

TERRAPENE TIMES



Adopt-A-Turtle Newsletter

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Research, education, outreach, & conservation

WASHBURN
UNIVERSITY

Biology Department

Do turtles learn? Spatial memory assay suggests yes!

Assessing an animal's ability as it relates to spatial memory, learning, and/or cognition is an extremely tricky business not without dozens of experimental design pitfalls and dozens more practical limitations. And that's when assessed in the lab with laboratory animals! Now, compound

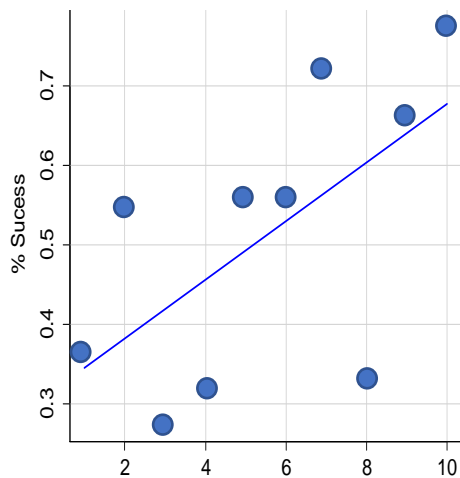


Figure 1. Percent success escaping cognition assay over time (trial #) aggregated for 22 field-tested turtles.

these challenges by trying to work with field (wild) animals in their natural environment. Not an easy task, especially if you are trying to collect meaningful data for publishing in a peer-reviewed journal. Enter Bri, a rockstar Washburn University Biology Major wishing to potentially pursue cognitive science or a related field in graduate school. Based on a senior capstone seminar series Bri took last Spring, she wanted to study cognition as it relates to behavioral types (boldness, activity, exploration/neophobia). As it turned out, we already study behavioral types in the WU Turtle Team Lab so "all Bri had to do" (sarcasm) was the simple task of designing and implementing a cognition assay with field turtles. After several design iterations and help from our collaborator Dr. Paul Wagner for making the assay (see Fig 2 on Page 2), Bri was ready to test turtle spatial memory! Bri, like five other students, packed up her belongings and headed off to Cedar Point Biological Station in Western (continued on page 2)

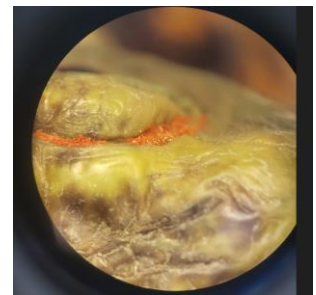
Senior Highlight

Abby completed all of her biology requirements for a degree at Washburn except her research credits, something she had been avoiding as research is often perceived as being scary by students when they first try to do an independent research project. Fortunately, I was able to talk Abby into doing box turtle research with me at Cedar Point Biological Station for seven weeks in Western Nebraska. Needless to say, Abby did an absolutely amazing job (as did Katie, Keetan, Bri, Tim, Patience,

Derek, Aubrey, Mason, and Sam) throughout the summer. Abby took over an extremely important role as lab manager, assuming duties as data organizer, behavioral assay coordinator, and pull-strength measurer. Abby, like graduating seniors Katie, Tim C, Irene, and Aubrey, will be sorely missed for their dedication to their research. Abby's teamwork and incredible hard-working nature will be impossible to replace. Thanks Abby and best wishes moving forward with your career!

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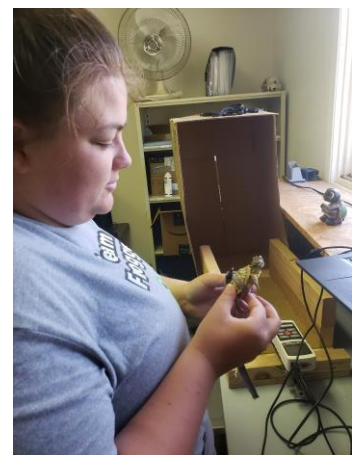
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CAN YOU GUESS WHAT THIS IS?
SEE PAGE 3 FOR THE ANSWER!

Upload your photos of ornate box turtles and three-toed box turtles here:

<https://forms.gle/XfuRp4q42GBbanqu5>



Abby preparing a juvenile turtle for the pull strength test. Muscle performance may be a physiological correlate of different behavioral types such as activeness.

Spatial memory continued...

Nebraska to investigate our long-term study population of box turtles there. These turtles would be vital to Bri's project as we have years of movement data on them to help correlate to their spatial memory and learning performance. For seven weeks Bri and her research partner Patience (along with others, including Katie) (all pictured to the right) conducted one of the most grueling research projects I have ever advised for undergraduate students. Bri and Patience tracked turtles daily, hauled the behavior assay box to various places around the field site where the turtles were located, collected the turtles, fed and weighed them, collected climatic variables using a Kestrel device, and weathered weeks of unending and miserably hot 100-degree Fahrenheit days all for ten minutes of data at time. To truly show learning, the team had to

repeatedly assay the same turtles a large number of times (9-10 times total) to show whether the turtles demonstrated spatial learning over a seven-week period. Bri and the team tested 22 turtles, 18 of which were assayed 9-10 times each with over 200 total trials completed on all of their study animals. After all of this effort and associated challenges of fieldwork, the data can be shown in Figure 1, which clearly shows (in our opinion) the turtles learned over time ($Rho=0.64$, $n=22$, $p<0.04$). Bri and Patience's next endeavor will be to link an individual turtle's performance within the memory assay to other

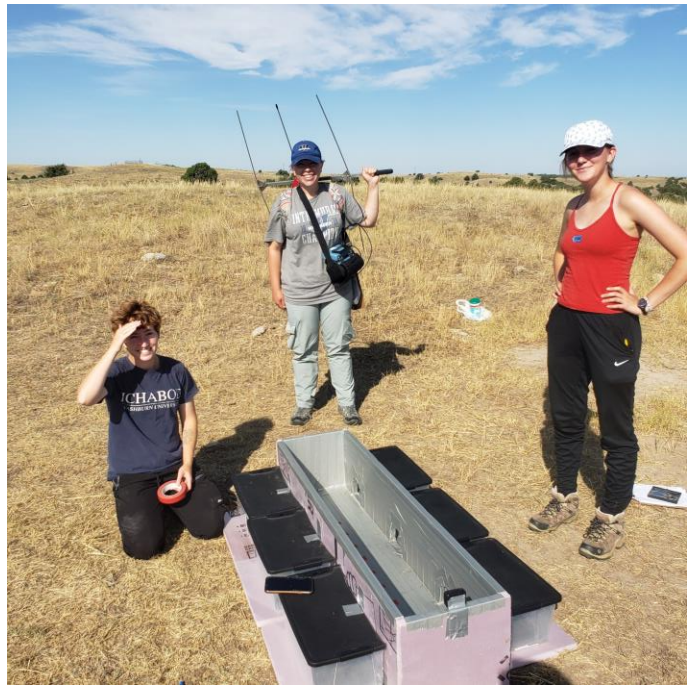


Figure 2. L-R Bri, Katie, and Patience posing around the spatial memory assay used during the summer of 2022 at CPBS.

characteristics about each turtle, including their sex, size, and aforementioned behavioral types. Bri and Patience will be presenting their findings at the upcoming Kansas Herpetological Society Conference in Joplin, MO this November. Wish them luck!

Introducing Lola

When Dr. Beth O'Neill emailed saying she found a box turtle on Washburn University main campus I immediately had to give her a call and locate this mystery turtle. Why is there an ornate box turtle on main campus? Surely, this turtle was not a resident of the university right? After learning that there is indeed a Bennett AND a Benton hall on campus, I found Dr. O'Neill and she led me to the mystery box turtle, who was tucked under some vegetation in a well-manicured garden space near the University's chapel. After a brief discussion on how the turtle was found, Dr. O'Neill named the turtle Lola and I began imagining her as an ambassador for box turtles, the box turtle program, and for education to give students an opportunity to practice radio



telemetry with a real animal. After about 24 hours in the lab Lola was released exactly where we found her, this time outfitted with a new transmitter so that we could monitor her movements and class attendance. Would she stay on campus? Could we help her cross roads if necessary? Was she a resident or just a passerby? We are still working on these questions but currently she remains on campus, but not without drama. As it turns out, unaware students and faculty are unaccustomed to seeing

a box turtle, let alone one with a radio transmitter. The turtle has been brought to various faculty, brought to IT for transmitter removal, and more. Lola has appeared on several wildlife pages on Facebook and social media accounts. She has made more of a digital imprint during her time at Washburn (2-weeks) than I have in 4+ years! Although I have been able to reach out to plenty of students, there is still work to be done to ensure Lola is not needlessly handled or bothered as she goes about her daily routines. Currently, I plan on putting some type of QR code on her transmitter that students/faculty can scan to learn about her and the broader box turtle research program at Washburn University. If you see a turtle with a transmitter on campus, enjoy it from a distance, but rest assured the transmitter is harmless and she is fine when hunkered down in a garden. Please help her crossing a road though or to get out of the way of a mower!

Right middle: Picture of F208, Lola, our new Washburn University box turtle ambassador and educator specialist.

Bust out the Microscope: The ‘Mite’iest of Turtles

M198, now named Scott (after Marvel’s Ant Man Scott Lang) was a unique find as I (Ben) first found him while crawling under a barbed wire fence and he was tucked deep into a tuft of grass I happened to put my hand in. After doing a happy dance for finding a new turtle, I quickly began my new turtle processing protocol, which begins with a thorough visual assessment of the turtle’s condition, including shell damage, tumors/neoplasia, broken/healed appendages, flesh flies, and now something new to me: mites! The image on the right shows the heavy mite infestation this turtle had, including around his eye socket. M198 easily had thousands of mites in total and they were found on every appendage, the carapace (top part of shell), plastron (bottom part of shell), and all over the neck and head. After returning to the lab, Kaylyn (Biology Lab Supervisor & Turtle Team member) immediately got out a stereo (dissecting) microscope to examine the turtle under significantly higher magnification. It was only after using the scope could we confirm the turtle did indeed have mites (pictured to the right), an observation that I have never made on ornate box turtles before. That’s not to say mites aren’t common on box turtles (I don’t know if they are or are not), I simply have never seen them on a turtle before. Naturally, we spent several hours carefully removing as many mites from the turtle as we could using tweezers, water, and turtle-safe oil. It is unclear if a mite infestation would kill a full-grown adult box turtle, but we didn’t want to take the risk of letting the turtle potentially die or spread mites to other turtles. Kaylyn collected samples of mites and continued to work with this turtle while I headed off to Nebraska to guide student research there. After several days of treatment and care M198 was released back exactly where I originally found him under the barbed-wire fence. He does not have a transmitter so we will not be able to keep track of him like we might other turtles, but we certainly hope he lives a long and illustrious life after his treatment. We eventually intend to genetically determine the species of mite discovered and will continue to look for turtles with mites in the future, although hopefully that was the first and last time we find a turtle with this type of parasite.

Figure 3 (right). M198 (Scott) calmly sitting on the stereoscope so that we could examine him for mites (and later remove as many as possible).



Rhoda Returned!



It is with mixed feelings that F130 (Rhoda), our long-term rehabilitation resident, has been returned back to the field. First off, special thanks to Wendy, Kaylyn, and Jossie for taking care of Rhoda during her six-month stay in our rehab center in Stoffer Hall. Rhoda was originally found out of brumation about 1 month early (Mid-March!) and was infested with flesh flies and had lost the back half of her scutes leaving her shell exposed as bone (pictured on the left). Rhoda was severely underweight, dehydrated, and lethargic. After close monitoring and feeding, Rhoda slowly became more and more active. Although it initially took her a long time to start eating, she eventually warmed up to strawberries and worms, and later became a picky eater choosing only to eat live mealworms. We released Rhoda after we were sufficiently happy with her weight gain, flesh fly removal, and activity levels. Good luck Rhoda, we hope to see you out in the wild again sometime soon!

We're on the Web!

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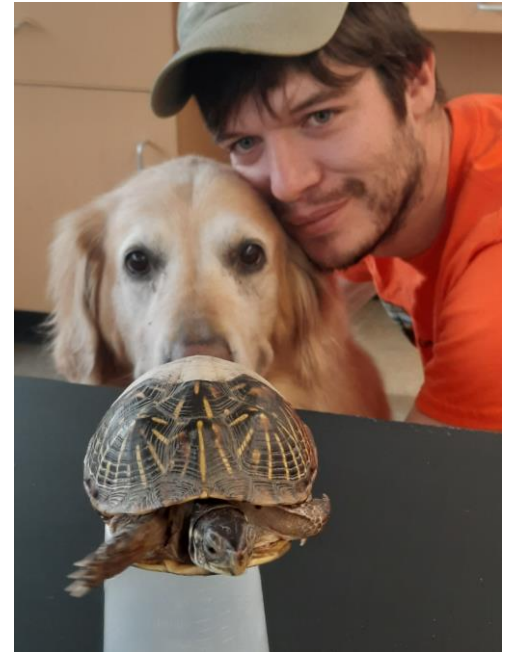
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Ornate box turtle	Rehabilitation	Cognition	Sally
Outreach	Flesh Fly	Kaylyn	Kelty
Memory	Rhoda	Scott	Mite
Assay	CPBS	Abby	Lola
Katie			

Summer 2022 Highlights

These newsletters tend to have lots of text, perhaps too much. Thus, I have created a website (link above) where a collage of photos can be seen on the homepage.

Below is a summary of the WU Turtle Team Spring 2022 highlights:

- The Turtle Team was awarded a Washburn Women's Venture Program Grant!
- Sally B is awarded a WTE for her 4-year project building the photo archive. The funds will be used to purchase a computer that will permanently house our entire photo archive which currently has over 10,000 photos!
- 22 students involved with summer research
- 130 turtles were assayed for their behavioral types, including 20 juveniles
- We discovered our largest turtle ever, a three-toed box turtle weighing 980g! (typical size is closer to 500g)
- 139 flesh flies removed from turtles
- Collected over 2,000 locations via radio telemetry at CPBS (Nebraska), over 1,100 locations at our North Topeka site, and over 600 locations at our Lawrence site all in 2022. Truly a staggering amount of work by the turtle team this summer
- Did outreach with Nature Nuts camp, a Zoo camp, Master Naturalist of NE, Young Nebraska Scientists (YNS) of Nebraska, and Master Naturalist of Kansas City
- Continued collaborations with partners at Coe College and the University of Nebraska-Lincoln

