Why can't the snakes cross the road, secret lives of baby snakes and other questions

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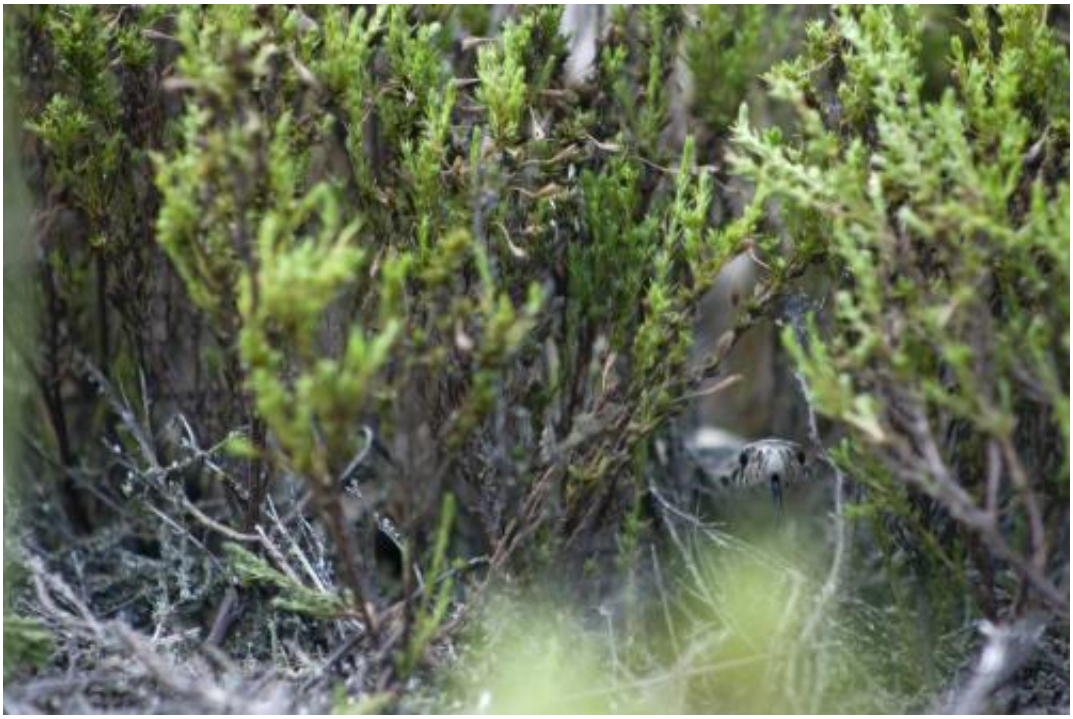


Researchers at Drexel University are conducting some of the first research on baby northern pine snakes. The population of these snakes is locally threatened in New Jersey. Credit: Kevin P.W. Smith / Drexel University

Why can't the pine snakes cross the road? Hint: New Jersey traffic might have something to do with it.

Drexel University students will bring to light these and other findings about the plight, perils and peculiarities of the Northern Pine Snake in

several presentations and posters at the Ecological Society of America annual meeting next week (ESA 2013), based on their research with Dr. Walt Bien's Laboratory of Pinelands Research in the New Jersey Pinelands.

Northern pine snakes are charismatic ambassadors for the Pinelands National Reserve, an ecologically important region –designated as a U.S. Biosphere Reserve by UNESCO and as the first National Reserve in the United States. The pine snakes are large, nonvenomous and docile.

The population in New Jersey is threatened, and the next-nearest population of northern pine snakes is in North Carolina. Protecting these snakes from the human-generated perils in the most densely populated U.S. state can go a long way toward protecting the entire ecosystem they are a part of.

Here is a closer look at some of the Drexel team's research:

Snake surgery is a special skill for conservation

Dane Ward has a rare talent for a graduate student in conservation biology: He is an adept snake surgeon. Many animals are studied using radio telemetry by attaching a radio transmitter to the outside of the body. Radio telemetry is useful for tracking pine snakes because their movements are hard to see through simple observation. But placing a transmitter on the surface of a pine snake's skin would interfere with the animal's slithering movements and feeding via constriction. So Ward has learned to surgically implant the transmitters in snakes instead, through a tiny one-inch incision.

The team has radio-tracked more than two dozen adult pine snakes in recent field seasons. The data have helped them learn more about the snakes' spatial range and behavior and develop population models they

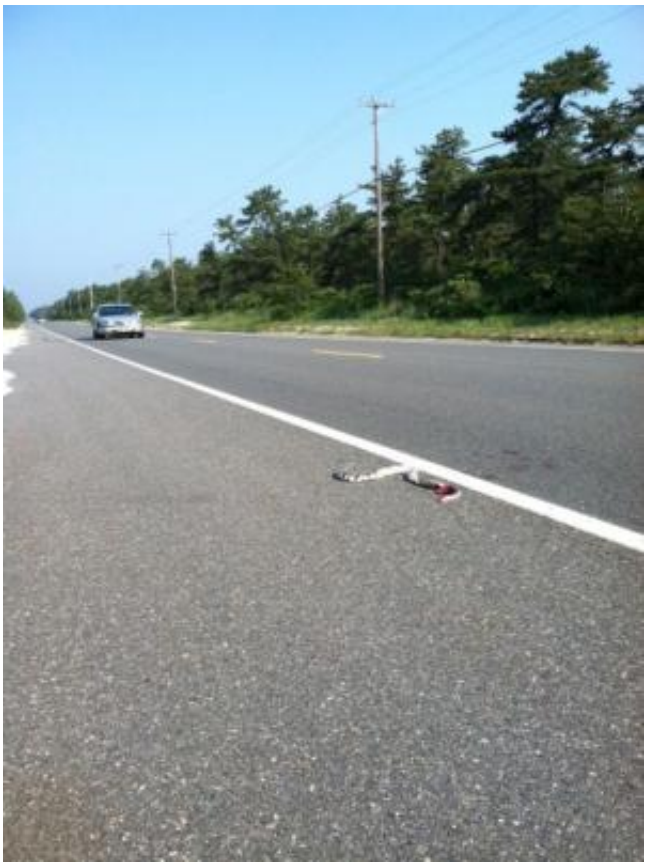
hope will be useful for conserving the locally threatened population of pine snakes.

Radio tracking pine snakes gave Ward and Drexel undergraduate Catherine (Katie) D'Amelio an opportunity to take an unusual approach to studying climate change. Because snakes are cold-blooded, and New Jersey is the northern limit of the pine snake's range, they reasoned that shifts in weather and climate could have an impact on their behavior.

D'Amelio looked at the data from snakes that had been tracked over three seasons, and compared their activity levels with the air and soil-surface temperatures the snakes encountered. At the highest temperatures, snakes' activity levels dropped off.

Comparing the snakes' most active temperature range with predictions of shifts due to climate change, the team pointed out that the timing of seasonal activities may shift in the future – which could impact their interactions with other species. And they note that freezing to death could be a danger if early-spring warming periods, followed by cold snaps, become common – something they observed in the spring of 2012.

D'Amelio won a top award at the Mid-Atlantic regional ESA meeting earlier this year for the poster on this work – earning her a trip to present it at ESA 2013 in Minneapolis.



Cars are a significant cause of mortality for northern pine snakes in the New Jersey Pinelands. Drexel University researchers are studying the extent of damage this causes to the population and are experimenting with ways to help snakes move through their habitat more safely. Credit: Dane Ward / Drexel University

Baby snake mazes and counting tiny tongue flicks

Nesting and early life for a newborn, or neonate, pine snake, are life phases that scientists know the least about. But graduate student Kevin P.W. Smith is deeply involved with changing that. He will give an oral presentation Tuesday at ESA about some of the first work ever done to study the behavior of neonate pine snakes.

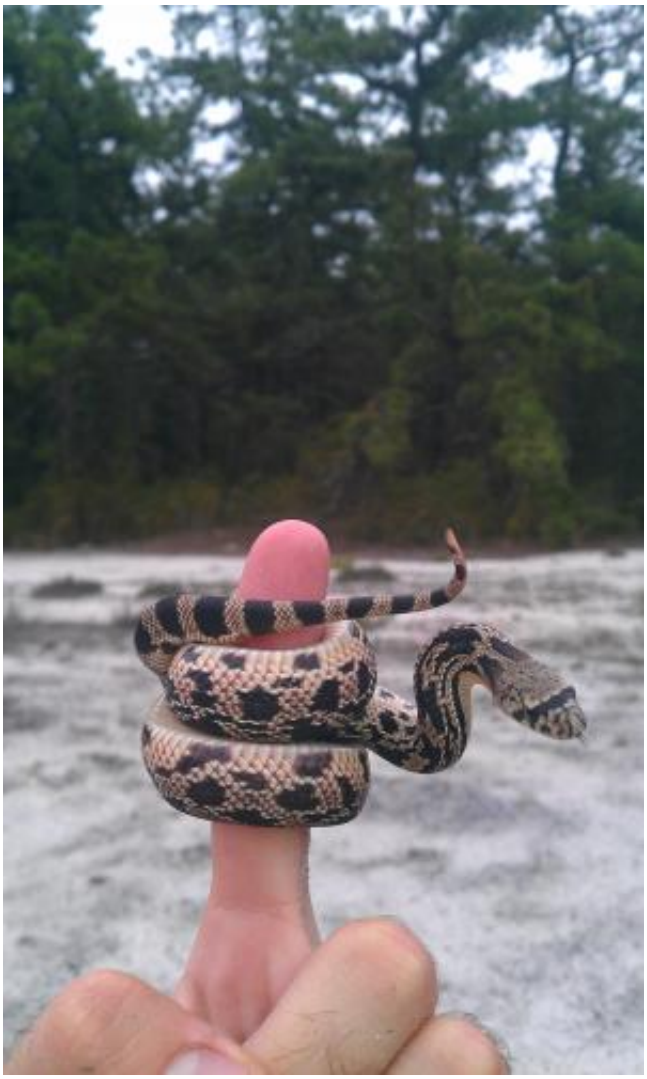
Because neonate pine snakes are tiny and hard to see, once again, snake surgery is required.

To find neonates in the first place, the team tracks adult female snakes to their nesting sites and marks the spot with GPS. In the Pinelands, female pine snakes dig out their own burrows over the course of several days, using a specialized scale on their noses to scoop out sand – so a careful observer can catch some females in the act of digging prior to laying eggs. Two months later, the newborn snakes emerge from the marked burrows into small fenced-in areas rigged by the researchers to capture them.

The team implanted eight neonate pine snakes with transmitters last season and they hope to have 10 implanted in 2013. (The snakes begin to emerge in September.)

Smith has been able to make important observations about the neonate snakes' natural behavior. For example, he learned that young pine snakes begin feeding on adult mammals – small ones, such as mice – within the first two months of life and they shed their skin multiple times within their first season.

He has also been working with neonate pine snakes in a variety of behavioral experiments, including simple maze tests to track migration and dispersal responses to different snakes' scents. In another experiment, he counts the neonates' tongue flicks to gauge their interest in the scents of various potential prey items.



Drexel doctoral student Kevin P.W. Smith is conducting some of the first research on northern pine snakes during the neonate phase of their lives. These small newborn snakes are hard to track in the wild, but Smith and other members of Dr. Walt Bien's lab have successfully captured neonate snakes and implanted them with radio trackers. Credit: Kevin P.W. Smith / Drexel University

Why can't snakes cross the road?

No joke: Pine snakes in New Jersey tend to get flattened on roads, and scientists speculate that summer shore traffic could be a big contributor

to snake mortality. (Some motorists tend to think of the Pinelands not as a rare and special natural environment for plants and wildlife, but as the woods on the way to the Jersey shore.) Just how often and why, and what that means for their populations' survival, is the subject of intense research.

Two Drexel undergraduates who joined Bien's lab in their freshman year last year, Jacquelyn Garcia and Rafaella Marano, are working with Ward and other members of the team to address this question, and will present a poster about their road-crossing studies at ESA.

They found that crossing a two-lane highway takes pine snakes about two minutes. When they cross-referenced that time against New Jersey traffic data for the roads crossing their study area, they found that snakes were virtually guaranteed to encounter several cars during any road crossing – anywhere from 3-4 cars crossing the least-used road, to more than 30 cars per two-minutes on New Jersey's Route 72 during the busy summer season.

They also studied the effects of the type of road surface on snakes' movement and found that snakes move faster on sand than on asphalt and concrete.

Snake deaths on roads aren't just a gruesome accident – they can be a real problem for the population dispersal and survival. Roads dividing the snakes' habitat can effectively fragment the population by preventing interbreeding with snakes on the other side.

(And sometimes snake deaths aren't an accident: Some motorists target wildlife such as snakes and turtles to run them over intentionally.)

Some of the team's ongoing work uses biological samples from the roadkill snakes they find, to determine if roads are causing noticeable

genetic differences in the population.

They are continuing to investigate whether culverts under the roads can provide safe crossings and will also test whether changing the surface texture of the road can help snakes cross more rapidly.

How bombs save snakes (and pines and flowers and grasses)

All of this snake research and much more is possible because Bien, a professor in Drexel's Department of Biodiversity Earth and Environmental Science, and his students, have been welcomed to work in environmental protection on the U.S. Air Force's Warren Grove Gunnery Range. The government is required under federal law to protect this property – and the Drexel researchers have helped them do just that, via a partnership with the Air Force and New Jersey Air National Guard lasting more than a decade.

Provided by Drexel University

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