Activity, Body Temperature Variation and Movements of the Midland Painted Turtle (*Chrysemys picta marginata*) by Paul Converse and Professor John Rowe, Alma College

Introduction

The thermal ecology and movement of the Midland Painted Turtle *(Chrysemys picta marginata)* have only recently been studied (Edwards and Blouin-Demers, 2006; Rowe and Dalgarn, in preparation). Painted turtles are "moderate thermoregulators" (Edwards and Blouin-Demers, 2006) that show substantial variations body temperature (T_b) with cool and invariable temperatures in the morning and oscillations in the afternoon (Rowe and Dalgarn, in prepartion). In a shallow marsh system on Beaver Island, Michigan, Rowe and Dalgarn (in preparation) found that home ranges and core areas of activity included both open water and grass-sedge microhabitats. Low environmental temperatures reduced activity and turtles in open water habitats had less variable T_b than those residing in sedge-grass edge microhabitats. Males maintained higher T_b than females during the early morning hours although why is not clear.

At Brewster Lake we were interested in conducting a study of movements and T_b variation of Painted Turtles in a relatively thermally stable lake with deep open-water and edge habitats. Use of cool deep water could cause very depressed T_b but nothing to date is known about how Painted Turtles use such a habitat. We used radiotelemetry to study habitat use, home range size, and T_b variation during the summer of 2007. This document is a report on progress to date. Due to the labor intensive nature of post-processing of data, we have only partially analyzed at this time.

Materials and Methods

We conducted our study between 1 June and 15 August, 2007. The first week encompassed a large amount of preparation in order to start the study smoothly. We first placed several aquatic traps in the littoral zone of Brewster Lake to collect specimens. Once we had an adequate amount of specimens, we took the best candidates for radiolocation and released the others; in total we had ten turtles. Three of the turtles had transmitters secured to the marginal scoots of the carapace using epoxy. The remaining seven had transmitters surgically inserted into the femoral pocket and were left in sterile conditions until the incision sufficiently healed. While trapping was in progress, we placed 114 marked flags approximately five meters apart around the entire perimeter of Brewster Lake. Those locations were then marked using GPS and recorded into ArchView giving us the exact dimensions of the lake to measure the total daily distance moved. In four locations on Brewster Lake, we placed temperature loggers in shallow and deep water to acquire a thermal profile for the lake. Lastly, we placed an antenna in the field to listen to the unique frequencies emitted by the turtles in 15 minute intervals in order to record thermal data. Once the sample population was back in Brewster Lake, we made runs at 0800 h, 1300 h and 1800 h five to seven days a week to collect the positional data of *C. picta.*

Results

Much of our data is still being analyzed; as new data are interpreted, it is almost certain that our results will change to some extent. The current data we have processed is for four turtles over a two-week span; in total our study monitored a total of 12 turtles over a two and a half month span.

Turtles confined their activity to the littoral shelf within 5 m of the lake's edge (Fig 1). Similar to Painted Turtles on Beaver Island (Rowe, 2003; Rowe and Dalgarn, in preparation), Brewster Lake Painted Turtles used core areas (clusters of observations in "favored" areas). A representative daily T_b profile is depicted in Fig. 2). The individual showed an early morning decrease in body temperature, a large afternoon spike, and late afternoon oscillations throughout the remainder of that day. Mean T_b plotted over several d reveals the cyclic nature of T_b variation at Brewster Lake (Fig. 3). While T_b was similar between sexes overall at Brewster Lake, females may have maintained higher T_b than males during the early morning h (Fig. 4).

Painted Turtles at Brewster Lake apparently used solar radiation to warm T_b in the morning and afternoon because T_b exceeded surface and deep water temperatures during that time period (Edge surface mean = 26.2 ± 0.20°C, n = 168; Edge deep mean = 24.9 ± 0.15°C, n = 168; Open water deep mean = 24.9 ± 0.10°C, n = 168) (Fig. 5). Notice the resemblance of the ES graphical data on Figure 4 to that of Figure 2b. The resemblance leads us to believe that *C. picta* is using the surface water to bask while also using radiant energy from the sun to slightly surpass the temperature of the surface water.

Discussion

The current data we have accumulated has shown that turtle movement was restricted to the edge of Brewster Lake. An explanation for this is the possibility of prey item distribution or colder water due to the lake being deeper away from the edges. The littoral shelf being an excellent location of vegetation and small insects may have also given little incentive to exploit the deep waters of Brewster Lake. The distribution of the turtles on the edge of Brewster Lake was not uniform. We have observed certain areas of preference, traditionally known as core areas. This may be a microhabitat preference or a thermal preference. Certain edges of the lake may have better basking sites or vegetation for evading predators.

We have also observed in the data collected so far that the mean body temperature of Brewster Lake turtles is 3ºC higher than the painted turtles in the study by Rowe and Dalgarn. We are unable to verify whether this is due to interpopulation differences or local environmental temperatures.

The Brewster Lake study also showed females maintaining a higher T_b in the morning than males, the exact opposite of what we found on Beaver Island. This may be due to the females elevating T_b for embryonic development and nesting season. In contrast, Rowe and Dalgarn (in preparation) found that male painted turtles elevated T_b above that of females. We look forward to the analyses to verify the differences.

We observed a high failure rate of the surgically implanted transmitters. Some transmitters would last a week while others would last several weeks or months. The transmitters that failed left us with incomplete positional and thermal data. We did replace most of the failed transmitters with new turtles of the same sex in order to maintain a 1:1 sex ratio for the study. While trapping for new specimens, we managed to recover two turtles with failed transmitters. The transmitters were excised and mailed to the company for analysis; we are yet to hear as to of why the transmitters failed although we are suspecting high electrical activity in the area.

Figure Lengend

Fig. 1
An arial view of Brewster Lake showing the movements and habitat preferences of turtle #192

Fig. 2
The T_b profile for a single female *C. picta*.

Fig. 3
A intrasexual comparison of T_b of *C. picta* demonstrating females maintaining higher T_b in the morning hours.

Fig. 4
T_b values of *C. picta* over a two-week span.

Fig. 5
A comparison of water temperature at several depths at Brewster Lake.

Figure 1

Figure 2

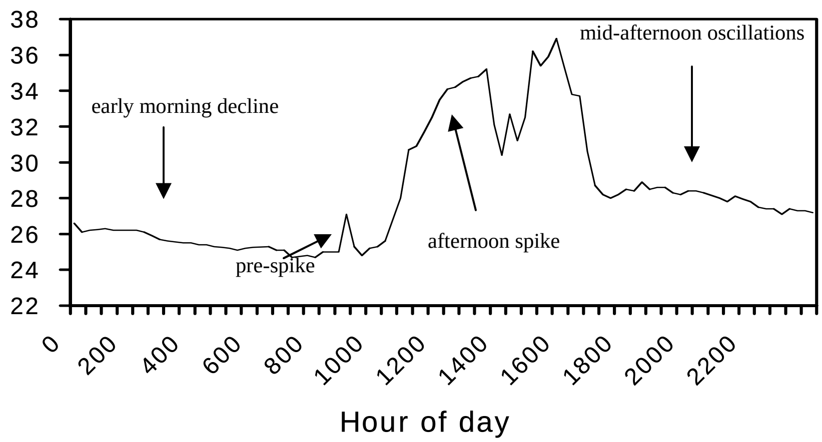


Figure 3

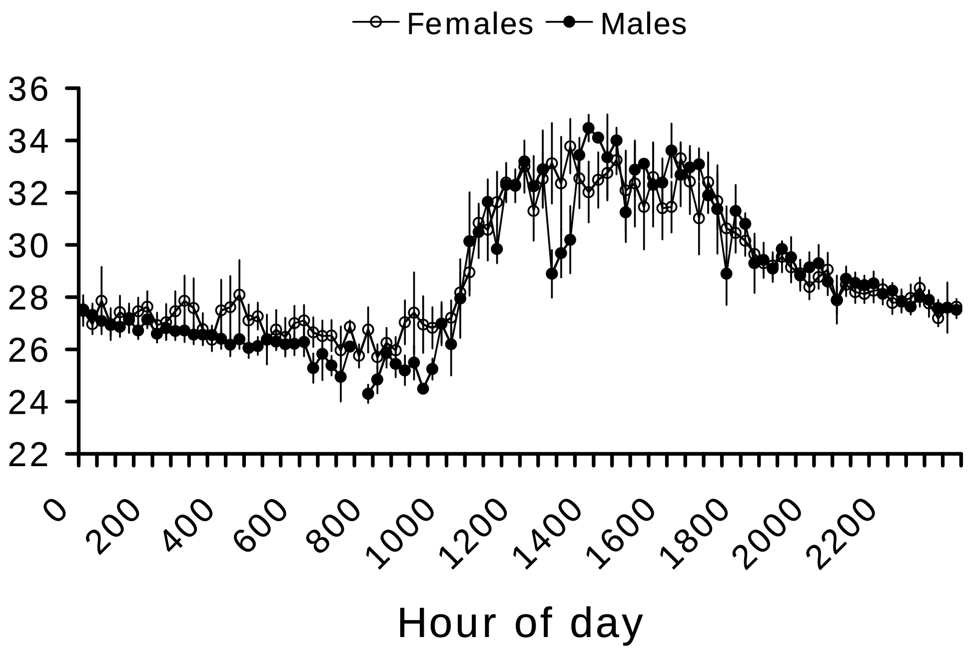


Figure 4

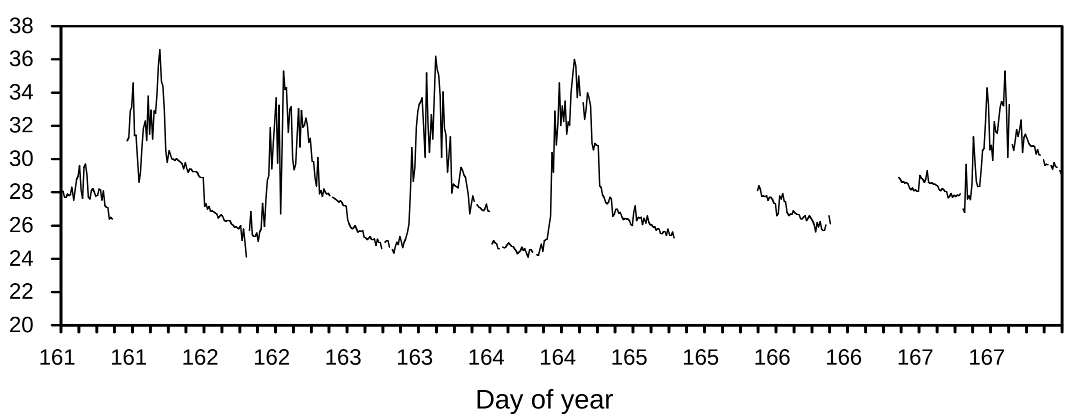
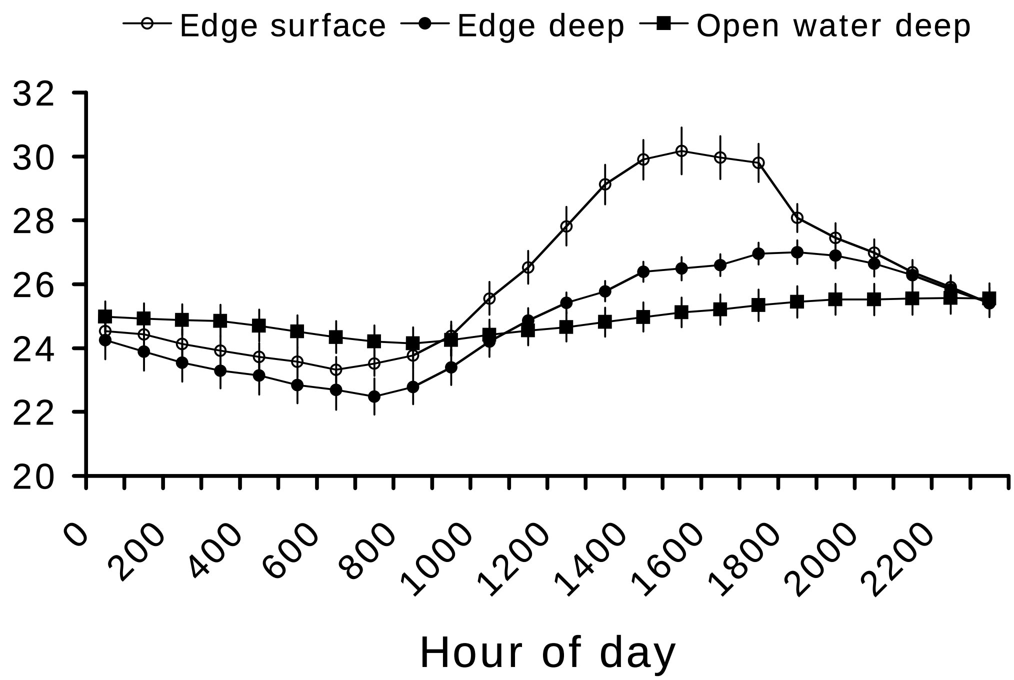


Figure 5



Edge surface
Edge deep
Open water deep
32
30
28
26
24
22
20
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
Hour of day

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