The Spatial Ecology and Habitat Utilization of Hatchling Blanding's Turtles at Camp Ripley Training Center, MN

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Introduction

This project concerns a Blanding's turtle (*Emydoidea blandingii*) population located at Camp Ripley Training Center in Little Falls, MN. Since the early 1990's, several management practices have been implemented to conserve the species at Camp Ripley. One of these management practices includes annual surveys to protect nests from predation. Following emergence, hatchlings are direct-released into the nearest wetland complex to reduce road mortality, predation, and eliminate a long journey to water. However, the success of this management practice is still uncertain.

Objectives

1) Discover habitat selection of hatchlings at the micro-macro scale
2) Compare survivorship of hatchlings direct-released into wetland complexes to hatchlings released at the nest site
3) Determine the best hatchling release strategy; either a) continue to direct-release hatchlings into the nearest wetland complex or b) release hatchlings at the nest site

Because this project is still ongoing, this poster only focuses on habitat utilization and survivorship of wetland direct-release hatchlings.

Table 1. *P*-values (significantly different comparisons bolded) from pair-wise comparisons (LSD) of mean habitat use ratios for macrohabitat selection by hatchling *Emydoidea blandingii* (*n*=5) at Camp Ripley, Little Falls, Minnesota. Habitats are ranked from most preferred (low habitat use ratio values) to least preferred (high habitat use ratio values).

Macrohabitat	Habitat Use Ratio	swamp forest	shrub swamp	marsh	upland forest	upland open	upland woodland	bog
swamp forest	0.458	-	-	-	-	-	-	-
shrub swamp	0.491	0.854	-	-	-	-	-	-
Marsh	0.645	0.271	0.39	-	-	-	-	-
upland forest	0.654	0.249	0.363	0.956	-	-	-	-
upland open	0.868	**0.02**	**0.041**	0.192	0.211	-	-	-
upland woodland	0.892	**0.014**	**0.031**	0.15	0.165	0.888	-	-
Bog	0.922	**0.009**	**0.021**	0.108	0.12	0.751	0.86	-
pond	0.999	**0.003**	**0.007**	**0.043**	**0.048**	0.441	0.528	0.648

Table 2. Microhabitat analysis using paired t-tests and conditional logistic regression. Variables with non-significant values from the t-tests were not included in the conditional logistic regressions. Only variables that were found to be significant in the regression are considered to be supported. Positive coefficients indicate that the probability of selection increases with a variable, and negative coefficients indicate the probability of selection decreases with that variable. "No data" entries indicate that there was no data to run analyses on.

	Paired t-tests for aquatic variables	Paired t-tests for upland variables	Conditional logistic regression for aquatic hatchlings		Conditional logistic regression for upland hatchlings	
Microhabitat variable	**Aquatic *P*-value**	**Upland *P*-value**	**Aquatic coefficient**	**Aquatic *P*-value**	**Upland coefficient**	**Upland *P*-value**
open water %	0.1238	No data	Not included		No data	
emergent vegetation %	0.7898	No data	Not included		No data	
floating vegetation %	0.0632	No data	Not included		No data	
woody vegetation %	No data	0.064	No data		-0.072	0.064
detritus vegetation %	**0.0342**	0.5978	16.82	0.9968	Not included	
moss vegetation %	No data	0.1028	No data		Not included	
herbaceous vegetation %	**0.0212**	**0.0102**	-3.50	0.9994	**0.015**	**0.005**
water depth	**<0.0001**	No data	**-0.042**	**0.0005**	No data	
soil depth	0.5051	**0.0003**	Not included		**0.3607**	**0.0001**
water temperature	0.3159	No data	Not included		No data	
soil temperature	No data	**0.0185**	No data		-0.038	0.3721
air temperature	0.7188	0.6541	Not included		Not included	

Methods

2017
n=6

Transmitters= 5% of a hatchlings' body mass

2018
n=17

Transmitters= 8.4% of a hatchlings' body mass

Wetland Release

Hatchlings were located every 1-3 days

Macrohabitat Analysis

See Table 1 for macrohabitat classification

Habitat classified into 8 categories using aerial photography & ArcGIS

Maximum path distance travelled in 2017 and 2018 used to define habitat available to hatchlings

The Euclidean distance method was used to compare hatchling locations to random locations

$$\frac{\text{Avg. distance from hatchling locations to each macrohabitat}}{\text{Avg. distance from random locations to each macrohabitat}}$$

MANOVA to test if habitats were used disproportionately to availability

Least Significant Difference (LSD) to find which habitats were used disproportionately

Microhabitat Analysis

See Table 2 for microhabitat variables

Collected microhabitat variables at hatchling locations

Collected microhabitat variables at random locations

Random locations were 10 m away from hatchling locations because this was the average daily distance travelled in 2017

Match paired t-tests were conducted to determine which variables were significantly different between turtle locations and random locations

Variables found to be significant in paired t-test were analyzed using conditional logistic regression to identify the best model for predicting turtle locations

Discussion

- Due to the discontinuation of the transmitter series used in 2017, heavier transmitters had to be used in 2018. **Hatchlings with heavier transmitters had a significantly higher mortality rate** (R^2 = 0.145, *P* = 0.045; Fig. 3).
- In 2017, transmitters weighed no more than 5% (3.29% ± 0.5) of a hatchlings' body mass while transmitters weighed up to 8.4% (5.60% ± 0.92) in 2018. Hatchlings wearing lighter transmitters travelled significantly farther (R^2= 0.314, *P* = 0.004; Fig. 4). In 2018, no macrohabitat preference was detected. This may be because the transmitters used in 2018 limited mobility, ultimately limiting macrohabitat choices.
- Though hatchlings were direct-released to shrub swamp and pond habitat, swamp forests were the most preferred habitat while pond was the least preferred in 2017. This suggests that hatchlings move to preferred habitat despite direct-release efforts. Hatchlings will be released at the nest-site in fall 2019 and management practices may be adjusted to accommodate hatchling habitat preference.
- Due to the 2018 findings, it is strongly recommended that transmitters weigh no more than 5% of a hatchlings' body mass for future studies.

Preliminary Results

- 23 hatchlings were tracked from 5 nests for a total of 347 radio-locations.
- Over the two field seasons, only 35% of hatchlings survived, with all known mortalities occurring during the 2018 field season (Fig. 1).
- In 2017, the largest distance travelled was 536 m while the largest distance travelled in 2018 was 157 m (Fig. 2).
- In 2017, hatchlings significantly preferred swamp forests, shrub swamps, marshes, and upland forests over upland open, upland woodland, bog, and pond habitats (Table 1).
- There was no macrohabitat preference detected for hatchlings in 2018.
- Hatchlings selected for significantly shallower water depths in aquatic environments (Table 2). This model accurately predicted a turtle location over a random location 56.8% of the time.
- Hatchlings selected for significantly deeper substrate depths and high herbaceous cover in uplands (Table 2). This model accurately predicted a turtle location over a random location 76.8% of the time.

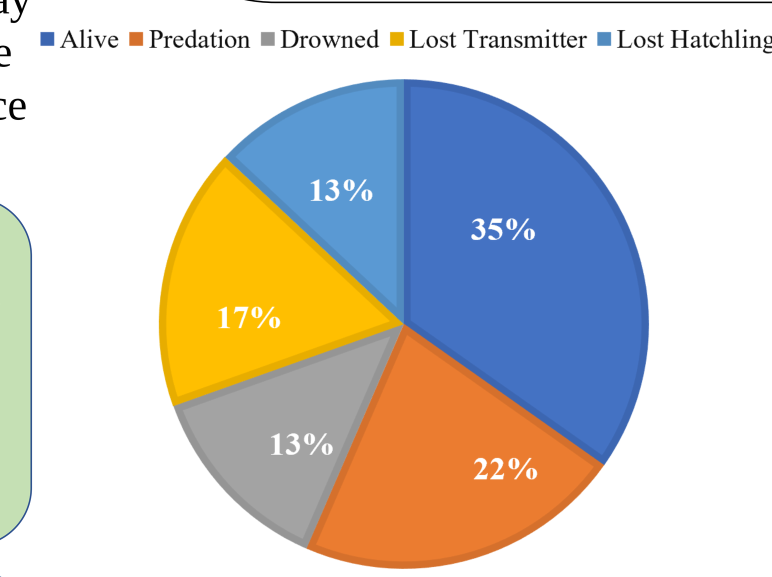

Fig. 1. Fates of *Emydoidea blandingii* hatchlings (*n*=23) tracked at Camp Ripley in 2017 and 2018 in Little Falls, Minnesota.

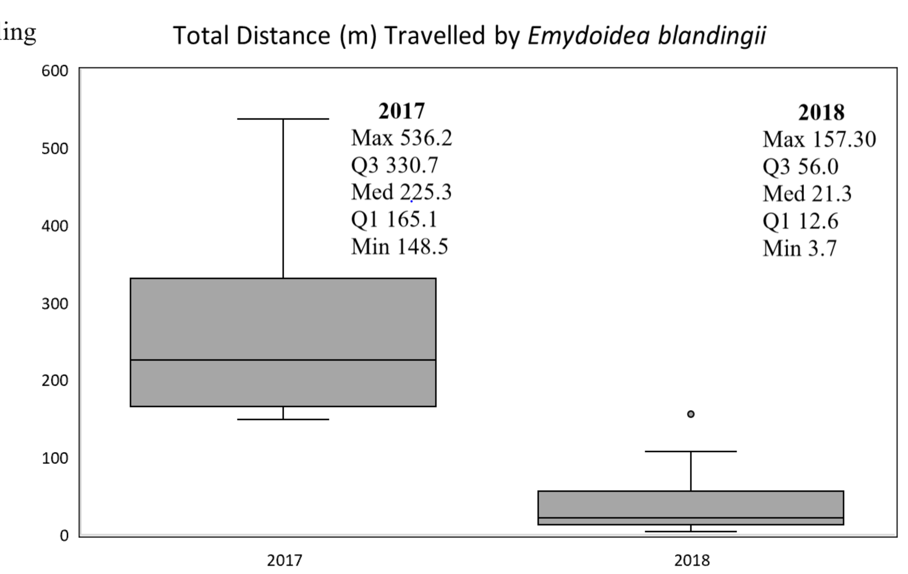

Fig. 2. Box plot of the distances travelled by *Emydoidea blandingii* hatchlings (*n*=23) in 2017 and 2018 at Camp Ripley in Little Falls, Minnesota.

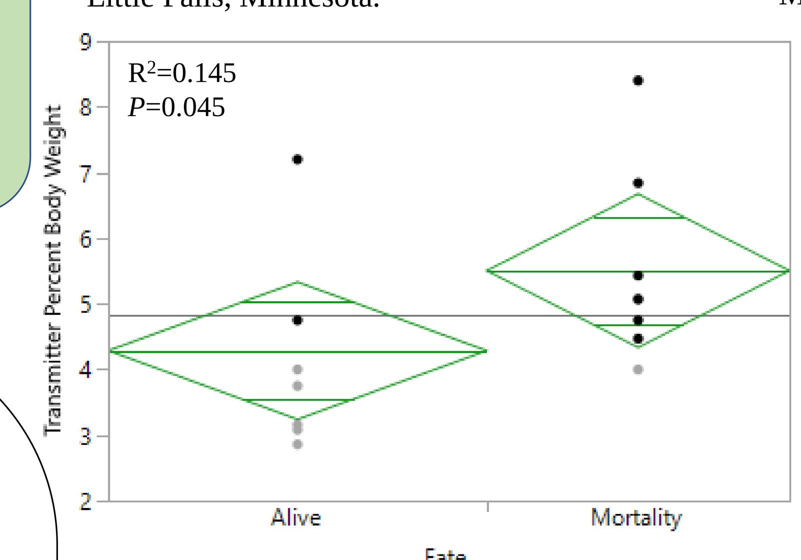

Fig. 3. A Wilcoxon Signed-Ranks Test was performed to test the significance of transmitter size based on hatchling weight on survivorship (*n*=18) for *Emydoidea blandingii* hatchlings at Camp Ripley.

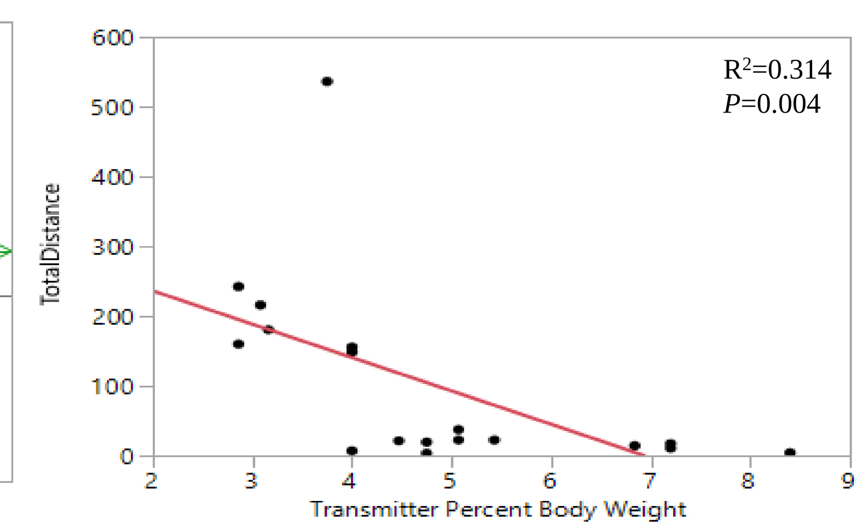

Fig. 4. Simple linear regression was used to investigate the impact transmitter weight compared to hatchling body mass had on total distance travelled by *Emydoidea blandingii* hatchlings (*n*=23) in Little Falls, Minnesota.

Current Field-Work

- During the fall of 2019, hatchlings were released at the nest site and data is currently being collected on survivorship, movement patterns, and micro-macro habitat selections.
- Due to our findings from 2018, transmitters weigh no more than 5% of a hatchlings' body mass to reduce disturbance to innate behaviors.
- Habitat utilization and survivorship of hatchlings direct-released in wetland complexes will be compared to hatchlings released at the nest site to evaluate the best hatchling release strategy.
- From the results of this project, DNR representatives can evaluate the current management practices and modify actions to accommodate habitat preferences and maximize hatchling survivorship.