Greetings GTC-ers!

Judging by the collection of ant bites, bruises, and prickly-pear punctures on my lower legs, it must be the height of the field season... which means the 40th Annual Meeting is less than three months away! See pages 2 through 4 for registration information and other details. I appreciate all those who have already stepped up to help with planning and running various aspects of the meeting. It’s such a joy not having to do any serious arm-twisting.

I’d like to take this opportunity to provide more information about the meeting locale, in case anyone is uncertain about making the trek to Archbold Biological Station (ABS) in October. If you’ve never ventured farther south than Orlando, then you may not appreciate how much wilder and more exotic the environment becomes as soon as you enter the northern Everglades. For example, the southern Lake Wales Ridge is arguably the only place where camera traps placed at tortoise burrows have a non-zero chance of capturing not one, but two, apex predators – as in Florida Panthers and Eastern Indigo Snakes!

The subtropical weather and relatively flat terrain also create unique ecological conditions. The concept of Gopher Tortoises as an “upland” species becomes a bit fuzzy in this poorly drained landscape. Even in xeric Florida scrub (never mind flatwoods), Gopher Tortoise burrows often fill with water at some point during June – November. Tortoises in flooded burrows then behave more like aquatic turtles, bobbing for air at the mouth of the burrow. On a somewhat related note, “isolated wetland” is a misnomer around here. During heavy rains, sheet-flowing water and flooded ditches form seasonal connections among wetlands that seem totally isolated during the dry season. You can literally road-cruise for fish in this part of the world. Just ask the Archbold interns who recently encountered dozens of Walking Catfish migrating across a wet country road during a storm, instigating an impromptu all-you-can-eat fish fry!

As everyone knows, southern Florida is ground-zero for invasion of exotic herps and fishes. In most cases we have very little idea of how these invaders are interacting with native species and affecting natural communities. For example, despite Gopher Frogs being quite common at Archbold, the most abundant vertebrate commensal in tortoise burrows is actually the Greenhouse Frog, a small, direct-developing eleutherodactylid native to the Caribbean islands and introduced to Florida in the late 1800s. Could Greenhouse Frogs be prey for Gopher Frogs? and/or competitors? Who knows! While surveying burrows in this area, we also keep an eye out for Argentine Tegus and Burmese Pythons. Thankfully, neither species has been sighted at Archbold (yet).

Granted, there won’t be time during the short meeting to witness all these phenomena. But to make sure everyone experiences Florida scrub, we will kick things off on Friday morning with nature walks to visit contrasting scrub communities.
and learn a little about the research occurring at ABS (so plan on field attire for Day 1). Archbold Executive Director, Dr. Hilary Swain, will also give a keynote talk explaining the global significance and conservation status of this biodiversity hotspot. If for some reason you miss the nature walks, then stick around for the 5K run/walk on Sunday morning. The route will take you through the Red Hill tortoise colony, the site of our long-term mark-recapture study.

In addition to the normal program of talks on Friday afternoon and all day Saturday, there will be plenty of opportunities for informal interaction and fun. The GTC business meeting on Friday afternoon will be followed by a picnic at ABS and a special presentation by George Heinrich on *The Big Turtle Year* initiative. Then on Saturday evening, after the silent auction closes, we will head to an off-station barn venue for the poster session/social and awards dinner.

Hope you will join us for another informative, action-packed meeting!

Betsie

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**ANNOUNCEMENTS**

**2018 Annual Meeting**

**Registration is open** for the Annual Meeting to be held October 12-14, 2018, at Archbold Biological Station in Lake Placid, FL!

Please register at our website at www.gophertortoisecouncil.org/meeting/

**Registration options:**

**Early-bird (through Sept. 14):**

Student $70 ($85 incl. membership)

Professional $90 ($115 incl. membership)

**Regular (after Sept. 14):**

Student $90 ($105 incl. membership)

Professional $115 ($140 incl. membership)

Registration costs include on-site refreshment breaks, lunch and dinner on Friday, and Saturday lunch.

**Please note: Registration is a two-step process.** In addition to registering with GTC, every meeting attendee must register as a visitor to Archbold Biological Station via this link. Archbold’s online form enables you to specify your meal preferences, sign up for one of the four nature walks on Friday morning, and reserve on-station lodging, if desired.
Abstracts
The deadline for submitting abstracts for oral and poster presentations is September 1st. For more information, please visit our website at www.gophertortoisescouncil.org/meeting/

GTC Board Meeting
The GTC Fall Board Meeting will be held on Thursday, October 11th at 6 pm at Archbold Biological Station (Eisner Room, Adrian Archbold Lodge). Please RSVP to Betsie Rothermel at brothermel@archbold-station.org by Sept. 28th if you plan to attend (also indicate if you prefer a vegetarian option for dinner).

Annual Meeting T-shirt Fundraiser
This year we are working with an online vendor to offer a selection of customized T-shirts. If you order by September 12th you can opt to pick up your shirt at the meeting, or you can have it shipped directly to you. Proceeds from T-shirt sales will benefit GTC.

The design for this year’s shirts incorporates elements of the unique habitats tortoises call home in peninsular Florida. The artist, Kate Bazany, recently completed a research internship at Archbold’s MacArthur Agro-ecology Research Center.

Don’t miss out! T-shirts are now available from: www.customink.com/fundraising/40thannualgtc
ANNOUNCEMENTS continued

Don’t forget!

Silent Auction-40th Annual GTC Meeting

Our silent auction at the Annual Meeting supports the GTC Donna J. Heinrich Environmental Education Grants! Please bring donated items with you to the meeting. Can’t attend? Contact us for shipping information. Please email Rachael Sulkers at rsulkers@hhnt.com for more information.

Meet the Queen!

A newly released film produced by Archbold Biological Station (http://www.archbold-station.org) and IntoNature Films digs deep into the sands of time, uncovering the inspiring ways natural history and human history are entwined.

Shortly after Richard Archbold hired Dr. Jim Layne to be the Station’s first Research Director in 1967, Layne found and measured the 21st tortoise in his study on Red Hill. Still alive today, Tortoise 21 is the queen of her domain and star of the new documentary ‘Queen of Red Hill: A Remarkable Tale of Tortoises and Conservation in Florida’.

We invite you to enjoy – and share – this remarkable tale via YouTube (https://www.youtube.com/watch?v=r8X18LeBc4I) or Vimeo (https://vimeo.com/279384555).

Call for Nominations

For the 2018 Gopher Tortoise Council Service Awards

Every year, the GTC board recognizes significant contributions of those within the Council and larger community for contributions to our mission of education and conservation of gopher tortoises and their upland habitat through service awards (described below) presented at our annual meeting. Please send nominations for awards to lora.smith@onesctr.org by September 14, 2018. We ask that you provide background as to why you think an individual is deserving of a particular award along with your nomination. Thank you for your help!

**Distinguished Service Award** - presented to those who have consistently offered years of service to the Council.

**Lifetime Service Award** - presented to individuals whose have devoted a career to service of the Council.

**Special Project(s) Award** - presented to individuals who have taken the lead or played a major role in special GTC projects.

**Conservation Education Award** - given to individuals who have contributed to significant education and outreach activities relevant to conservation of tortoises and upland habitats. Candidates may be outside the realm of GTC. Includes a $250 cash award

**Auffenberg and Franz Conservation Award** – presented to individuals with life time accomplishments and organizations with long-term efforts in conserving gopher tortoises and upland ecosystems. We should think broadly in choosing recipients for this award. The first recipients for this award were Walter Auffenberg and Dick Franz, presented at the 2003 Annual meeting (our 25th meeting).
ANNOUNCEMENTS continued

**The J. Larry Landers Student Research Award**

The J. Larry Landers Student Research Award is a Gopher Tortoise Council competitive grant program for undergraduate and graduate college students. Proposals can address research concerning gopher tortoise biology or any other relevant aspect of upland habitat conservation and management. The amount of the award is variable but has averaged $1,000 over the last few years.

The proposal should be limited to four pages in length and should include a description of the project, a concise budget, and a brief resume of the student.

This is an excellent opportunity for undergraduate and graduate students to access funding for their projects.

**The deadline for grant proposals each year is the 15th of September.** Proposals should be submitted electronically in Word to Dr. Jeff Goessling at jeff.goessling@gmail.com.

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**Gopher Tortoise Council’s 2018 Donna J. Heinrich Environmental Education Grant**

The GTC Environmental Education Grant was established to support educators and organizations committed to developing educational projects about the gopher tortoise and the fascinating world in which it lives. The grant also honors Donna June Heinrich, an environmental educator, whose life was dedicated to conserving wildlife and their associated habitats.

**Deadline for submission of this year’s proposals is August 31st, 2018.** Applications may be downloaded from our website (http://www.gophertortoisecouncil.org). Click on “Menu” in the upper right hand corner. Go to “Who We Are” and click on the “Grant Programs” tab and scroll down. Applications which contain the following will be given preference:

- Projects that reach diverse and new audiences.
- Projects that focus on the importance of the conservation of intact upland ecosystems.
- Projects that encourage community involvement.
- Projects that have matching funds.

Please follow the instructions on the grants program page noting the requirements.

For questions contact Cyndi Gates at cyndi@fgates.com. Proposals should be submitted to the same email address.

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**GTC Student Awards**

**Student Presentation Awards** are given for the top three student oral presentations at the annual meeting. Please indicate clearly in your abstract if you are an undergraduate or graduate student so that you can be considered for this award. Contact Lora Smith at lora.smith@jonesctr.org if you have any questions.

**Bob Herrington Student Travel Awards** will be available and 2 awards ($100 each) will be randomly selected among students who travel >60 miles to attend the meeting. Students must be presenting an oral or poster presentation. If interested, please email Jeff Goessling at jeff.goessling@gmail.com by September 1st and include your current university affiliation.
The Florida pine snake, *Pituophis melanoleucus mugitus* is found in the coastal plain of southwestern South Carolina, southern Georgia, southeastern Alabama, and throughout most of Florida. It is one of three subspecies that represent the eastern pine snake, *P. melanoleucus*, complex which also includes the northern pine snake, *P. m. melanoleucus* (patchy distribution from southern New Jersey to North Georgia) and the federally threatened black pine snake, *P. m. lodingi* (southwestern Alabama and southeastern Mississippi). The Florida pine snake is a species of conservation concern and thought to be in decline. Currently, the status of this species is under review for listing under the Endangered Species Act after it was petitioned in 2012.

Florida pine snakes are among the largest southeastern snakes. Adults typically reach a size of 106-183 cm (3.5-6 ft) and have yellowish tan to white bodies with dark brown or reddish blotches that extend to the tip of the tail. Their pointy snout and enlarged rostral scale (Figure 1) make them adept at burrowing underground in sandy soils (Figure 2) (Franz 2001). This snake’s subspecific epithet (*mugitus*) is derived from the Latin word for “bellowing” which aptly describes the loud hissing sound they often make when threatened. They breed from April-May and females will lay 3-27 eggs underground in sandy areas with little canopy cover (Tuberville and Mason 2008).
FEATURE ARTICLE on the Florida Pine Snake continued

Surprisingly, to date, there have been only two published ecological studies on the Florida pine snake. Former GTC founder and Co-chair, Dick Franz, conducted a telemetry study (Franz 2005) in a North Florida longleaf pine (*Pinus palustris*) sandhill and found that snakes had average home range sizes of 57 ha (141 acres) and selected high pine and open pasture habitats. Snakes were located underground more than 80% of the time and primarily used southeastern pocket gopher (*Geomys pinetis*) tunnel systems for shelter. More recently, Gabe Miller, a former University of Florida graduate student, conducted a telemetry study (Miller et al. 2012) in a mesic longleaf forest at the Jones Ecological Research Center in southwest Georgia. Gabe’s study had similar findings; average home range estimates were 59 ha (146 acres), snakes were highly fossorial (76% of locations were underground), and were found mostly using pocket gopher tunnel systems in mature pine habitat (Figure 3). The results from these two studies suggest that pine snakes are habitat specialists and the loss of 95% of longleaf pine forests across the southeastern Coastal Plain may help explain their decline. In addition, fire suppression and subsequent hardwood encroachment on remaining patches of habitat creates closed canopy forests that limit the presence of pocket gophers, a species that is also strongly tied to longleaf savannas (Parsons et al. 2018) and whose tunnel systems were found to be important sheltering habitat for Florida pine snakes.

Figure 3. Hole excavated into pocket gopher mound by pine snake. Photo by Gabe Miller.

Florida pine snake research is ongoing in the Herpetology Lab at the Jones Center. One project is a long-term study aimed at describing the upland snake community and deriving population estimates from some of the more commonly mark-recaptured snakes. We’ve sampled 16 snake box trap arrays in upland longleaf pine habitat during the active season (March-November) for the last 15 years. To date, we’ve captured over 4,800 snakes comprised of 22 species, including 173 Florida pine snakes. We’ve recaptured 40 of the marked pine snakes, including one snake that was recaptured after 13 years! The second study examined the role that prescribed fire has on site selection for the Florida pine snake. We investigated how long it would take a snake to occupy a site after a prescribed fire and what the fire history was for sites used by snakes. Most of our study site was burned on a 2-year fire return interval, however, fire frequencies varied, in that some areas were burned more frequently to meet research or management objectives and other sites were burned less frequently due to site or weather constraints. We used telemetry data collected from 2005-2008 during Gabe Miller’s study along with annual burn data from 1998-2008. We analyzed the data using a method called compositional analysis (Aebischer et al. 1993) and found that most Florida pine snakes used sites within 2 years of a burn and that snakes selected sites that

Continued on next page
were burned at least every 2.5 years over sites that were burned less frequently (>3.3 year fire return interval). We hope to publish these results in the near future in the hope they will contribute to habitat management for this unique upland snake.

References:


Jen Howze is a Senior Research Associate at the Joseph W. Jones Ecological Research Center in Newton, GA. She also chairs the Upland Snake Conservation Committee and is a frequent contributor to the GTC newsletter.

Recent Publications


Fascinating facts about the Florida Pine Snake—brought to you by the Upland Snake Conservation Committee

**Florida Pine Snake**
*Pituophis melanoleucus mugitus*

**Upland Snake Species Profile**

Name Game
The genus of this species, *Pituophis*, roughly translates to “pine snake”. The species name, *melanoleucus*, means “black and white”, and the subspecies designation, *mugitus*, means “bellowing”. All are apt descriptors of this snake.

Natural History: Florida pine snakes are habitat specialists that can be found in open pine forests. They have similar habitat requirements as gopher tortoises. This is a very secretive snake that spends much of its time underground in burrows excavated by gopher tortoises and pocket gophers. It is so specialized for life underground, that it has a special scale on its nose, called the rostral scale, that is used for digging. Pine snakes are most active in the late spring and early summer. These snakes have a broad diet, but feed primarily on small mammals, and favor southeastern pocket gophers (*Geomys pinetis*) when available.

Protection: Florida pine snakes are state protected in Florida and Georgia, and are a species of conservation concern in Alabama and South Carolina.

Appearance: Florida pine snakes are large, non-venomous snakes that can reach maximum lengths of over 7.5 feet, although most snakes average 4 – 5.5 feet. Florida pine snakes have a base cream-to-tan color, with brown blotches or saddles extending the length of the body. As the markings approach the tail they may become deep red or salmon in color.

Quick Fact
Pine snakes have a modified epiglottis, a flap of skin in their mouth, that allows them to hiss loudly.

When encountered in the wild, pine snakes will put on a remarkable defensive display that includes bluff striking and loud hissing. Pine snakes rarely bite, but can deliver a powerful strike.

Range: There are three pine snake subspecies that occur within the range of the gopher tortoise. The Florida pine snake ranges from southern South Carolina, westward through central Georgia and Alabama, and through the Florida peninsula. The northern pine snake (*Pituophis m. melanoleucus*) can be found in Alabama, Georgia, and South Carolina. The black pine snake (*P. m. lodingi*) is found chiefly in southwestern Alabama and southeastern Mississippi, and is presumed extirpated in Louisiana. Florida pine snakes may intergrade with black pine snakes west of the Escambia River in Florida.

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**Upland Snake Conservation Initiative**

www.gophertortoisecouncil.org
Florida Pine Snake
*Pituophis melanoleucus mugitus*

**Conservation Challenges:** Florida pine snakes are thought to be declining throughout their range. Research has demonstrated that these snakes can spend up to 80% of their lives underground. Living underground presents a suite of challenges to wildlife biologists studying the species. Little is known about the biology and ecology of this species, and population estimates are difficult to determine for the species because of their fossorial habits. Roads also present a unique challenge to the species as they may be both unwilling to cross roads and highly susceptible to being hit by cars due to their large size. Pine snakes can benefit from living in close association with southeastern pocket gophers, another species that may be declining in southern forests.

**Snake Vocabulary**
Fossorial: Adapted to dig, burrow, and live underground.

**Southeastern pocket gophers are important to Florida pine snakes.**

**Threats:** Florida pine snakes face several threats, including habitat loss and fragmentation due to development and conversion of land to agriculture or silviculture. These habitat specialists require landscapes that burn every few years. A lack of natural or prescribed fire can alter the landscape to a state that is inhospitable to pine snakes. Florida pine snakes are susceptible to over-collection because of their rare status and pleasing looks. Predation by domestic animals, such as outdoor house cats, can also cause mortality.

*Florida pine snakes (top photo) are sometimes confused with gray rat snakes (bottom photo).*

**What You Can Do To Help:** You can help the Florida pine snake by being a proponent of prescribed fire. Healthy landscapes are important to many reptile and amphibian species, and many are declining because of improper habitat management. If you see a Florida pine snake, you can also contact your state wildlife agency with its location. GPS coordinates and photographs are very helpful to biologists.

**For More Information:**


Created by Bradley O’Hanlon and Jennifer Howze
Photographs provided by Lora Smith, Bradley O’Hanlon, Michelina Dziadzio, and Matt Smith
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More on the Digging Behavior of Florida Pine Snakes

Here are a few excerpts from an article published by GTC Co-Founder and Past Co-Chair Dick Franz, published in Herpetological Review 32(2) in 2001: **PITUOPHIS MELANOLEUCUS MUGITUS** (Florida Pine Snake). DIGGING BEHAVIOR

“Adult Florida pine snakes...were radio-tracked for periods of 6-26 months in sandhill habitats at the Katharine Ordway Preserve-Swisher Memorial Sanctuary, Putnam County, Florida, USA. ...Three tagged males... were observed on nine occasions in the act of excavating pocket gopher (*Geomys pinetis*) mounds. Excavating snakes were successful on eight occasions in removing sand plugs placed by pocket gophers in exit burrows inside the mounds. These plugs probably serve to exclude predators and regulate air flow in burrow systems. Opening these plugs allow pine snakes an access point into the burrow system.

...Types of disturbances at freshly excavated mounds include scrapings 12-18 cm wide, conical depressions that conform to the shape of the snake’s face, and impressions of dorsal and ventral scales. The final access hole is about the diameter of the excavating snake.

Pocket gopher tunnel systems commonly are used by Florida pine snakes as retreats, based on available telemetric data from the Ordway Preserve. These tunnel systems presumably provide safe havens from predators, fires, and adverse weather conditions and may serve as a source for food...”

Special thanks to Herpetological Review for permission to reprint excerpts of this article.

**Kids’ Corner**

Read the articles and fact sheet on the snake species featured in this edition (get your folks to help you!) and see if you can answer the questions below:

1. Very few kinds of snakes can really dig holes (despite popular belief!). What is the name of a snake that truly can dig holes? *Hint-look at pages 6-7 and 9-11.*

2. The snake that can dig holes has special adaptations to help it dig holes in soft dirt. Can you name a special feature that helps the hole-digging snake? *Hint-look around its head! See page 6.*

3. Scientists come up with special names for each different kind of plant and animal. These names are usually very descriptive of some characteristic of that species, but often sound kind of funny and are hard to pronounce-so we give plants and animals common names in English. The scientific name of our featured snake is *Pituophis melanoleucus mugitus*. What a mouthful, right? Find out what each of those 3 names means—See *hint on page 9*. The scientific name is very descriptive when translated into English...don’t you agree?

4. Do you know what an epiglottis is? Do you have one? Check out *hint on page 9* to see how the featured snake species uses its epiglottis and got the subspecific name “*mugitus*”.

5. Our featured snake often lives in the same type of dry, sandy habitat as the gopher tortoise. In fact, this snake often uses tortoise burrows for refuge when it’s too hot, or too cold, or if it’s looking for another burrow dweller to eat! What is the name of the mammal that digs its own underground tunnels and pushes up mounds of dirt that our featured snake likes to dig in? This snake not only uses the mammal’s tunnels for safety but sometimes eats the mammal that made them! *Hint-See photo on page 7 and info on page 10.*

**Answers on Pages 16 and 17**
A Shout-Out to Private Lands Stewards!

GTC member, Jon Gould, and wife, Carol, were recently recognized as Southern Regional Outstanding Tree Farmers of the Year! To find out more about their tree farm located in the Florida Panhandle go to https://www.treefarm-system.org/south-nominee-goulds. See how the Goulds are promoting longleaf forests, enhancing gopher tortoise and wildlife habitat, and protecting wetlands and sensitive waterways on their property (see photos below-courtesy of Jon Gould). Congratulations Jon and Carol!

Swallowtail butterfly

Summer tanager on longleaf

Sherman’s fox squirrel

Outreach to Audubon birdwatchers

Feature Article-Sand Tigers: Musings of a Naturalist

By Dirk J. Stevenson

In November of 2011, while conducting a visual encounter survey for eastern indigo snakes and eastern diamondback rattlesnakes at gopher tortoise burrows, I made a notable discovery, finding a population of the rare, and sandhill endemic, autumn tiger beetle (Cicindela nigrior) on a xeric ridge close to the Ohoopee River in southeastern Georgia. A day later, I fielded a call from the accomplished entomologist and tiger beetle expert, Dr. Paul “Skip” Choate, Jr., of the University of Florida: “Congratulations on the new nigrior site, Dirk. It’s long been a dream of mine to photo a mixed-morph mating pair, that is a black morph male beetle atop a green morph female, or vice versa. It would make a great cover photo for Cicindela. May I join you in the field to make this happen?”

A couple days later, at the entrance gate to the Ohoopee ridge, I was shaking hands for the first time with Skip. He arrived in an old van, the back compartment of which was full of insects in vials. Skip showed me live specimens of the remarkable flightless burrowing scarab beetle Mycotrupes lethroides, a sandhill endemic known only from four Georgia counties (“my graduate student Kyle Beucke just discovered that they eat acorns!”), and some cool dung beetles (“excavating these is a lot of fun, I will show you how to do so ...”). Then, he gave me an autographed
FEATURE ARTICLE on Tiger Beetles continued...


The *C. nigrior* were concentrated on an old firebreak that ran downhill through of meadow of sweet smelling *Dicerandra* mints to a sphagnum-lined, tea-colored branch water all of a meter wide (a fellow could probably drink safely from this rill, I remember thinking). Skip was able to get the photos he coveted, a black morph male atop a green morph female, within an hour (Figure 1).

I then escorted him to a tortoise burrow nearby where I had seen a fine jingletail (*Crotalus adamanteus*) only a week before. A fresh snake track, moist and smudgy sand, and prints of individual caudal scales marked the burrow mouth. It is always nice to meet a fellow biologist – but someone who is not a herp fetishist – who enjoys snakes and is interested to learn more. An adrenalin spike accompanies treading near the opening of a burrow when you know there is a fat diamondback resting on the surface nearby. We spotted the snake from a distance, sunlight bouncing off yellow scales. Skip was thrilled.

Next, we visited an enormous extensive aeolian dune, also along the Ohoopee River. The deep, coarse, excessively-drained “sugar sands” of this site, vegetated with rosemary, woody goldenrod, and fields of scarlet basil, lent it an aspect more like a Lake Wales Ridge scrub than a typical south Georgia sandhill. It’s a true desert-in-the-rain ecosystem with optimal habitat for wintering indigos as the tortoise burrows here never flood.

As we walked a sand road, a fount of knowledge poured from Skip. Among the countless antlion pits and millipede trails, he showed me how to locate the tiny vertical burrows of tiger beetle larvae and how to discern them from similar tunnels made by other invertebrates (especially hymenopterans). Then, using a grass stem to follow their deep burrows, we dug up some gorgeous rainbow dung beetles (*Phanaeus vindex*).

The autumn tiger beetle (Figure 2) closely resembles another sandhill species, the festive tiger beetle (*C. scutellaris unicolor*), which may explain why the former wasn’t formally described as a species until 1985. Festives, however, come only in green suits (never black morphs). The green morphs of both species may appear Prussian blue in sunlight (and as lustrous as a fresh-shed eastern indigo snake). After several years of study, I could discern the green morphs visually...well, most of the time anyway (*C. nigrior* are a bit bigger, that is a couple millimeters wider/longer, and a richer forest green). The autumn tiger beetle lives up to its common name, with adults active only from late summer to early winter, with a peak in autumn (a life cycle unusual for southeastern U.S. tigers). Adult *C. scutellaris unicolor*, meanwhile, overwinter once; they are active in spring and fall, avoiding the infernal heat of summer and cold temperatures of winter in their shallowly dug burrows.

![Figure 1. Note the diversity in color of these autumn tiger beetle specimens (Photo by Dirk Stevenson)](image1)

![Figure 2. Note the vibrant color of these mating autumn tiger beetles (Photo by Jonathan Mays)](image2)
FEATURE ARTICLE on Tiger Beetles continued...

There are subtle, yet very real differences in the habitat preferences of these two tigers. Populations of the ubiquitous *C. s. unicolor* seem to be present in most open sandhills with patches of bare sand, and are commonly seen on tortoise burrow aprons. *C. nigrior* likes sandy soils that are somewhat compact and possibly moister, such as on slopes. It is a much less common, and more locally distributed beetle and is tracked by the Natural Heritage Programs of those states in which it occurs (MS, AL, FL, GA, SC, NC).

The nocturnal, large, flightless and attractively-patterned Carolina tiger beetle (*Tetracha carolina*; known from tortoise burrows and other habitats) has been observed feeding on DOR (dead on road) herps.

A Midwesterner during my formative years, I suspect that my introduction to tiger beetles was similar to many folks reared near forested habitats in the eastern U.S. As a youngin’, the cool-fresh air of middle school springs found me under the lavender and cream blossoms of redbuds and dogwoods hunting morel mushrooms. The first-of-the-year bellows of bullfrogs from a nearby lake complemented the ambiance. Between attempts to spot small pieces of spongy brains (what morels look like) in carpets of wood-sorrel and developing May apples, I would peel pieces of bark from oak logs – often revealing blue-tailed skinks (called “scorpions” by some Missourians) and the bright forms of newly-metamorphosed six-spotted tiger beetles (*Cicindela sexguttata*) resting underneath. In those days, courting/impressing one of the gals from my neighborhood equated with, and was limited to, showing her the scary mouthparts of local fauna I was able to catch – curmudgeonly northern water snakes worked very well, but the super-sized sickle-shaped mandibles of a handsome green *C. sexguttata* always aroused interest.

I would later learn that tiger beetles, understandably given their incredible beauty and diversity, have a prodigious cult following among hobbyists (a small percentage of which may over-collect and/or illegally collect). Viewing a collection of pinned tigers of all sizes and colors is hypnotic. Locality data for rare tigers, just like the locations of prime morel mushroom habitat, are closely guarded.

This spring, while investigating mossy banks along south Georgia ravine streams for trapdoor spider burrows, I found larvae of six-spotted tigers. As hardwood forest habitats become more localized in the southeastern Coastal Plain, so do these beetles. Accidentally exhuming a larva, I was again struck by the compelling design of these creatures. Larvae are shriveled-looking, hairy grubs with disproportionately large heads and jaws.

Like the adults, larval tigers are predaceous and come with daunting and toothy mandibles (Figure 3). It’s a really bad dream for the small invert that wanders too close to the cryptic tunnel of a hungry larva. Anchored in its burrow by prominent hooks on its abdomen, the larva seizes then drags captured prey into the burrow depths. Both adult and larval tiger beetles are predaceous, feeding mostly on other insects and spiders.

Larvae may require 1-3 years to complete development and typically do not leave their burrows on their own accord. If excavated by a predator, larvae of the southeastern beach tiger beetle (*Cicindela dorsalis media*)
FEATURE ARTICLE on Tiger Beetles continued...

may exhibit “wind-powered wheel locomotion” initiated by leaping somersaults. Forming a loop of their bodies, they jump and land, jump and land; ultimately, the wheel balances and they roll rapidly down the beach.

As you may know, our gopher tortoise habitats (sandhill and scrub) are among the oldest of Coastal Plain environments (Figure 4). These ancient beaches, sandbars or dunes are home to a number of sand-specialist arthropods, tiger beetles included. In addition to Cicindela nigrior and Cicindela scutellaris unicolor, Ellipsoptera hirtilabris (moustached tiger beetle) and Ellipsoptera gratiosa (whitish tiger beetle) (Figure 5) are also sandhill and/or scrub endemic species. They are similar in appearance, sand-colored and dramatically stilt-legged species, with non-overlapping ranges.

Figure 4. Longleaf-turkey oak sandhill habitat in brilliant fall color in south Georgia where the autumn tiger beetle and festive tiger beetle may be found. (Photo by Dirk Stevenson)

Figure 5. Mating pair-whitish tiger beetles (Photo by Kevin Stohlgren)

Skip Choate’s work did much to resolve the taxonomy of a species complex, all of which are tiny, shiny black beetles with green-to-purple reflections: Cicindelidia highlandensis (Highlands tiger beetle), Cicindelidia abdominalis (pinebarrens tiger beetle), Cicindelidia scabrosa (scabrous tiger beetle) and Cicindelidia floridana (Miami tiger beetle). These are also strictly sandhill/scrub species, except for C. floridana, which inhabits pine rocklands. Cicindelidia highlandensis, described by Skip and found only on the Lake Wales Ridge of south-central Florida, is a candidate for Federal listing.

Jonathan Mays, who does double duty as a herpetologist and invertebrate specialist with the Florida Fish and Wildlife Conservation Commission, is currently conducting field work focused on the status and distribution of the federally endangered Miami tiger beetle (known from a very limited area close to Miami). Mays also conducts atlas-type efforts aimed at better determining the current ranges of the Florida tiger beetle fauna, with a special emphasis on rare and/or habitat specific species, including our sandhill- and scrub-specific tigers.

In Memoriam:

I dedicate this article to the memory of Paul “Skip” Choate, who passed away in 2012 after a 12-year battle with multiple myeloma.
FEATURE ARTICLE on Tiger Beetles continued...

Suggested Reading:

*Cicindela* is a quarterly journal devoted to tiger beetles (until recently, tiger beetles were in the Family Cicindelidae, now Carabidae). Historically, most species were placed in the genus *Cicindela*. Now there are numerous genera.


_Dirk Stevenson, a long-time member of GTC, is a zoologist based in Hinesville, Georgia. He has worked extensively with amphibians and reptiles including eastern indigo snakes. Dirk is especially interested in the invertebrate fauna of tortoise habitats._

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**Kids’ Corner**

Did you take the quiz on page 11? Answers are below...

Question 1. The snake featured in this issue of the newsletter is the *Florida pine snake*. This species can actually dig holes into soft dirt. Check out the picture below to see a pine snake in action!

![Florida Pine Snake](image)

From: *PITUOPHIS MELANOLEUCUS MUGITUS* (Florida Pine Snake).

Question 2. One special feature of the Florida pine snake that helps it dig into the dirt is an enlarged *rostral scale* at the tip of its snout. In addition, this species also has a pointy snout that makes it easier to dig.
Kids’ Corner continued...

Answers for Quiz on page 11 continued...

Question 3. Did you guess what each part of the Florida pine snake’s scientific name means? The genus, *Pituophis* just means “pine snake”. There are several subspecies or kinds of pine snake—check out the map on page 9. The species, *melanoleucus* means “black and white” (see picture on page 11) but colors can vary (see photo below and in species profile on pages 9 and 10). The subspecies, *mugitus*, means “bellowing”. Read the species profile on page 9 to see what makes this snake a “bellower”!

![Florida Pine Snake](image1)

A “big, hissy” Florida pine snake photographed in Nassau County, Florida by Dirk Stevenson. Note the black and white coloration near the head with brown and cream tones along the snake’s body.

Question 4. Yes, you do have an epiglottis! In humans the epiglottis is a flap of cartilage at the root of the tongue way at the back of your mouth. When you swallow food or drink this little flap closes over the windpipe so you don’t choke on your food! A pine snake can make a loud hiss when it pushes air through a modified epiglottis.

Question 5. Pine snakes often make a meal of various small mammals including mice, rats and rabbits. But did you guess which of the Florida pine snake’s favorite snacks digs tunnels and pushes soft mounds of soil to the surface? See the picture below for the answer!

![Pocket Gopher!](image2)

Pocket Gopher! It’s what’s for dinner!

Photo by JT Pynne

Want to learn more about pine snakes and how you can help protect their habitat? Check out the websites below!

https://srelherp.uga.edu/snakes/pitmel.htm

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