The official journal of the Tennessee Herpetological Society

Tennessee Journal of Herpetology

Volume 8, 2025

ISSN 2576-9340

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We would like to thank the following individuals for serving as peer reviewers for the current volume
Brian Miller
Joshua Hall
Matthew Grisnik
Matthew Niemiller
Morgan Muell
Ryan Hanscom

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Cover Photo: Green Anole (*Anolis carolinensis*), **Anthony Brais**

The Tennessee Journal of Herpetology

Contents **Volume 8, 2025**

Tennessee Journal of Herpetology Vol. 8, 2025
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Natural History Notes

***ANOLIS CAROLINESIS* (Green Anole). WINTER ACTIVITY**. Winter activity of the green anole (*Anolis carolinensis*) has been described for Tennessee populations in the foothills of the Blue Ridge Mountains of East Tennessee (Bishop and Echternacht 2003. Copeia 4: 906-909; Bishop and Echternacht 2004. Herpetologica 60: 168-177). Individuals emerge from overwintering crevices in south-facing rock bluffs to bask on sunny winter days (Bishop and Echternacht 2003. *op. cit*; Bishop and Echternacht 2004. *op. cit*). This population of *A. carolinensis* utilized the rock bluff from late October / early November through late March / early April (Bishop and Echternacht 2004. *op. cit*). Infrequent feeding was observed for *A. carolinensis* during the winter months in East Tennessee and both male and female individuals experienced significant growth in snout vent length (SVL) (Bishop and Echternacht 2003. *op. cit*). Additional Tennessee populations occur on the Cumberland Plateau escarpment along the eastern edge of the Sequatchie Valley ca. 100 km east of the Blue Ridge populations (Scott and Redmond 2008. Atlas of Reptiles in Tennessee. https://www.apsubiology.org/tnamphibianatlas/; accessed 1 January 2024; Brais 2021. Herpetol. Rev. 52: 82-83). The winter activity of Tennessee *A. carolinensis* outside of the Blue Ridge ecoregion has been poorly documented.

An *A. carolinensis* population is known from a southeast facing, steep rock cut within the right of way of Big Spring Gap Rd on the Cumberland Plateau escarpment, along the eastern edge of the Sequatchie Valley, Bledsoe County, Tennessee (35.704933 °N, 85.12236 °W, WGS 84, 433 m elev.). This site is ca. 21 km north of the northernmost previously described *A. carolinensis* record from the Cumberland Plateau escarpment of the Sequatchie Valley (Brais 2021. *op. cit*).

Figure. 1. Winter basking *Anolis carolinensis* on woody vegetation of the Cumberland Plateau escarpment of Tennessee.

I visited this location on 26 December 2020 between 1100 and 1200 h during clear, sunny conditions and found four basking *A. carolinensis*. I documented these individuals basking on the face of the rock cut and on woody vegetation adjacent to the rock cut (Fig. 1). High and low temperatures observed for 26 December 2020 from the Pikeville USC00407184 National Oceanic Atmospheric Administration (NOAA) weather station located 13.5 km southwest of the Big Spring Gap Rd site were 5.5 & -11 degrees Celsius respectively. Daily high and low temperatures are provided as part of the NOAA Daily Global Historical Climatology Network dataset (Menne et al. 2012. J. Atmos. Ocean. Tech. 29:897-910) accessed on 22 March 2024. This winter activity for Cumberland Plateau escarpment *A. carolinensis* is similar to previously studied *A. carolinensis* in the foothills of the Blue Ridge mountains, where individuals emerge to bask on sunny winter days along south-facing rocky refugia (Bishop and Echternacht 2003. *op. cit.;* Bishop and Echternacht 2004. *op. cit.*). The late December basking activity of *A. carolinensis* at the Big Spring Gap Rd site is within the November through March activity reported in the Blue Ridge foothills population (Bishop and Echternacht 2003. *op. cit*; Bishop and Echternacht 2004. *op. cit)*. Additional populations of *A. carolinensis* are known from the Cumberland Plateau escarpment along the eastern edge of Walden's Ridge in East Tennessee (Scott and Redmond 2008 *op. cit*.). Further study is needed to better describe Walden's Ridge *A. carolinensis* winter behavior.

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ANEIDES AENEUS (Green Salamander). **BROODING AND HATCHLING BEHAVIOR**. *Aneides aeneus* is a semi-arboreal salamander found throughout the Southern Appalachian Mountains and has been identified as a vulnerable cryptic species (Niemiller et al. 2022. Front. Conserv. Sci. 3: 890859). Characterized by their flattened, dark body covered in green to yellow lichen-like splotches and square-shaped toes, they are highly selective of their habitat, utilizing deep crevices of south-facing rocky outcrops, caves, cliffs, and large boulders for breeding and brumation (Niemiller et al. 2022. Herpetol. Conserv. Biol. 17:249-265). The IUCN Red List of Threatened Species lists *A. aeneus* as "Near Threatened" due to population declines resulting from disease, over-collection, climate change, large-scale habitat loss, and degradation (IUCN 2025. IUCN Red List of Threatened Species; Soto et al. 2021. Conserv. Action Plan Green Salamander (*A. Aeneus*) Species Complex). On 3 September 2024 at 1226 h, I discovered an adult female green salamander (snout-vent length 6.0 cm) brooding her clutch of 10-15 eggs (Fig. 1A). The geographic coordinates for this observation are withheld due to the conservation status of this species. Observations of females guarding their eggs have been reported in Kentucky, North Carolina, Virginia, West Virginia, and Tennessee (Petranka 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington, USA). My observation adds to a very small number of recorded *A. aeneus* nesting observations in Tennessee, documented in two master's theses from Tennessee Tech University (Cantrell 2012. Distrib. Spec.-Habitat Relat. Green Salamander, *A. aeneus*, Catoosa WMA; Wyatt 2010. Status Spec.-Habitat Relat. Green Salamander *A. aeneus*, Myatt Creek, Catoosa WMA).

Green salamanders typically breed in May or June in the northern parts of their range, but in southern populations, breeding activity and oviposition may extend into September or October (Cupp 1971. Herpetologica 27:308-310; Petranka 1998. *op. cit.*). This female was found in a moss-enclosed crevice on a rocky outcrop in Bays Mountain Park and Planetarium, Sullivan County, Tennessee, USA. The crevice (width = 11.4 cm, height = 2.5 cm, depth = 1 cm) was unusually dry compared to nearby crevices and covered by Pincushion Moss (*Leucobryum albidum)* (Fig. 1B). The egg mass (diameter = 0.4-0.5 cm) consisted of approximately 10-15 polarized and spotted eggs. While I could not get an accurate embryonic stage, the eggs were most likely nearing hatching given the time of year. *Aneides* typically breed in May or June and embryos take 2-2.5 months to develop (Gordon and Smith 1949. Copeia 1949:173-175). Given the number of eggs, I suspect the female was sitting on a single clutch that was most likely her own (Soto et al. 2021. *op. cit.*). Unlike other species, such as the Northern Two-Lined salamander (*Eurycea bislineata*), Green salamander females do not participate in communal oviposition (Jockusch et al. 2014. J. North Am. Herpetol. 2014: 87-92). The female was defensively positioned with her head to the left of the clutch and her tail curled on the opposite end. Females have been observed lunging and biting during the guarding period if they feel threatened (Gordon 1952. Am. Midl. Nat. 47:666-701). However, this behavior was not observed most likely due to the short duration of interaction.

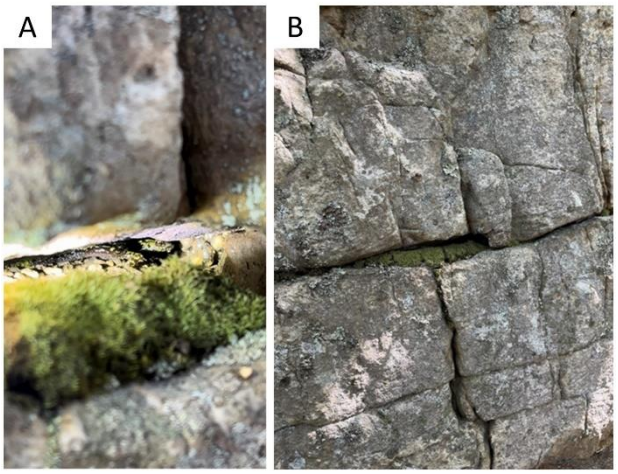

Figure 1. (A) A female Green Salamander (*Aneides aeneus*) brooding her clutch of 10-15 eggs on 3 September 2024 in a moss-covered crevice, Bays Mountain Park and Planetarium, Sullivan County, Tennessee. (B) The crevice, covered by Pincushion Moss (*Leucobryum albidum),* where the female Green Salamander (*Aneides aeneus*) was located.

On 10 October 2024 at 1236 h, I observed the same crevice, discovering six hatchlings but no sign of the female. Green salamanders' incubation period is estimated to be 67 to 91 days (Wyatt 2010. *op. cit*.).

Females will brood their eggs and remain with their hatchlings for 3-5 weeks post-hatching with a nest failure rate of 20-40% (Wyatt 2010. *op. cit.*). Successful hatching heavily depends on the female's brooding abilities to protect the eggs from predators and pathogens (Cantrell 2012. *op. cit*.). Green salamanders directly develop without a larval stage, so hatchlings resemble small adults ranging from 18.5-23 mm long (Cantrell 2012. *op. cit.*). After spending a few months in the hibernacula, the hatchlings will disperse to seek other crevices (Wyatt 2010. *op. cit.*). The observed green salamander hatchlings had likely spent a little over a month in this crevice, with the egg sack still intact and hanging on the right of the crevice ceiling (Fig. 2A). Assuming the eggs hatched shortly after the first observation on 3 September 2024, the hatchlings would be approximately 37 days old at the time of the second observation on 10 October 2024, which is within the maximum incubation period (Wyatt 2010. *op. cit.*). The hatchlings showed little to no activity, barely moving around the back of the crevice. On the same day, I found another crevice 13.27 m east with an adult green salamander and two juveniles. I was only able to photograph one juvenile due to the narrowness of the crevice (Fig. 2B). This crevice (width = 10.1 cm, height = 1.31 cm, depth = 1 cm) lacked moss at the entrance (Fig. 2C). The adult's sex could not be determined. The two juveniles sat on the right side of the crevice while the adult was on the opposite end in a defensive position with its tail in front of its face.

The current observation contributes to a growing understanding of the species' nesting behavior in Tennessee. Only a few observations in the state have been previously recorded. Four nests were observed in 2008 and 2009 at the Myatt Creek drainage located on the Catoosa Wildlife Management Area (WMA) in Cumberland County, TN (Wyatt 2010. *op. cit.*). In 2008, one female was observed guarding eggs on 10 July while another female was found guarding her eggs on 23 July (Wyatt 2010. *op. cit.*). The eggs found on 10 July began hatching by 18 September and appeared to all hatch by 3 October; however, the second female and only one of her hatchlings were visible on 3 October as the eggs had not hatched yet (Wyatt 2010. *op. cit.*). On 10 October, the first female's five hatchlings were observed lacking her presence and only two hatchlings were observed with her on 20 October (Wyatt 2010. *op. cit.*). On the same day, the second female and three hatchlings were present in the crevice, and all eggs seemed to have hatched (Wyatt 2010. *op. cit.*). Two additional observations of two females brooding on different rock outcrops on 9 July 2009 were made, but follow-up observations did not occur (Wyatt 2010. *op. cit.*). These findings support the assertion that females guard their eggs, remain with their hatchlings for a few weeks, and hatchling success is contingent upon the female's protective care. Additionally, egg number variation and the timing of hatching across observations reinforces the idea that breeding periods and incubation times vary depending on geographic location and environmental conditions.

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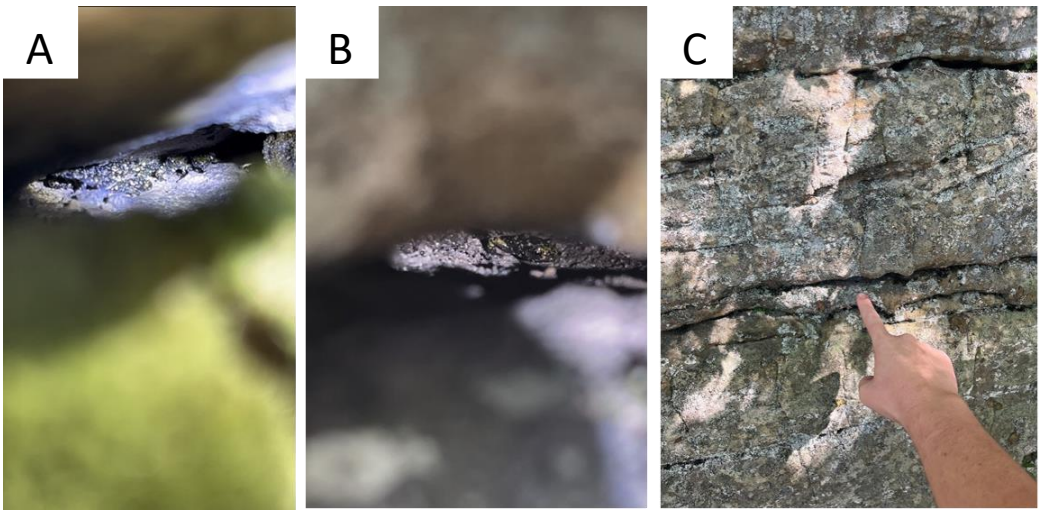

Figure 2. (A) The six Green Salamander (*Aneides aeneus*) hatchlings found in the same crevice on 10 October 2024, Bays Mountain Park and Planetarium, Sullivan County, Tennessee. (B) One of the two juvenile Green Salamanders (*Aneides aeneus*) found in a crevice 13.27 m away from the first crevice. (C) The crevice where one adult and two juvenile Green Salamanders (*Aneides aeneus*) were located.

***ANEIDES AENEUS* (Green Salamander). RARE OCCURRENCE AT A SITE WITHIN THE EASTERN HIGHLAND RIM THAT IS REGULARLY SURVEYED FOR AMPHIBIANS.** The Green Salamander (*Aneides aeneus*) is a rarely encountered species in Tennessee that occurs across the Cumberland Plateau and Ridge and Valley physiographic regions; however, individuals are occasionally observed in the Eastern Highland Rim (Fig. 1). Populations have been declining in recent decades due to habitat destruction (Wilson 2003. Contemp. Herpetol. 2:1-10.). As such, the species is listed as threatened or endangered in most states in which it occurs (Thames et al. 2021. Tenn. J. Herpetol. 4:4-13.) and any information regarding its habits or distribution across the range is useful to understand the species' ecology and prevalence across the landscape.

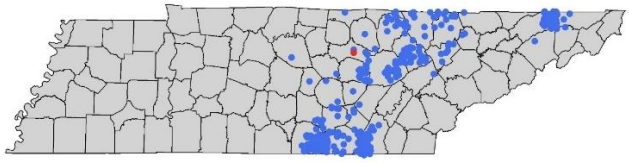

Figure 1. Known records of Green Salamanders (*Aneides aeneus*) in Tennessee per the Tennessee Herp Atlas (accessed by J. Grady 25 November 2024). Blue circles show all records from iNaturalist, GBIF, and APSU museum records which have GPS coordinates (n=359). Many APSU records (n=46) include county-level data only and are not shown. Four such records are from Putnam county, but field notes indicate these are from the Cumberland Plateau. The red circle approximates the location for the current record. The map was generated in R studio using the 'ggplot2', 'sf', 'tigris', and 'dplyr' packages.

On 5 July 2024, I discovered a juvenile Green Salamander at City Lake Natural Area (CLNA) in Cookeville, TN (36°07'58.2"N 85°26'40.8"W) within a rock crevice adjacent to a series of waterfalls (Fig. 2). Although the species is known from several records in Putnam County, this record is noteworthy because it occurs in the Eastern Highland Rim rather than the Cumberland Plateau where the species is more common. Per the Tennessee Herp Atlas (accessed 25 November 2024; Fig. 1), there is one other record of the Green Salamander in the Eastern Highland Rim of Putnam County. That record is 4 km north of CLNA. Moreover, there are fewer than 20 records of the salamander West of the Cumberland Plateau in the Eastern Highland Rim with a single record from the inner Nashville Basin. Such rare occurrences indicate a few scenarios. First, the species may be present west of the plateau within only a few pockets of suitable habitat which are relatively isolated (Thames et al. 2021, *op. cit*.). Thus, specimens may be commonly encountered at specific locations should those locations be surveyed regularly. Alternatively, the species may be relatively widespread across the Eastern Highland Rim, but at very low densities. In this scenario, even sites regularly surveyed may fail to detect individuals. Finally, populations may be relatively sparse, and densities low. Regardless, this record is useful because it occurs at a location that has been regularly surveyed for salamanders across many decades with no previous report of the Green Salamander (see below).

CLNA is often used for field laboratory exercises for Tennessee Tech University courses (e.g. Herpetology). Indeed, faculty have consistently brought students to this site to look for salamanders since the 1960's, when Ray Jordan first joined the faculty of Tennessee Tech's biology department. Thus, the site has been searched by faculty and students regularly for many decades with no reported occurrence of the Green Salamander until now. Survey methods at this site typically instruct undergraduate students to gently turn rocks and logs in and around the stream and waterfalls and search crevices in rock outcroppings, using flashlights. Given the abundance of surveys over many years with no prior detection, a likely explanation is that the species has been present at the site but at very low abundance.

There are a few reasons why Green Salamanders have been previously undetected at CLNA. First, Green Salamanders are most active during the summer months, particularly during May and June (Petranka. 1998. The Salamanders of the United States and Canada, Smithsonian Books, Washington, D.C., USA); however, surveys usually occur in the Fall and Spring, corresponding with the university schedule. Additionally, the habitat searched may not correspond with habitat most used by Green Salamanders at this site due to competitive exclusion. Five species of salamander

are abundant at CLNA: Dusky Salamanders (*Desmognathus* sp.), the Two-lined salamander (*Eurycea bislineata*), Slimy Salamander (*Plethodon glutinosus*), Zig-zag Salamander (*Plethodon dorsalis*) and Cave Salamander (*Eurycea lucifuga*). Elsewhere, Green Salamanders may be encountered hiding within rock crevices which are not overly wet but are shaded by dense canopy cover (Petranka. 1998. *op. cit*.). At CLNA, these microhabitats are commonly occupied by the other species listed above, particularly Slimy Salamanders and Cave Salamanders. There is some evidence that Green Salamanders compete with *Plethodon* species and stratify habitat when they co-occur (Petranka. 1998. *op. cit*.), which may be an additional reason Green Salamanders are not abundant at the site or not abundant in locations commonly searched. Thus, the combination of low abundance, competitive exclusion from commonly searched microhabitats, and timing of surveys may have collectively resulted in the lack of detection of the Green Salamander at CLNA.

CLNA is in an area with moderate suitability for Green Salamander occurrence (Thames et al. 2021 *op. cit*.). Niemiller et al. (2022, Herpetol. Conserv. Biol. 17(2):249-265) predicted that Green Salamanders would occur in this transition zone between the Eastern Highland Rim and Cumberland Plateau and noted the absence of records from Putnam County assuming it was due to a lack of surveys. My observation indicates that an increase in the number of surveys would not necessarily enhance the number of occurrences in this transition zone, particularly if those surveys are not tailored to the very specific habitat and seasonal activity of Green Salamanders. The surveys conducted at CLNA, though sufficient to detect the diversity and abundance of most species at the site, were not targeted searches for Green Salamanders. Indeed, detection probability of the species may be exceedingly low outside the Cumberland Plateau during such surveys if populations are sparse and densities low. Therefore, this occurrence emphasizes the importance of searching for Green Salamanders during the optimal detection period (likely May to July). Regardless, this sighting is encouraging because it supports the prediction of Niemiller et al. (2022, *op. cit*.), that populations are more common across the Eastern Highland Rim than previously thought.

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Figure 2. Juvenile Green Salamander (*Aneides aeneus*) discovered at City Lake Natural Area in Cookeville, TN on 5 July 2024.

Geographic Records

***APALONE SPINIFERA* (Spiny Softshell).** USA: TENNESSEE: Chester Co.: South Fork Forked Deer River (35.44920˚N, -88.60432˚W; WGS 84). 1 April 2024. Corey J. Fleak. Verified by Jessica Grady. David H. Snyder Museum of Zoology, Austin Peay State University (APSU 20762, color photo). One individual was inadvertently captured by angling on a hook baited with chicken liver. This species was previously reported from Chester County in 1938, however, no specimens were vouchered (Endsley 1954. J. Tenn. Acad. Sci. 29:36-41). Endsley (1954, *op. cit.*) described the species as common from west Tennessee but stated that only one individual was observed from the South Fork Forked Deer River during his study. Our observation represents the first vouchered individual and the first documented observation for this species from Chester County in ca. 86 years.

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Abstracts of the 30th Annual Meeting of the TN Herpetological Society, Bristol, TN

Student Oral Presentations

Can variable amounts of poly(I:C) quantifiably affect behavioral fever

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A variety of threats are harming amphibian populations worldwide. Disease outbreaks being of major concern. While metabolically-induced fever may be part of the endothermic response to a pathogen, ectotherms are unable to increase body temperature by similar means. However, several studies with ectotherms indicate they may seek out warmer microclimates in response to a pathogen exposure through a phenomenon called "behavioral fever". An understanding of the extent to which amphibians exhibit this behavior could provide insight on their capacity to deal with disease exposure. The goal of this project is to explore how treatment with a chemical pyrogen (a substance that can mimic pathogen exposure) affects behavior and dermal corticosterone of Slimy salamanders (*Plethodon glutinosus*). Salamanders were randomly assigned to a treatment of the pyrogen poly(I:C): control, 7.5 µg/g, 15 µg/g, and 21.5 µg/g. Individuals were injected and placed within a behavioral arena. Dermal corticosterone was swabbed at three points: once upon capture, once before being placed in the arenas, and once after 36-hours had passed.

How do spring peeper advertisement calls signal Bd infection status?

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Males of many frog and toad species advertise in leks. In these systems, female choice is based on male advertisement calls. Calls are thus evolutionarily selected to convey information about an individual's quality. Disease status may affect the energy a male can allocate toward calling behavior, although it is unclear in what way and whether this is beneficial for males or females. The Hamilton-Zuk hypothesis of sexual selection posits that female selection for parasite resistance has shaped the ornamentation of male sexual signals, meaning that males with low infection levels will have more elaborate calls. Conversely, the terminal investment hypothesis predicts that individuals facing death allocate more energy into immediate reproductive investment. Evidence for these hypotheses is mixed across animal systems, and there is no clear consensus in the frog literature. To test these hypotheses, we sampled 63 male spring peepers (*Pseudacris crucifer*) and natural infections of amphibian chytrid fungus (*Batrachochytrium dendrobatidis*, Bd) around Knoxville, TN. We analyzed 30 calls per male to test whether vocal performance was associated with fungal load and found that while Bd infection did not influence most call parameters, males with high fungal loads tended to have shorter calls with narrower bandwidths. These findings support the Hamilton-Zuk hypothesis and suggest that information about infection status is conveyed in the calls of spring peepers. Future studies will test whether female spring peepers pay attention to such differences when making mating decisions.

Weller's wannabe? Investigating possible mimicry between *Desmognathus orestes* and *Plethodon welleri*

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Batesian mimicry occurs when a model species displays warning coloration to signal an unfavorable trait to predators, and a mimic species possesses the same coloration, but no such trait. This phenomenon has been observed in salamander species such as *Plethodon jordani*, the model, and *Desmognathus imitator*, the mimic. In this case, *P. jordani* produces a noxious, unpalatable secretion that is sticky and acts as a deterrent to predators while *D. imitator* does not. A mimetic relationship has been hypothesized between two species found in the Mount Rogers National Recreation Area: *Plethodon welleri* (model with noxious secretions) and *Desmognathus orestes* (mimic with no secretion). In this study, we surveyed sites separated by 30.5m in elevation, in Virginia's Smyth, Grayson, and Washington counties. Bidirectional transects of 10m by 5m were completed at each site. For each *P. welleri* and *D. orestes*, we matched their color to a swatch in the Herpeton Color Catalogue for Field Biologists. We then calculated the proportions of overlapping colors for *D. orestes* and *P. welleri* for each elevation. Our results suggest that *D. orestes* appears to be mimicking *P. welleri* based on the similarity of dorsal colors in areas of co-occurrence and a significantly reduced similarity in areas without co-occurrences.

Investigating the genomic variation among Green Salamanders (*Aneides aeneus*) in Bays Mountain Park and Planetarium

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Anthropogenic and environmental constraints have contributed to the global decline of amphibians. Comprehensive taxonomic information on threatened species is crucial for identification and provides valuable insights on crafting conservation strategies tailored to species' distinctive attributes and needs. Green salamanders (*Aneides aeneus*) are found throughout the Southern Appalachian Mountains and are labeled as vulnerable or imperiled cryptic species. This study aimed to characterize the genetic diversity in A. aeneus at Bays Mountain Park (BMP) in Kingsport, Tennessee to better

understand the aeneus complex and increase the demand to recognize them as an evolutionary significant unit (ESU). Previous mitochondrial and nuclear phylogenetic analysis determined four distinct lineages within the complex: Northern Apps, Southern Apps, Hickory Nut Gorge (HNG), and Blue-Ridge Escarpment (BRE). Data from molecular studies investigating the genetic relationship among *aeneus* individuals are delimited making it difficult for researchers to assess their conservation status accurately. Tail tips were collected from individuals in BMP from April to October 2024. Genetic variation was assessed by targeting and comparing two mitochondrial genes with high mutation rates to address the presence or absence of gene flow. It was hypothesized that individuals in BMP would be genetically similar and exhibit a close genetic relationship to individuals in the characterized northern lineage. It was also hypothesized that individuals in BMP could be genetically isolated from the northern lineage.

Geometric morphometrics of the Eastern Newt's limbs across polyphenic life stages

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Eastern Newts (*Notophthalmus viridescens*) are a ubiquitous member of eastern North America's caudate fauna. Unlike the common amphibian with two major life stages, their life cycle is typically split into three phases, commonly called a triphasic life cycle. The larvae of Eastern Newts are fully aquatic, eventually metamorphosing into terrestrial juveniles called efts. Upon sexual maturity, the eft will metamorphose into a semi-aquatic adult whose external morphology resembles other aquatic salamander species. The Eastern Newt is considered polyphenic and possesses alternative life cycle strategies that are less common, including an aquatic juvenile stage and a facultatively paedomorphic adult stage. Since the different life stages of these salamanders occupy different ecological niches (terrestrial vs. semi-aquatic vs. fully aquatic) throughout their lives and, therefore likely experience various physical forces on their skeletons, they provide a unique model to study musculoskeletal changes across ontogeny and ecology. We hypothesize that ontogenetic niche shifts and the associated shifts in locomotion biomechanics will coincide with shifts in the morphology of limbs. Using micro-computed tomography (µCT) and geometric morphometrics (GMM), we quantified shape changes of limb bones across different life stages (terrestrial juvenile, aquatic juvenile, paedomorph, adult). Our findings indicate a correlation between the form and function of specific bones in the limbs, with ecological differences and the associated biomechanics.

Salamander distribution over a 65-year period on Mount Rodgers in southwestern Virginia

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Climate change is hypothesized to pose a significant risk for species whose ranges are restricted by barriers to dispersal, potentially preventing organisms from shifting their distribution to track favorable climatic conditions. High-elevation species may be vulnerable as movement to their preferred climatic niches might not be possible. This may be particularly true for species that are high-elevation endemics, restricted to climatic conditions found only on mountains. We took advantage of past sampling efforts in a portion of the southern Appalachian Mountains, Mount Rogers National Recreation Area, Virginia, to investigate changes in the occurrence of 12 Plethodontid salamanders in relation to elevation over a 65-year period. Surveys of occurrence were initially conducted in the late 1950s and early 1990s, and we repeated these surveys from 2008-2012 and 2024 including repeated surveys at a subset of sites to allow estimation of detection probability. Multi-season occupancy models identified significant relationships between salamander species occurrence and elevation. We observed slight range changes from the 1990s to 2012. Additionally, preliminary data from 2024 suggests salamander populations of which species are moving upward on southward facing slopes.

Assessing stress hormones in Green Frogs (*Lithobates clamitans*) throughout the mating season

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Amphibian populations are declining due to combinations of abiotic and biotic stressors throughout their annual active periods. Understanding how these stressors affect the physiology of amphibians is vital to conservation efforts. The goal of this study was to investigate corticosterone in Green Frogs (*Lithobates clamitans*) in response to an acute stressor and throughout the mating season. To collect corticosterone, dermal swabbing was performed in the field from May to September of 2024 in ponds at Bays Mountain Park in Kingsport, Tennessee. Data were collected for six consecutive days each month including dermal swabs, body metrics, water chemistry, weather conditions, and observational variables. The acute stress response was assessed by capturing individual frogs and taking repeated swabs over the course of a one hour holding period. The collected swabs were later analyzed in the lab using enzyme-linked immunosorbent assay (ELISA) kits to quantify corticosterone levels. It was expected that corticosterone levels will be greater in males with both sexes experiencing a peak in August.

Where the rubber eels meet the road: Mapping the potential range of *Typhlonectes natans* in Florida using ecological niche modeling

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Florida is a globally recognized hotspot for introduced species, with nonnative herptiles being especially abundant. Among the most recently documented introductions is the neotropical aquatic caecilian *Typhlonectes natans*, which is currently found in man-made canals around the Miami-Dade area. Other introduced species have expanded from these localized urban habitats into surrounding regions, suggesting a similar possible trajectory for *T. natans*. To inform how a potential range expansion could proceed, we used maximum entropy niche

modeling to establish the extent of currently suitable habitat for *T. natans* in Florida and projected future suitability under three different carbon emission scenarios. Current model results suggest habitat suitability is constrained by low temperatures and moisture availability, with suitable habitat predicted south of the frost line in Florida. This potential habitat encompasses areas of Everglades National Park and Big Cypress National Preserve, both critical conservation areas for native species. Future projections suggest that under all emission scenarios, suitable habitat for *T. natans* will likely remain restricted to South Florida. While continued range expansion is possible without human management, the negative impacts of increasing seasonality and competition from both native and nonnative species could hamper the spread of *T. natans*. These results suggest that South Florida is likely to remain a suitable habitat for *T. natans* into the future, but its invasive potential across the rest of Florida may be limited.

Monitoring the response of herpetofaunal assemblages to longleaf pine forest restoration in William B. Bankhead National Forest

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The United States Forest Service is working to restore longleaf pine (*Pinus palustris*) forests across the southern range of the William B. Bankhead National Forest through strategic thinning, replanting, and prescribed burning. To monitor how herpetofaunal assemblages responded to these efforts, we deployed 16 drift fence arrays with funnel traps and pit fall traps across a chronosequence of forest restoration stand types: Control (no restoration), Early-stage, Late-stage, and Desired Forest Condition (DFC). Early, Late, and DFC stands are burned on a 2–5 year rotation. Stands were monitored from May to August for four years (2021-2024). We used an ordination technique, non-metric multidimensional scaling, to examine patterns in community composition across stand types. Restoration treatments had a significant effect on reptile assemblages (p-value = 0.001), but not on amphibian assemblages (p-value = 0.52). The presence of emergent ephemeral wetlands is likely more significant than restoration treatments in determining amphibian assemblages. For reptiles, the primary ordination axis revealed a distinct gradient between control stands, dominated by generalist species, and DFC stands, characterized by specialist species. Both Early and Late-stage restoration treatments were characterized by a mixture of generalist and specialist species. Overall, the abundance and richness of herpetofauna was greatest in Early, Late, and DFC stands, apart from salamanders which had the greatest abundance in Control stands.

The influence of symbiotic algae on ranid embryonic survival and development

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The single-celled chlamydomonad alga *Oophila amblystomatis* is known to colonize the inner egg capsules of certain pond-breeding amphibian species. Previous experiments with ambystomatid salamanders indicate a positive correlation between algal density and embryonic growth, survival, hatching synchrony, and hatchling body size, suggesting a mutualistic relationship. However, the nature of this symbiotic relationship in other documented host taxa, such as ranid frogs, remains unclear. We raised Northern Red-legged Frog (*Rana aurora*) and Wood Frog (Rana sylvatica) egg masses under three light treatments (24-hour light, 12:12 light:dark cycle, and 24-hour darkness) to test whether embryonic ranid hosts benefit from the symbiotic association with *Oophila amblystomatis*. Due to previously documented differences in egg mass oxygen transport and embryonic responses to hypoxia between ranid and ambystomatid hosts, we hypothesized that light treatment will have less of an influence on R. aurora and R. sylvatica embryos compared to results from similar experiments with ambystomatids. We found that eggs raised in 24-hour darkness experienced decreased survival compared to those raised in lighted treatments, but hatchling body size, stage at hatching, or rate of development was not influenced by light treatment. This differs from previous experiments with ambystomatid hosts and suggests greater diversity in embryo-algal relationships within pond-breeding amphibians.

Ecological connectivity and in-kind mitigation: A case study with Four-toed Salamanders in Oak Ridge, TN

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Ecological connectivity is critical to the survival and long-term viability of populations but is often overlooked in regulatory frameworks. We integrated landscape-level processes into a mitigation strategy for impacts to aquatic resources on the U.S. Department of Energy (DOE) Oak Ridge Reservation (ORR) in eastern Tennessee. Wetlands on the ORR, which contain significant breeding populations of the imperiled Four-toed Salamander (*Hemidactylium scutatum*), will be impacted by construction of an environmental waste disposal facility. We emphasized habitat connectivity through models that prioritized an area's importance to natural area connectivity and maintenance of population structure for an affected habitat specialist (Four-toed Salamanders). We also emphasized in-kind mitigation through the preservation and enhancement of ecologically similar resources and the translocation and establishment of a new subpopulation of four-toed salamanders elsewhere on the ORR. We translocated dozens of four-toed salamander nests, reared larvae in a unique outdoor mesocosm setup, and We ultimately released over 500 juvenile salamanders that originated from the impacted site into the chosen mitigation wetlands. This study helps show that ecological connectivity and the conservation of species that are not afforded explicit regulatory processes can be effectively and efficiently integrated into environmental decision-making and land use planning.

Professional Oral Presentations

Status and update of Amphibian and Reptile Atlases of Tennessee

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The David H. Snyder Museum of Zoology at APSU houses the largest amphibian and reptile collection in Tennessee. The specimens in the collections were the basis for the biogeographic, ecological, and taxonomic information used in the publication of the Atlas of Amphibians in Tennessee (1996) and the Atlas of Reptiles in Tennessee (2008; Redmond and Scott). Data from the atlases are important for conservation planning, including the Tennessee State Wildlife Action Plans. For 23 years online versions of the atlases were updated quarterly (Redmond and Scott), but updating the static content of those legacy atlases is no longer possible. Here we present recent changes to the Tennessee Herp Atlas system including migrating all content to a database-driven web page and a more contemporary digital framework drawing species occurrence information from multiple online data sources. A live demo of the new atlases will be given.

A brief history of the Tennessee Herpetological Society

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As the Tennessee Herpetological Society (THS) celebrates its 30th anniversary, it's important to recall the society history. Using materials from Lisa Powers and Chris Ogle, I wrote a new narrative of THS history for the society website and added a diversity of historical documents. THS began as a loosely organized group in 1992, but first held a conference in October 1994 at Lincoln Memorial University with keynote speaker Dr. George Folkerts. In 1995, the conference members helped pass legislation designating the Tennessee Cave Salamander and Eastern Box turtle as the state amphibian and reptile. In 1996, the society began sequestering funds for the Chad Lewis Memorial Grant, in honor of a graduate student who passed unexpectedly. The grant has grown to a $1000 award, supported by a live auction at each meeting. In 1999, during the 5th annual conference at Tennessee Tech, attendees established a formal organization, and the THS was born! The first meeting as a formal society was held in 2000 at Chickasaw State Park. In 2017, a generous donation enabled the creation of the Niemiller Travel Scholarship for students, and the first scholarship was delivered in 2018. That same year, the society published the first volume of the Tennessee Journal of Herpetology. Across the 30-year history of THS, it is clear the society has been unwavering in its commitment to research of natural history and conservation of southeastern reptiles and amphibians, with particular focus on supporting the efforts of undergraduate and graduate students.

Machine learning for bioacoustics analysis: the frogs and toads of Steele Creek Park

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Close monitoring of amphibian populations is essential for making informed conservation decisions. Amphibian population trends are often markers for ecosystem health, particularly in the face of habitat loss, climate change, and noise pollution, as they are highly susceptible to population decline due to environmental changes. Currently, amphibians are experiencing a global population decline, necessitating more research on the ecological impacts of these changes. For vocalizing taxa, bioacoustics monitoring has emerged as a valuable tool for gaining insights into biodiversity by studying the acoustics of an ecosystem. Passive acoustic monitoring allows researchers to collect data without necessitating their full time presence in the field, but often results in large datasets that are labor-intensive to analyze manually. To offset the time needed to analyze this data, machine learning and artificial intelligence tools can be trained to identify and classify audio collected from field research. From April through September 2023, researchers deployed passive audio monitoring devices to capture frog and toad calls at Steele Creek Park in Bristol, Tennessee. Custom artificial neural networks were implemented to aid in the acoustic analysis and audio classification of over 2700 hours of audio data. This presentation will highlight the continuing efforts of researchers at Steele Creek Park, and how these methods can be applied to research, conservation, and education in Tennessee and beyond.

"Ex Situ" dinosaur ichnites from the late Triassic trostle quarry (Newark supergroup), Adams County, Pennsylvania

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The Newark Supergroup is a series of Upper Triassic – Lower Jurassic age rocks existing as a north-south band across much of the eastern slopes of the Appalachian Mountains in eastern North America from Nova Scotia to South Carolina, and preserves a rich record of evolution and extinction during a tumultuous period in Earth History. The Gettysburg Shale is overlain by the York Haven Diabase sill, a course-grained diabase intruded as part of the rifting of the supercontinent Pangaea and is indicative of the late Carnian/early Norian stages of the Late Triassic. Described here are tetrapod ichnofossils from "ex situ" quarried blocks of Gettysburg Shale, observed in Adams County (south-central), Pennsylvania. At least three ichnotaxa are present: "*Atreipus milfordensis*", "Anchisauripus" sp, and a manus/pes combination from a large, quadrupedally locomoting, tetrapod similar to "*Eosauropus cimarronensis*". The pes of the latter is circular in shape and measures approximately 14 cm in diameter. The manus is ovate and approximately 10 cm by 3 cm. "*Eosauropus cimarronensis*" is known from from Arizona, Wales, and Italy, and likely represents a sauropodomorph trackmaker. The presence of an "Eosauropus"-like trace was not previously known from the Newark Supergroup and suggests a more derived sauropodomorph (and more diverse dinosaurian fauna overall)

was present in Late Triassic North America than was previously thought.

More complex choice environments level the playing field for inconsistent or unattractive treefrog males

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Receivers in many taxa attend to the repetition rate of signals, an emergent property requiring receivers to sample over a period of time. However, signalers show remarkable within-individual variation or "inconsistency". This inconsistency makes decisions uncertain, and is also a trait to which receivers attend. In nature, receivers must discriminate among many signalers based on multiple signal components. We measured sexual selection on two traits, call rate and inconsistency in call rate, in the diploid Gray Treefrog, *Hyla chrysoscelis*. For each of 125 receivers, we generated 8 unique hypothetical male phenotypes (1,000 total). These hypothetical males were represented by sequences of calls whose mean call rate (calls per min) and within-individual variation in call rate (coefficient of variation) were chosen randomly and independently from the range of natural variation. We assayed signal discrimination in 2-, 4-, and 8-choice phonotaxis tests (1,500 tests). Receivers overwhelmingly chose faster, more consistent call rates in 2-choice tests, but markedly less often in 4 and 8 choices. Results suggest inconsistent signals and noisy surroundings shelter males from selection.

Lightning Talks

Caging Four-toed Salamander nests reduces nest predation in northeastern Tennessee

Kalin J. Ferguson and M. Kevin Hamed
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Four-toed Salamanders (*Hemidactylium scutatum*) have disjunct populations within the United States and Canada. An increase in predation could negatively affect their populations and further alter their distribution. Using nest cages to protect threatened populations can increase their survival by reducing the chance of predation. We installed cages around Four-toed Salamander nests in northeastern Tennessee to test the efficiency of nest cages. We used a table of random numbers to select 65/120 nests to cage at our study sites at the South Holston Weir Dam and Bouton Tract in Sullivan County, Tennessee. Based on our camera trapping survey, we found that raccoons (*Procyon lotor*) were the only predators of uncaged four-toed salamander nests. Raccoon predation events resulted in moss being removed from the clump and the absence of the female and her eggs. Our nest caging experiment found that twenty-six percent of uncaged nests were preyed upon, and none of the caged nests experienced predation. We found nest cages to be an effective conservation tool in improving the nest success of Four-toed Salamanders and a method for land managers to conserve threatened populations.

Long term impacts of roadbed contamination on salamander communities in the Great Smoky Mountains

Ethan Furr, Jon Davenport, Benjamin Fitzpatrick
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Beech Flats Creek (BFC), a high elevation headwater stream in the Great Smoky Mountains National Park, was exposed to contamination by Anakeesta rock formations in 1963 resulting in fish and salamander mortality. A previous study revisited the stream and found that salamander community and age structure was still impacted 30+ years after the initial contamination. In the summer of 2024, we visited impacted and unimpacted sections of BFC and adjacent watersheds to observe if salamander populations had recovered since the 90's surveys. We completed night searches for adult salamanders in and around streams, and deployed leaf litter bags to detect and count any larvae in the stream. Overall, we found a higher proportion of adult salamanders at our disturbed sites, and few/no larvae in our sites closest to the road contamination. Our findings suggest that BFC may have been recolonized by adult salamanders in contaminated sites but that recruitment may still be low.

Hot Genes, Cool Salamanders: Thermal Response and Comparative Gene Expression in Streamside Salamander Populations

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In light of rising global temperatures and the urban heat island effect, understanding the adaptive responses of ectothermic species like the Streamside Salamander (*Ambystoma barbouri*) is crucial for effective conservation. This study aims to elucidate the genetic mechanisms underlying thermal tolerance in A. barbouri populations across latitudinal gradients, offering insights into their resilience to climate change. We conducted a differential gene expression analysis using RNA sequencing, exposing individuals from different populations to two thermal treatments: 10°C (optimal conditions) and 20°C (thermal stress). This design allowed us to assess gene expression changes in response to temperature fluctuations during critical developmental stages. We employed DESeq2 to identify differentially expressed genes (DEGs) and compare populations. While analysis is ongoing, we anticipate revealing transcript abundance variations, highlighting unique and shared DEGs across populations. Functional annotation and enrichment analyses are expected to identify key biological pathways involved in thermal stress responses. Ultimately, this research aims to improve our understanding of the molecular mechanisms driving phenotypic differences and adaptive responses in *A. barbouri*. The insights gained will inform conservation strategies and management practices to preserve this species amid environmental changes, while providing a framework applicable to other species facing similar challenges.

Diet of 3 Co-occurring Large *Plethodon* Salamanders

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Three species of large *Plethodon* salamanders co-occur in northwestern NC; *Plethodon yonahlossee*, *Plethodon*

montanus, and *Plethodon cylindraceus*. They occupy similar habitats so it has been hypothesized that dietary niches may differ to allow co-occurrence. We performed gastric lavages on >10 individuals of each species at three different sites. All regurgitated prey items were preserved for identification and enumeration. Out of the 170 samples collected thus far, we've processed 60. From those initial 60 samples, there is a high degree of overlap in the diets of the three species. There is also high overlap among the most common prey items: ants, springtails, millipedes, mites, and beetle larvae.

Determining niche overlap of two woodland salamanders in Great Smoky Mountains National Park

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Plethodon salamanders have been identified as model organisms for ecological and evolutionary research. These amphibians are typically abundant where found and play vital roles in their ecosystems. Southern Zigzag Salamanders, *Plethodon ventralis*, and Southern Redback Salamanders, *Plethodon serratus*, are two small-bodied woodland salamanders with limited range overlap in the Great Smoky Mountains National Park and the surrounding area. These two species are ecologically similar, and research is lacking to explain how they coexist. The many potential mechanisms for coexistence are widely debated. This research focuses on niche partitioning as a possible explanation of *P. ventralis* and *P. serratus* coexistence. In particular, the partitioning of dietary resources and the related trophic morphology will be studied by sampling sympatric and allopatric populations of the two salamander species. Stable isotope analysis and geometric morphometric analysis will be employed to determine if niche overlap exists in isotopic space and head shape morphology. Based on preliminary results at nineteen sites, it appears there is overlap in the isotopic niche space of allopatric and sympatric populations of *P. ventralis* and *P. serratus*. Geometric morphometric data are awaiting analysis, but I hypothesize that overlap will be found in morphological space. Environmental parameters may play a bigger role in the coexistence of the two woodland salamanders in question. This research will expand our understanding on what factors may enable coexistence of ecologically similar species.

Poster Presentations

Pathogen prevalence and habitat selection implications of free-ranging Eastern Box Turtle populations in the Central Basin of Middle Tennessee

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This study investigates pathogen prevalence in Eastern Box Turtles (EBTs) within Tennessee's Central Basin, a region where habitat fragmentation, loss, and urbanization create significant environmental pressures. These pressures, coupled with limited green space, are expected to exacerbate pathogen susceptibility and alter the behavior of EBTs. Our hypotheses are: (1) EBTs will select macrohabitats composed of deciduous forests near water bodies and microhabitats with deeper litter cover compared to random points; (2) pathogen and co-pathogen prevalence will be greater in this study due to higher urban impacts compared to previous studies; and (3) EBTs with positive pathogen detections will exhibit altered habitat use patterns compared to those without pathogens. Turtles were notched, swabbed, and fitted with transmitters for radio telemetry tracking at both the Ellington Agricultural Center and Nashville Zoo. Detailed weather, habitat, and behavioral data were systematically collected during field surveys at each detection site. We expect results to show an increased incidence of co-pathogen detection, along with significant behavioral and movement changes in infected turtles. These outcomes will provide essential insights into disease ecology in EBTs and guide improved habitat management strategies to mitigate pathogen spread. Ultimately, the study aims to enhance conservation efforts for EBTs in the Central Basin by addressing critical knowledge gaps regarding pathogen interactions and microhabitat use.

Molecular detection of a cryptic salamander: Development of an eDNA assay for the detection of the mud salamander (*Pseudotriton montanus*).

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The mud salamander (*Pseudotriton montanus*) is a notoriously cryptic semi-aquatic Plethodontid found throughout much of the eastern United States; reports of decades passing between observations of this species in areas of known occurrence are common. Although it is listed as imperiled or in need of conservation throughout much of its range, with extirpation suspected in many areas, relatively little is known of its current distribution due to its secretive nature. We developed a species-specific qPCR assay for use in eDNA detection of *Pseudotriton montanus*. Primers and probe were designed based on cytochrome b sequences obtained from specimens collected in central and eastern KY, compared to published sequences throughout the species' range, and screened in silico (twenty-seven species) and in vitro (seventeen species) for specificity against sympatric salamander species. The developed assay was field tested via the collection of water samples at sites known or suspected to serve as *P. montanus* habitat in Kentucky, Ohio, and Tennessee. Of the 69 samples collected, *P. montanus* eDNA was detected in eight, including all sites (six) in which P. montanus larvae were observed in the field. Sequencing of each environmentally-obtained amplicon confirmed detection of *P. montanus*. This work provides thoroughly vetted tools that should prove useful for future monitoring and range delineation of this highly cryptic species.

Further evidence for a chemical mirror in socially naïve sibling common garter snakes (*Thamnophis sirtalis*)

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The visually based mirror mark test, which various animals have successfully completed, notably apes, has been used to study self-recognition, sometimes equated with self-consciousness or

self-awareness. However, for non-visually dominant animals, a chemical mirror may exist. There are controversial studies on dog and wolf urine that support this hypothesis, but snakes are even more chemically reliant. A previous study with garter snakes showed a higher ratio of tongue flicks per movement on their own substrate compared to snakes fed with conspecific different diet, conspecific same diet, and clean substrates by males but not females. The current study quantified escape movements. We tested 12 male and 12 female garter snakes, *Thamnophis sirtalis*, with cage liners that were either clean, their own, or from same-sex siblings fed the same or different diet in order to test this possibility. The snakes were individually housed and fed either an earthworm or fish diet from birth. In videotaped 30-minute trials, escape movements from small enclosures were counted. Snakes of both sexes tried to escape significantly fewer times on their own substrate, both overall and in the first two 10-minute segments, compared to other stimuli. In light of this additional analysis, the possibility that squamate reptiles have a chemical "mirror" form of self-recognition is strengthened.

Analyzing sexual dimorphism and sex ratio in an East Tennessee population of Slider Turtles (*Trachemys scripta*)

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Understanding sex ratios and sexual dimorphic traits are important for monitoring and conserving wildlife populations around the world. For the past 17 years, the Clinch River Environmental Studies Organization has been collecting data on pond sliders (*Trachemys scripta*), including morphometric measurements and sex identification in Oak Ridge, TN. Here, we utilize this large data set to better understand changes in sex ratio over and sexually dimorphic traits. We found that male and female sliders are extremely sexually dimorphic, with females having longer and wider carapaces and plastrons and taller shells, while males have longer nails ($p<0.001$ for all comparisons). We also found a general trend to a more female-biased sex ratio over time, but especially in the last decade. This research helps us to better understand how long-term studies of aquatic turtles like *Trachemys scripta* can vary in sex ratios and morphological traits.

Comparative morphology of North American pitviper cranial bones with implications for fossil identification

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Snake fossils generally occur as isolated bones in fossil deposits with vertebrae being the most abundant element found. Cranial fossils are much less common, but could be more taxonomically informative than vertebrae which show more conservative morphology across related taxa. Hickory Tree Cave (HTC) in northeastern Tennessee, which includes deposits of possible Pleistocene age, has produced numerous snake remains, including some cranial elements. The majority of those remains are from pitvipers (Crotalinae). The morphology of isolated cranial bones of snakes has received little attention compared to vertebrae. This project aims to describe the morphology of isolated cranial bones of North American pitvipers and find apomorphic features to distinguish genera and species. Preliminary results show that there could potentially be apomorphies (not yet described) for Agkistrodon and Crotalus in at least the maxilla, prefrontal, ectopterygoid, pterygoid, and palatine. Specific apomorphies have not been examined yet. Further work will involve including more species and more individuals of pitvipers to examine the full range of variation in each taxon and compare the HTC fossils to the modern specimens.

Aquatic turtle captures over time: Assessing the impact of sampling conditions on capture efficiency

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Hoop netting is a common method of trapping in aquatic turtle research studies. However, research involving the effects of environmental conditions on the success rates of hoop netting aquatic turtle species is scant. For the past 17 years, the Clinch River Environmental Studies Organization has collected data on captured aquatic turtle species including pond sliders (*Trachemys scripta*), common snapping turtles (*Chelydra serpentina*), eastern musk turtles (*Sternotherus odoratus*), and painted turtles (*Chrysemys picta*) in Oak Ridge, TN. We utilized this long-term data set to assess the impact of environmental conditions on capture efficiency. We used linear regression to measure the relationship between capture rates and environmental conditions such as water temperature, precipitation, time of year, and specific pond sampling. We did not find any effect of precipitation, or the specific pond sampled. Additionally, we found no significant effect of temperature was found from when testing all turtle species together. However, we did find that temperature influenced capture rates when assessing turtle species separately. Capture rates of *T. scripta* decreased as temperature increased $r^2 = 0.145$ while capture rates of *C. serpentina* increased with temperature $r^2 = 0.06$. This study informed about the impact of environmental conditions on capture rates of varied species of aquatic turtles and their reaction. Lastly, this study demonstrates the potential for different thermal optima in *T. scripta* versus *C. serpentina*.

The Long-Term Effects of Thermal Developmental Plasticity on the Endangered Streamside Salamander (*Ambystoma barbouri*)

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Embryos of vertebrate ectotherms are particularly vulnerable to changes in temperature because they have little ability to thermoregulate. Although much research demonstrates embryonic temperature can alter fitness-relevant phenotypes via developmental plasticity, little research has considered the long-term effects of developmental temperature on ectotherms. The streamside salamander (*Ambystoma barbouri*) is an endangered species that oviposits in shallow, ephemeral streams which are subject to thermal variation over time. The purpose of this study was to determine the long-term effects of

developmental temperature during embryogenesis on adult fitness-relevant traits. Eggs were collected from streams of natural populations, incubated at naturally occurring temperatures (5°C, 10°C, and 20°C), and resultant metamorphs are currently being raised into adulthood to assess temperature effects on morphology (body size, head size, body mass), performance (speed and endurance), and physiological (growth rate) traits. We present preliminary results for morphology at 6- and 12-months post-metamorphosis and discuss our future endeavors to assess how interactions between incubation temperature and environmental temperature shape salamander performance traits. With these results, we aim to assess the potential for incubation temperature to influence fitness of the streamside salamander via lasting impacts on phenotypes.

Variability in Male Advertisement Calls of *Hyla chrysoscelis* in Eastern Tennessee

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Understanding differences in variability and specific properties of advertisement calls in Cope's gray treefrog, *Hyla chrysoscelis*, helps to reveal population dynamics as well as give insight into individual mall calling strategy. Last summer, we recorded male call data at 4 sites in East Tennessee for 64 males with 20 calls per male for a total of 1280 calls. We then measured 14 temporal and 4 spectral characteristics of each call using Raven Software. Data were temperature corrected to 20°C. Principal component analysis (PCA) was used to determine variation in males across the 4 sites. Coefficients of Variation within males (CVw) were calculated to classify signal traits based on within-individual variation. We expected to find population differences and clustering of males based on location. We also expect that differences in the amount of variation for specific call traits will give greater insight into these within-individual differences. Our findings contribute to the growing knowledge of signaling strategies employed by individual male anurans as well as population data for several sites within Eastern Tennessee.

Stable isotope analysis of dietary niche space in three coexisting *Plethodon* salamanders in North Carolina

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The southern Appalachians harbor a high diversity of lungless salamanders. Upwards of 6 closely related Plethodontid species can coexist in certain terrestrial or aquatic communities. Despite the coexistence of multiple species, 1-2 species tend to be numerically more abundant. Interspecific competition may explain this dominance, and prior research with terrestrial salamanders suggests that competition may limit the distribution and abundance of *Plethodon* salamanders. However, environmental parameters likely effect the extent of any competitive interactions. Three species of large-bodied Plethodon salamanders (*Plethodon montanus*, *P. cylindraceous*, *P. yonahlossee*) can be found coexisting in forested ecosystems of northwestern North Carolina. Little is known about the factors that permit this coexistence, but diet may be one contributing factor. Therefore, we sought to understand overlap in dietary niche space of these 3 species in 4 separate communities. We calculated isotopic niche space and diets of each species using tail tips from field collected individuals in summers of 2021-2022. We found significant overlap in niche space among the 3 species across all 4 communities. We also found that one species, *P. yonahlossee*, appears to be consuming different forest floor invertebrate guilds in comparison to the other 2 species. Our findings suggest that our 3 focal species may be eating diets of the same trophic level but there might be partitioning within the trophic group being consumed. This may provide some explanation for current patterns of coexistence.

Estimating Alligator Body Size Based on Skeletal Remains, with Application to the Gray Fossil Site of Northeastern Tennessee

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Body size is linked to many aspects of an organism's biology, and estimation of size is regularly employed in paleontological studies to better characterize life histories of extinct animals. Several studies have examined correlation of total body length to skeletal measurements in the American alligator (*Alligator mississippiensis*), with some being better predictors of total length than others. Femur length has been found to be tightly correlated with total body length in *A. mississippiensis*, and this relationship has been used to estimate body size of extinct crocodilians. Using the femur, we estimated the body size of Alligator from the Gray Fossil Site (GFS), an early Pliocene sinkhole lake deposit in the southern Appalachians of northeastern Tennessee. Our results suggest that the GFS Alligator is smaller on average than modern *A. mississippiensis*. A relatively smaller size in the GFS Alligator could reflect phyletic size differences between the extant and extinct form, inadequate sampling of the fossil record, or phenotypic plasticity related to environmental conditions and/or food availability. New data shows other limb elements may also be tightly correlated with total body length and useful for body size estimation size in *A. mississippiensis*, which is the focus of ongoing research.

30th Annual Meeting of the Tennessee Herpetological Society
26-27 September 2024
Steele Creek Park, Bristol, TN

Business Meeting Notes
Recorded by Joshua M. Hall

Award Recipients
Congratulations to the 2024 recipients of the Chad Lewis Memorial Grant: **Maxwell Ramey** and **Bailey Sauls** of Appalachian State University for their projects: *Life History and Demography of Plethodon aureoles* and *Determining niche overlap of two woodland salamanders in Great Smoky Mountains,* respectively.

Trina Chou of the University of Tennessee at Knoxville received the Niemiller Travel Scholarship.

The award for best student poster was given to **Zachary Spicer** of Appalachian State University for presenting his work of *Stable isotope analysis of dietary niche space in three coexisting Plethodon salamanders in North Carolina.*

The award for best student oral presentation was given to **Trina Chou** of The University of Tennessee at Knoxville for presenting her work entitled: *How do Spring Peeper advertisement calls signal Bd infection status?.*

Publication Committee
Herpetological Society Journal received a few more submissions in 2024 than 2023. We are still working to get the journal indexed so articles are more easily discovered.

Outreach and Social Media Committee
Please follow and interact with us on the Tennessee Herp Society accounts on Facebook, Instagram (@tnherpsociety), and Twitter (@TennesseeHerper).

Treasurer's Report
As of the meeting date, the balance in the checking account was $10,903.91 and the investment balance for the Chad Lewis Grant was $30,562.75. The members entertained increasing the amount of the Lewis Grant above $1000. The treasurer will consult with the society financial advisor to determine the minimum balance required to sustain the grant long term.

New Business
The society members voted to create an additional student travel grant in honor of the late Dr. Floyd Scott. This will be given in addition to the Niemiller award beginning next year.

The members voted in favor of reducing the registration cost of retired professionals to the student rate of $15. Starting in 2025, there will be a "student/retired" registration option.

Elections
Vice President: Stephen Nelson
Secretary: Joshua M Hall
Treasurer: Chris Ogle
East TN Rep: Scott Dykes
Middle TN Rep: Michael Fulbright

Next Annual Meeting
2025 will bring a Middle Tennessee meeting venue. Look to the society website for updates concerning the dates and location of the next meeting.