RESEARCH & MITIGATION

PROJECT PROPOSAL

INFLUENCE OF PHEROMONES ON HATCHLING TURTLE DISPERSAL

OVERVIEW

Understanding the driving force behind movement patterns of turtles during an early life history stage is important to mitigating the impact of anthropogenic additive mortality rates during this vulnerable age class. Turtles exhibit a bet hedging life history pattern, resulting in a high juvenile mortality rate being compensated by the long term persistence of mature turtles. In the face of increasing threats to sexually mature turtles, the low survivorship of hatchling turtles should be compensated for. Hatchling turtles are exceptionally vulnerable to predation (see subsidized predation), desiccation, and anthropogenic threats such as road mortality because of their soft shells, small size, and reduced mobility.

In order to mitigate the low survivorship of hatchling turtles, some techniques have been utilized in the past, such as headstarting, incubation, and strategically placed nesting mounds. These measures have had varying outcomes, and understanding the mechanism behind the dispersal and movement patterns of hatchling turtles can allow for appropriate implementation of these methods. Previous studies have assessed the influence of hydric conditions, proximity to water, light sources, and other environmental factors on post-emergence behaviour of hatchling turtles, but none have investigated the impact of pre-existing pheromone trails on hatchling turtle movements and tortuosity. This knowledge can allow researchers to predict the path of hatchling turtles from their natal nest and provide the required site-specific protections. In addition, this study can shed light on whether the absence of mature turtles (and thus their pheromone trails) is impacting hatchling movement patterns.

The Land Between
TG Research and Monitoring Team


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OBJECTIVES AND HYPOTHESIS

The objective of this study is to determine if pheromone trails have an influence on the tortuosity, movement length, and environmental exposure times of post-emergence hatchling turtle movements.

If pheromone trails have an influence on post-emergence hatchling behaviour, then I predict there will be a significantly more direct path to wetland sites by the hatchling turtles than when moving with solely environmental influences. If this hypothesis is supported, I expect to see a reduction on time-traveled and tortuosity metrics by hatchling turtles.

STUDY DESIGN

This study will be conducted in an arena-style experiment (Figure 1). Pool noodles taped to the floor with packing tape will form a 17 x 17 foot barrier to contain the hatchlings within the arena. The arena will contain a Snapping Turtle hatchling release site in the center, with water source at one pole, and a trail of pheromones leading to the other pole. An aerial-placed video camera will record the movements of the all hatchling turtles for 1 hour post-release. Two hygrometer/thermometers will ensure that each treatment is exposed to the same humidity, temperature and light source (consistent humidity and 28 ℃ , respectively). The pheromones will be obtained by exposing a cotton pad to the cloaca or mental glands

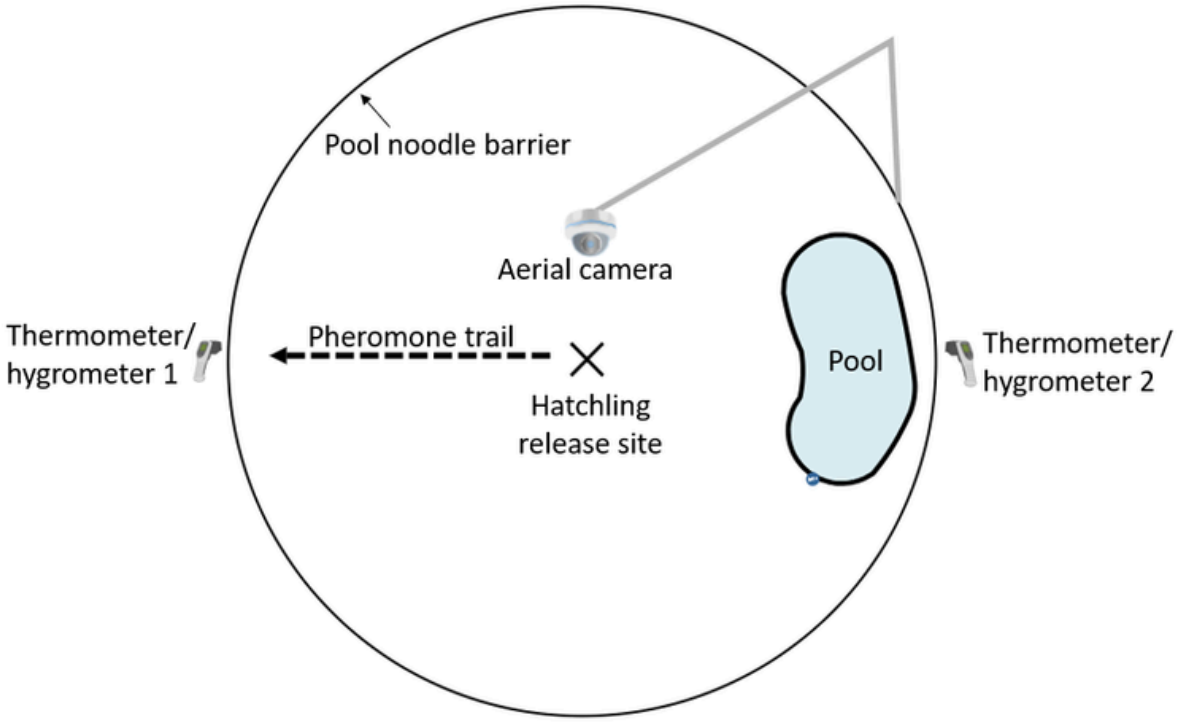

Figure 1. Schematic of experimental arena.

STUDY TIMELINE

of wild Snapping Turtles, depending on the treatment being applied. The cotton pads will form the pheromone trail, and unscented cotton pads will be in all treatments and controls to eliminate the possibility that the hatchlings are following them and not the pheromones. Between treatments, the arena will be thoroughly cleaned with a vinegar dilute to remove the scent of the previous trial, and controls will be performed first to prevent scent-contamination.

A total sample size of 180 hatchlings will be used in this experiment, from 9 nests (Figure 2). Treatments will include: 1) cloacal pheromones, each trial having three replicates of 20 hatchling Snapping Turtles, 2) mental gland pheromones, each trial having three replicates of 20 hatchling Snapping Turtles, and 3) a control, which will have three replicates of 20 Snapping Turtles. All hatchlings will be exposed to pheromones from the same approximate location of their nest to avoid promoting the spread of disease among populations.

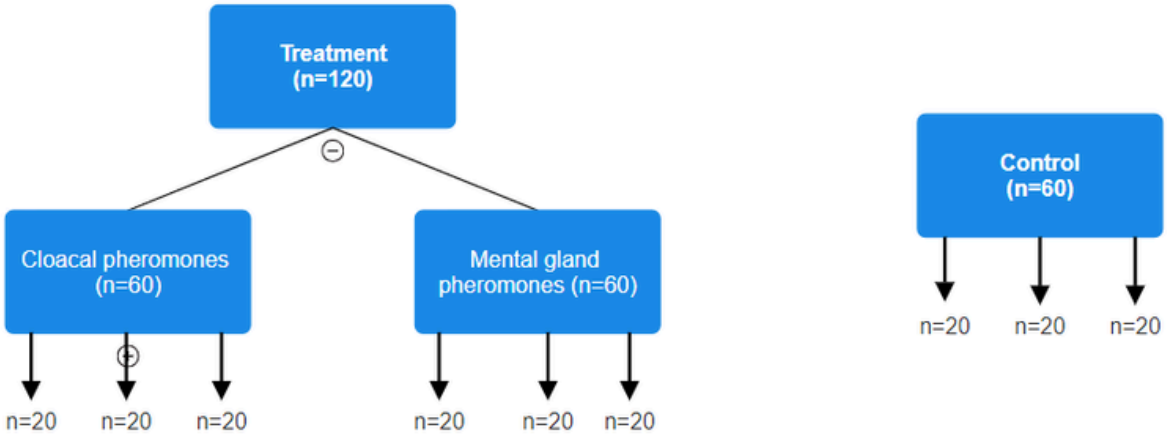

Figure 2. Diagram of study design.

During the 1 hour session in the arena, each of the 20 turtles will be simultaneously recorded with the aerial camera. The footage will be analyzed using Kinovea software to assess each turtle's distance moved and the tortuosity of their movement (determined based on movement angles), and overall directionality. These metrics will be converted into an average and compared between replications and treatments using an ANOVA (Analysis of Variance) to test for significant difference ($P>0.05$). Post-hoc tests will be conducted if necessary.

CONCLUSION

This study will provide a framework for further research on the impact of species and sex-specific pheromones on post-emergence hatchling turtle behaviour. Additional work will utilize fluorescent power to track hatchling turtle movements in environmental conditions with pheromone trails. Chemical analysis of various pheromones will also be conducted to determine the structure and potential hydrophobic properties of these compounds.