

# Why didn't the Spotted Turtle (*Clemmys guttata*) cross the road?

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**Abstract.** Spotted Turtles (*Clemmys guttata*) typically make use of multiple wetlands during the active season. Movements between wetlands can put Spotted Turtles at significant risk of traffic mortality. A fen in eastern Ontario, Canada, bisected by a two-lane paved road, supported a small population of Spotted Turtles on one side of the road. To determine if the turtles commonly crossed the road, five turtles (three females, two males) were radio-tracked. All 5 of the radio-tracked turtles came within 30 m of the road, but none of them crossed the road, made use of any other wetland, or left the fen to use upland habitat. Surveys across the road in the remainder of the wetland failed to locate any Spotted Turtles. The range length of the females averaged 202 m (180–244 m) while males averaged 262 m (200–324 m). Minimum Convex Polygon home ranges of the females averaged 1.3 ha (0.7–2.2 ha) while males averaged 2.1 ha (1.7–2.5 ha). Although the Spotted Turtles remained within a portion of a single wetland, this habitat was highly diverse, containing permanent pools, seasonal pools and “upland habitat” consisting of sphagnum hummocks. Despite the fact that Spotted Turtles across their range may face a significant threat from traffic mortality, some populations may be relatively immune to this threat if they remain within large wetlands. The identification and protection of such sites should be a conservation priority.

Key Words. home range, radio telemetry, traffic mortality, Ontario, Canada

## Introduction

Spotted Turtles (*Clemmys guttata*) (Schneider, 1792) occur over a wide latitudinal range, from Ontario, Canada to Florida, USA (Ernst and Lovich, 2009). They are typically associated with shallow wetlands with a soft substrate and make use of multiple wetlands over the course of the year (e.g. Litzgus et al., 1999; Joyal, McCollough and Hunter, 2001). Spotted Turtles can also spend up to 74% of the active season in upland habitat (Joyal, McCollough and Hunter, 2001). Individuals are known to cross roads (e.g. Graham, 1995; Steen et al., 2006) and traffic mortality may be a significant threat to some populations (Beaudry, deMaynadier and Hunter, 2008).

The Spotted Turtle is a species of conservation concern across most states and provinces where it occurs and is considered endangered in Canada (COSEWIC, 2004). Extant populations in Canada are limited to the province of Ontario. As part of recovery actions, the demography and habitat use of a small population inhabiting a fen in eastern Ontario has been studied since 2001. The known population (as of 2010) consists of 22 individuals (4 males, 11 females and 7 juveniles). A paved road passes through the fen, but to date Spotted Turtles have only been found on one side of the road. Given the potential

risk of traffic mortality, a radio tracking project was initiated to determine if Spotted Turtles routinely crossed the road and did the road affect the movement patterns and home ranges of the Spotted Turtles.

## Materials and Methods

### Study area

Research took place in a fen near the city of Ottawa, Ontario, Canada. The precise location of the study site is being kept confidential to deter illegal collecting. The site consisted primarily of open and treed fen. The open fen habitat consisted of graminoid and shrub-rich portions. A two-lane paved road divided the fen into two pieces. The date of road construction is unknown, but based on historical airphotos was prior to 1950. The open fen on the side of the road known to be occupied by Spotted Turtles was shallow (< 50 cm), relatively open and approximately 10 ha in size. The remainder of the wetland on the other side of the road also had some open, shallow fen areas, but more areas of slightly deeper water, more areas of deciduous shrub thicket and the fen grades into an extensive swamp and marsh.

### Methods

Surveys were conducted on foot and consisted of walking through the fen searching for turtles, which were caught by hand. The straight line carapace length (CL) was measured to the nearest 0.5 mm using vernier calipers, and turtles were weighed to the nearest 1 g using a Pesola spring scale. Adult turtles (usually greater than 91 mm CL) were sexed using external features. Each turtle was assessed for condition, in terms of injuries and abnormal scute patterns. The marginal scutes of all turtles caught were notched (Cagle 1939).

**Table 1.** Home range lengths (m) from Spotted Turtle (*Clemmys guttata*) studies.

| Location      | Mean | Range    | Source                             |
|---------------|------|----------|------------------------------------|
| Ontario       | 226  | 180–324  | This study                         |
| Massachusetts | 302  | 175–500  | Milam and Melvin, 2001             |
| Massachusetts | 320  | 115–1125 | Milam and Melvin, 2001             |
| Ontario       | 327  | 275–375  | Seburn, 2003                       |
| Ontario       | ---  | >1500    | Haxton, 1998                       |
| Maine         | 1120 | 510–2010 | Joyal, McCollough and Hunter, 2001 |

**Table 2.** Minimum Convex Polygon home ranges (ha) from Spotted Turtle (*Clemmys guttata*) studies.

| Mean home range |         |       |                            |
|-----------------|---------|-------|----------------------------|
| Location        | Females | Males | Source                     |
| Ontario         | 1.3     | 2.1   | This study                 |
| Ontario         | 3.2     | 3.6   | Litzgus, 1996              |
| Massachusetts   | 4.6     | 1.9   | Milam and Melvin, 2001     |
| Ontario         | 4.7     | 2.0   | Haxton and Berrill, 1999   |
| South Carolina  | 19.1    | 5.2   | Litzgus and Mousseau, 2004 |

A total of five adult Spotted Turtles (three females, two males) captured from 25 May to 21 June, 2010 were outfitted with PD-2 radio transmitters (Holohil Systems Ltd., Carp, Ontario, Canada). Transmitters were only attached to turtles that weighed at least 140 g to ensure that the transmitter and epoxy did not exceed 5% of the turtle's weight. The five turtles averaged 103.5 mm CL (95.5–111.0 mm CL). Transmitters were attached to the rear edge of the carapace using 5-Minute Epoxy (Lepage 12), followed by a layer of waterproof epoxy (PC-7). After the epoxy dried the turtle was released at its point of capture. Subsequent tracking occurred on foot using a TRX-2000S radio receiver and a three-element Yagi antenna. All locations were determined using a Garmin eTrex GPS, with at least 5 m accuracy.

Turtles were tracked every 3.2 d on average, resulting in an average of 34.8 (28–38) tracking locations per turtle. All radios were removed on 22 September, before the turtles entered into hibernation. Minimum Convex Polygon home ranges were calculated using the program BIOTAS 2.0 (Ecological Software Solutions).

## Results

None of the five radio-tracked Spotted Turtles crossed the road, moved to another wetland or left the fen to use upland habitat. All radio-tracked turtles came within 30 m of the road and three came within 20 m of the road. The radio-tracked turtles displayed a similar movement pattern, with most of the activity focused in a small area of the fen, corresponding to the wettest area, with limited movement into other areas of the fen. Surveys conducted on six days in the remainder of the wetland across the road failed to locate any Spotted Turtles.

The range length of the females averaged 202 m (180–244 m) while males averaged 262 m (200–324 m). Minimum Convex Polygon home ranges of the female turtles averaged 1.3 ha (0.7–2.2 ha) while males averaged 2.1 ha (1.7–2.5 ha). The mean home range for all turtles was 1.6 ha

## Discussion

Both range lengths and home ranges in the current study are less than those reported in several other studies (Table 1 and 2). It is possible that the small values in the present study are because tracking did not commence early in the active season. However, this is unlikely as plotting of all capture locations of Spotted Turtles since 2001 ( $n = 29$ ) indicates that turtles made use of the same main area of the fen early in the year. The small range metrics in the current study are likely a result of the turtles not moving between wetlands. Spotted Turtles have been observed to move up to 1151 m between wetlands (Beaudry, deMaynadier and Hunter, 2009). Nesting was not observed in the current study and it is possible that none of the radio-tracked females nested. It is also possible that they nested, but within the fen, making use of sphagnum hummocks (e.g. Chippindale, 1989; Beaudry, deMaynadier and Hunter, 2010). Such small scale movements would have limited effect on home range size.

Male home range size in the current study is smaller than in some studies, but is similar to others (Table 2). Differences in the configuration of wetlands and the quality of the habitat may explain some variation in home range size (Milam and Melvin, 2001). Nonetheless, the number of studies with home ranges of males of approximately 2 ha, suggests that the Spotted Turtles in the current study were not limited in their movements despite remaining in only a portion of a single wetland.

Spotted Turtles from across their range typically make use of multiple wetlands (e.g. Litzgus et al., 1999; Joyal, McCollough and Hunter, 2001; Milam and Melvin, 2001; Litzgus and Mousseau, 2004) with individual turtles using up to nine wetlands (Beaudry, deMaynadier and Hunter, 2008). In contrast, a few populations are limited to single wetlands: a roughly 3.2 ha marsh in Pennsylvania (Ernst, 1976; Ernst and Lovich, 2009) and a 2500 ha bog in eastern Ontario (Seburn, 2003). It is unclear why the turtles in the current study remained within a portion of a single wetland and did not cross the road, as Spotted Turtles have been frequently documented on roads (e.g. Graham, 1995; Ashley and Robinson, 1996; Steen et al., 2006; Beaudry, deMaynadier and Hunter, 2008). It is possible that if more turtles were followed, or followed in multiple years, that some turtles would have been observed to cross the road. Nonetheless, the results are suggestive that road crossing is not common in this population. Wetland size may be another factor affecting movement patterns, as Spotted Turtles typically make use of small wetlands, many of which are seasonal. Wetlands used by Spotted Turtles in Maine were all < 0.4 ha in size (Joyal, McCollough and Hunter, 2001), while seasonal pools used in Massachusetts were no more than 0.25 ha in size (Milam and Melvin, 2001). In contrast, the area of the fen used by the turtles in the current study was approximately 10 ha.

While the fen of the current study can be viewed as a single wetland, it is also a mosaic of habitats: permanent pools, seasonal pools, channels, and "upland habitat" consisting of sphagnum hummocks (some > 1 m in diameter) with shrubs or small trees. The Spotted Turtles may not have needed to leave the fen because the fen provided the full range of habitats the turtles required. Although Spotted Turtles may face a significant threat from traffic mortality (Beaudry, deMaynadier and Hunter, 2008) some populations may be relatively immune to this threat if they remain within large wetlands. The identification and protection of such sites should be a conservation priority as these populations may have a greater probability of remaining viable.

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