Ecology Lab, which spurred his love of amphibian population ecology and conservation.

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**ABSTRACTS****Natural History of the Eastern Coachwhip (*Masticophis [Coluber] f. flagellum*) in North Carolina****Jeffrey C. Beane**North Carolina Museum of Natural Sciences  
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The coachwhip (*Masticophis [Coluber] flagellum*) ranges extensively over much of the southern United States and Mexico, with the nominate (eastern) subspecies reaching its northeastern range limit in North Carolina. It is North Carolina's longest snake species, also ranking among the fastest, most visually-oriented, and (arguably) most intelligent. Known historically from 22 counties in the southeastern portion of the state, it has declined over much of that range in recent decades, due primarily to habitat loss, and is currently under review for possible state-listing. Primarily a longleaf pine ecosystem associate in North Carolina, the diurnal, heat-loving coachwhip has a strong affinity for sand ridges and other relatively open, xeric, sandy uplands. Telemetry data from 16 adults, radio-tracked between 1999 and 2019 in the Richmond and Scotland County Sandhills, reveal relatively large but well-defined home ranges and frequent site and refugium fidelity. Anthropogenic microhabitats were often utilized. Most hibernacula were subterranean chambers formed by decaying pine stumps; these were sometimes shared with conspecifics as well as other snake species. Some individuals changed hibernacula during warm periods. Coachwhips may be described as generalist predators, but they show strong preference for lizard prey. Of 70 food items recovered from 50 snakes, more than two-thirds were lizards and more than half were six-lined racerunners. Despite its conspicuous presence in some areas, much remains to be learned about the natural history of this charismatic snake in North Carolina.

**Inter- and Intra-population Variation in Spatial Ecology of Eastern Box Turtles (*Terrapene carolina*) in Fire-maintained and Unburned Forests****Dr. John H. Roe**University of North Carolina at Pembroke  
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Prescribed fire is an essential tool for the conservation and management of forest communities in the southeastern United States. While such management practices may result in the unintentional injury or killing of box turtles, we know little regarding how turtles respond behaviorally, including how fires influence movements and use of space. From 2012–2016, we radio-tracked turtles at fire-maintained and unburned protected areas and examined inter- and intra-population variation in movement rates and home range size. Home range size was larger for females than males using both minimum convex polygon and 95% kernel density estimates, and individuals at the unburned site maintained larger home ranges than at the fire-maintained site according to the 95% kernel density method. Home range fidelity, measured as the proportion of spatial overlap in area from year to year, was higher for males than females and higher at the fire-maintained site compared to the unburned site. For individuals at the fire-maintained site, home range size decreased with increasing fire frequency and extent. Movement rates increased with body size and were higher in females than males only in July, but individuals at the fire-maintained and unburned sites moved at similar rates. Our initial results suggest that fire may have important effects on the spatial ecology of terrestrial turtles by constraining their home ranges to relatively small areas of fire refuge habitats such as mesic forests and areas near watercourses. Such behavior could be a strategy to avoid the dangers, such as injury and mortality from fire, that come with exploration into pyrogenic habitats. Further studies that assess the response of box turtles to fire over longer time-frames, or following experimental manipulations of fire regimes, would help land managers understand the implications of current management practices for non-target biota.

**Snapp: Guiding Anti-venom Selection with Snake-identification Imagery Analysis Based on Artificial Intelligence and Remote Collaborative Expertise****Dr. Andrew M. Durso**University of Geneva in Switzerland  
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Snakebite is a neglected tropical disease, annually responsible for >100,000 human deaths and >400,000 victims of disability globally. It disproportionately affects poor and rural communities in developing countries, which also have high snake diversity and limited access to antivenom. Antivenom can be life-saving when correctly administered, but administration often depends on the correct identification of the biting snake. Snake identification is challenging due to snake diversity and potentially incomplete or misleading information provided to clinicians by snakebite victims or bystanders. Clinicians do not necessarily have enough knowledge or resources in herpetology to identify a snake from a carcass or photo. To reduce potentially erroneous or delayed healthcare actions, we are building the first medical decision-support mobile app for snake identification based on artificial intelligence (AI) and remote collaborative expertise, supporting clinicians, snakebite victims, and laypeople in the identification of snakes. Our ultimate objective is to improve clinical management of snakebite. To do this, we are building a massive global repository of photos of snakes from museum collections (including VertNet and GBIF as well as digitized slides from historical archives), personal and researcher image collections, open online biodiversity platforms (e.g., iNaturalist, HerpMapper), and social media (e.g., Facebook, Twitter, Flickr), updating snake range maps globally, developing a system capable of identifying snakes using photos and geolocation based on machine learning, challenging communities of citizens and experts worldwide to identify snakes, comparing their speed and accuracy with that of machine learning, and establishing an international working group of experts in snake identification to help validate images.

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## Understanding the Distribution and Population Status of the Neuse River Waterdog (*Necturus lewisi*)

**Eric Teitsworth**

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The Neuse River Waterdog (*Necturus lewisi*) is endemic to the Neuse and Tar-Pamlico river basins of eastern North Carolina. As listed in the North Carolina State Wildlife Action Plan, *N. lewisi* is apparently suffering from range contractions and declines in overall abundance, likely caused by habitat loss and alterations via surrounding land use. The objective is to provide baseline occupancy and abundance data by conducting a multi-year capture-mark-recapture study throughout the Neuse and Tar basins. During the 2018-2019 field season, 65 locations were surveyed, yielding detections at 32 locations. Low recapture rates and apparently high mobility indicate typically low detection for individuals. In light of this, high capture rates at some locations suggest strongholds with robust populations. Many other locations appear to be in low occupancy, similar to previous survey efforts. Analysis of detection rates and capture success from the 2018-2019 season, combined with habitat and landscape characteristics, will enable us to develop predictive occupancy models throughout their range and will inform survey methods for the 2019-2020 season.

## Travelogue: A Trip Through the Mountains and Rainforests of Ecuador

**Nathan A. Shepard**

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Ecuador is exceptionally high in reptile and amphibian diversity. This is especially impressive given the small geographical size of this country. The political and economic stability of Ecuador has helped make this country a welcoming destination for foreign biologists and amateur naturalists. This talk will explore three distinct physiographical regions of the country: Amazon, Andes, and the Choco (including nearby tropical-dry forests). I will present information gathered from two trips, but this presentation will focus on our 2019 expedition into the Jama-Coaque Ecological Reserve and adventures in the Mindo area. I will include stories and species accounts from time I spent in the Amazon and two coastal reserves in 2008.

## Ethical Considerations for Interacting with Wildlife in the Modern World

**Michael D. Martin**

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While ethics can be attributed in part to common-sense standards for conduct, it is important to have such standards explicitly stated by trusted advisors. Interest groups have long self-policed their communities, but changing social environments change the way we share information and interact. As a group with a common interest in the conservation of wildlife and their habitats, it is wise to reflect on the ways in which we interact with wildlife to acknowledge, and then minimize or eliminate, negative impacts. Whether herping, photographing, or conducting research in the lab or field, as individuals and as part of a group, we should treat animals with interest in their well-being. Additionally, access to information has fundamentally changed since the introduction of internet into our lives. Our ability to connect with other herpers online means we can find more, travel further, and interact in various ways. We will cover how social media might be influencing herping and public perception of wildlife, and how even some positive outcomes can have unintended, negative consequences. We will suggest options to minimize ethical conflicts. Open discussions on the topic of ethics can help everyone find common ground to build a code of conduct that ultimately helps us better protect the species we love in the home, in our back yards, and beyond.

## How Many Undescribed Salamander Species Occur in North Carolina?

**Dr. David A. Beamer**

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Undescribed diversity has been a common theme in taxonomic studies on salamanders. This undescribed diversity includes both morphologically "distinct" species as well as cryptic species that require molecular techniques to identify. North Carolina, despite being long recognized for its high salamander diversity, still holds many salamanders of undetermined taxonomic status. Since most salamander species are small and are characterized by limited dispersal capabilities, their populations have been fragmented over geological time scales across the diverse landscapes contained within North Carolina. These biological features, coupled with the complex geological and ecological history, have produced the rich salamander fauna that North Carolina is known for. These same factors also play a role in the deficit of our knowledge with respect to how many species occur in North Carolina and even where the known species are distributed. In this presentation, I will highlight some of the problem areas remaining in our knowledge on the taxonomic status of North Carolina salamanders.