

The Effect of Brumation on Stress in *Trachemys scripta elegans*, Measured by Blood Cortisol Concentrations



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Abstract

Brumation is a physiological state in reptiles and amphibians that takes place during cold, winter months; it involves a slowing of the animals' metabolic processes, reduced activity, and minimal food intake. This process is naturally occurring in wild reptiles. When it comes to reptiles in captivity this natural process of brumation has been removed from common reptile husbandry standards. Without brumation there are negative effects on reptiles that could affect quality of life. This study will examine the effect of brumation on stress in the red eared slider. Blood cortisol levels will be compared between a non-brumating group of turtles and an artificially brumated group of turtles. Cortisol levels are expected to be higher in the group that does not brumate.

Introduction

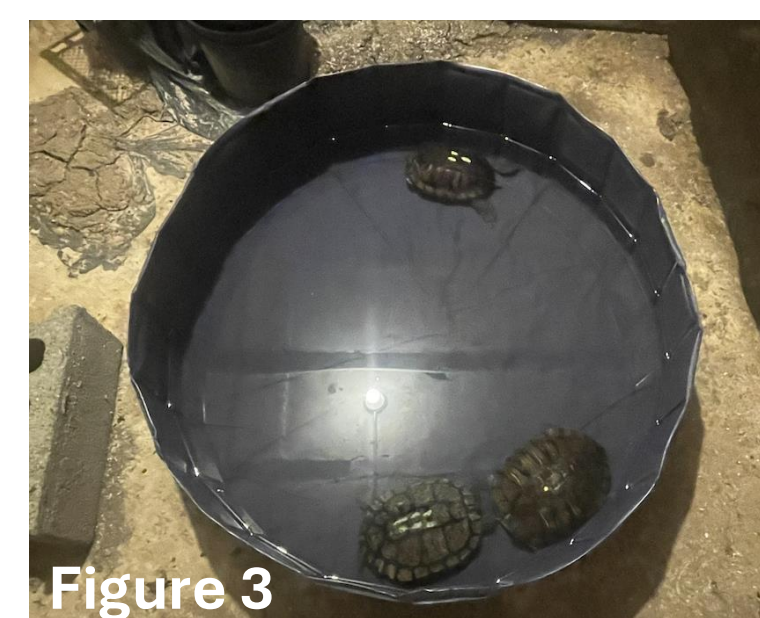
Brumation is a physiological state in reptiles and amphibians that takes place during cold winter months that involves a slowing of the animals' metabolic processes, reduced activity, and minimal food intake allowing them to survive an extended period of cold temperatures without food and emerge after the season healthy. For many species that brumate on a regular basis, brumation may be an integral part of their long-term health for example playing a pivotal role in hormone regulation for many types of reptiles. If turtle species that regularly brumate are prevented from completing the brumation process, they are more prone to illnesses and to a shortened lifespan. Maintaining low stress levels for captive reptiles is an instrumental part of keeping them healthy. Stress in reptiles can be measured by Cortisol levels circulating in their blood and should correlate to the amount of stress the animal is under. Allowing captive reptiles to go through an annual brumation cycle may be a way to decrease the stress of the animal while living in captivity. In this study we will examine the effect of brumation on stress levels in *Trachemys scripta elegans*, the red eared slider. Red eared sliders are particularly good at brumation. This research aims to show the differences in cortisol levels in *Trachemys scripta elegans* that brumate artificially and those who do not brumate at all. We expect cortisol levels to be lowest in the turtles that brumate in comparison to the turtles that do not brumate. This would suggest that brumation can be used as a key stress relieving tactic within the species and may be applicable to other reptiles and amphibians in captivity.

References & Acknowledgements

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 Turtle Brumation (2021). *The benefits & dangers of the hibernation cycle*. Texas A&M Veterinary Medicine & Biomedical Sciences, VMBS News. Fix the intext citations to reflect this change.

I would like to thank: The Shoenfeld Foundation for their funding and support of student research projects. Rebecca Hughes for her time, materials, and training for the fecal parasite checks. Jake Lauten for loaning his turtles. Cold Blooded Kingdom for the donation of lights and bucket filter.

Methods



- Indoor turtle habitat was constructed using a plastic formed pool and includes UV lights, basking surfaces and a bucket filter (Figure 1).
- Water quality is monitored daily, including temperature, pH, hardness, ammonia and nitrates. Water changes are completed as needed.
- All six turtles were examined by Dr. April, the veterinarian used by the animal care center at Del Val.
- Fecal parasite checks were completed using the fecal float method.
- 2 mL of blood was drawn from the subcarapacial venous sinus and stored in lithium heparin vacutainer tubes in a separate refrigerator (Figure 2).
- Outdoor turtle habitat was just a pool to encourage turtles to enter brumation (Figure 3).
- Artificial brumation habitat is inside a refrigerator set at 4 degrees C.
- Brumation boxes were constructed from clear plastic shoe boxes with holes in the side for air circulation, filled with moist soil and dry leaves (Figure 4).

Results and Discussion

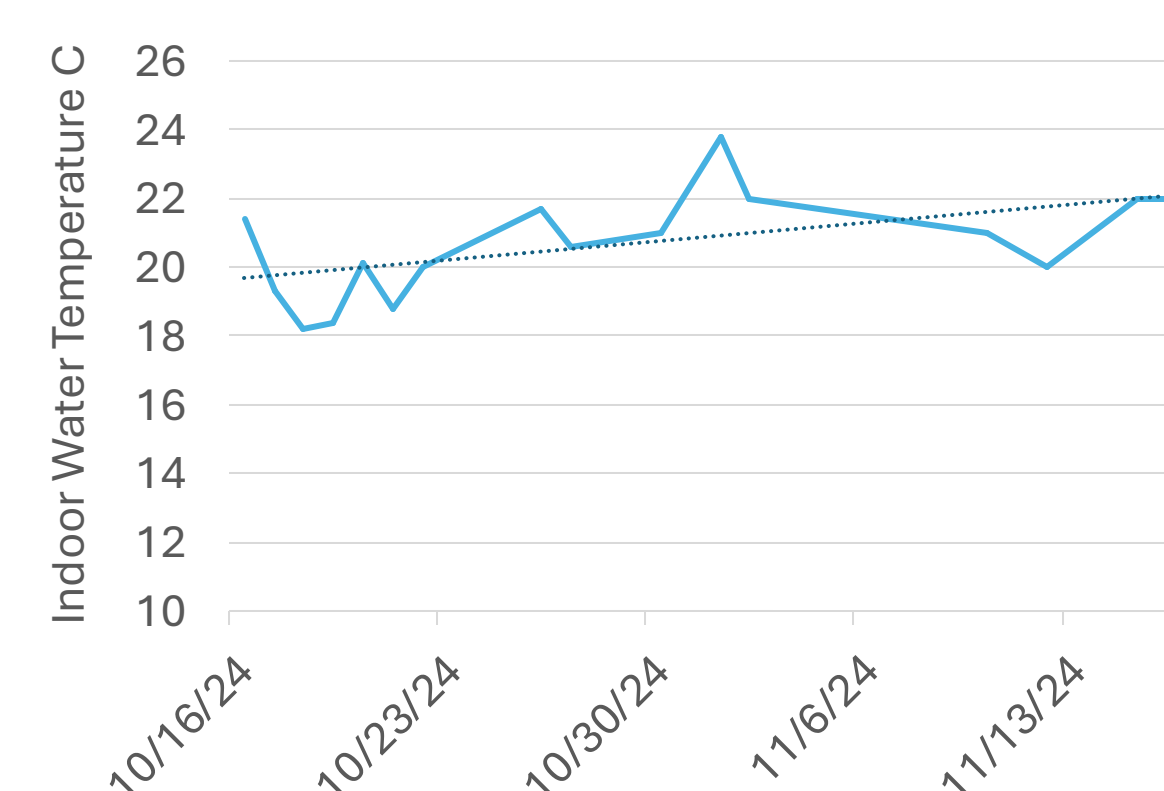


Figure 5: Temperature of indoor turtle habitat. Turtles remain active year-round above 16 degrees C.

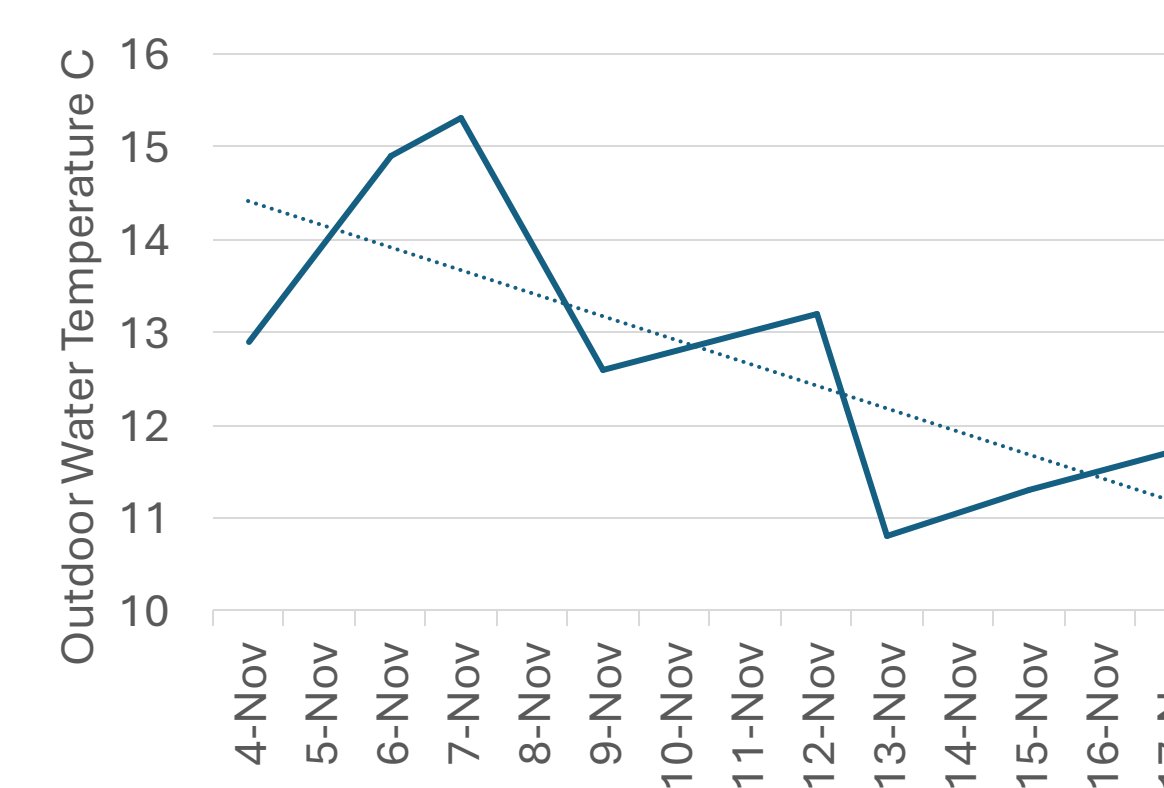


Figure 6: Temperatures of outdoor turtle habitat. Turtles will begin to slow down, getting ready for brumation, as temperatures near 10 degrees C. Once temperatures remain around 3-5 C turtles will remain in the brumation state.

- Veterinary examinations were positive and turtles were deemed healthy based on body condition.
- Fecal parasite test showed minimal evidence of parasitic infection.
- Results were reviewed by Rebecca Hughes, Manager of Small Animal Science Center, and were deemed safe to proceed.
- Outdoor water temperatures decreased to a range that turtles began to slow down (Fig 6).
- Turtles have successfully transitioned into a state of brumation in the refrigerator.
- Turtles will be checked every 2 weeks during brumation and weight will be monitored.
- If more than 1% of body weight is lost the turtle will be removed from the experiment (Fig 7).
- Estimated date of removal from brumation is January 15th.

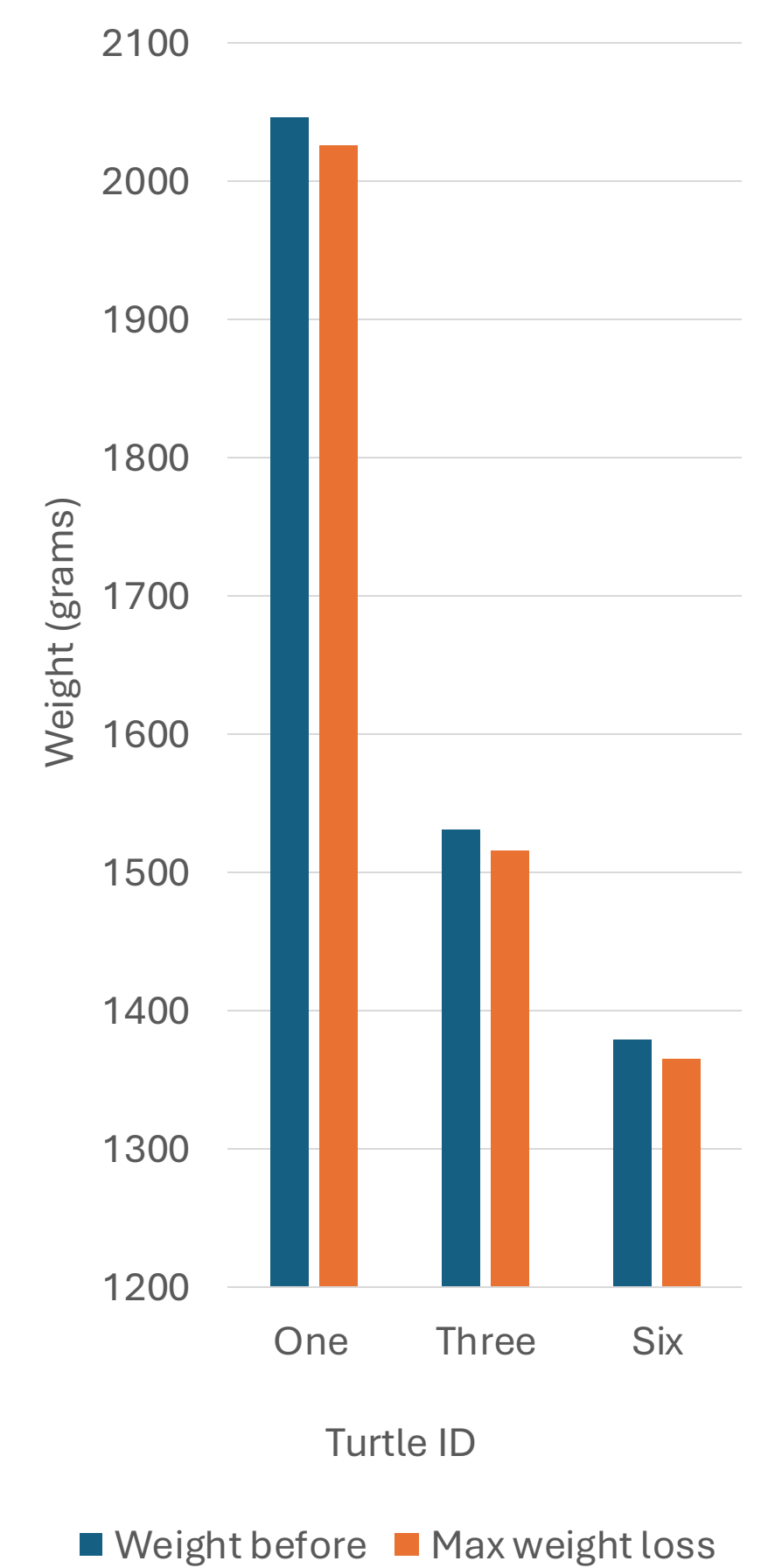


Figure 7: Turtle weight before artificial brumation compared to safe loss of weight through the experiment. Turtles should not lose more than 1% of their weight during brumation.

Future Directions

