The Status of Turtles in Point Pelee National Park: Species Loss and Shifting Population Structure

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Abstract

Point Pelee National Park (PPNP) was historically the location of the greatest turtle diversity in all of Canada. Recently there have been concerns regarding population declines and possible extirpation of several turtle species found at PPNP. Our objectives were to examine the status of turtle species at PPNP and causes of declines. A total of 510 turtles were marked in 2001: 305 painted, 145 snapping, 40 Blanding's, 11 map, and 9 stinkpot. No spotted turtles or spiny softshells were observed during this study. Populations of painted and snapping turtles still appear to be large but are significantly male-biased. Painted, snapping, and Blanding's populations have significantly top-heavy age structures. The distribution of carapace lengths (≈age) in 2001 when compared to data from 1972 suggests that there has been a significant shift toward older age classes for both the snapping and Blanding's turtles.

Introduction

Parks in Canada play an important role in protecting our natural ecosystems. However, despite over 100 years of protection there have still been declines and losses in many of the reptile and amphibian populations. Point Pelee National Park (PPNP) was the first national park in Canada to be created for it's biological importance (Crowe, 1999). It remains an important area for natural heritage because it contains substantial areas of two ecosystems that are of conservation concern: Carolinian forest and a deep freshwater coastal marsh. Historically PPNP was the location of greatest turtle diversity in all of Canada. Seven native species and three introduced species have been reported to occur in PPNP (Table 1). Recently there have been concerns of population declines and possible extirpation of a number of the turtle species found at PPNP. Turtles are of conservation concern in many areas worldwide. The most important threats to the status of turtles include: habitat loss, population isolation, subsidized predators, road mortality, collection as pets, interactions with exotic species, human recreation, disease, and effects of contaminants (Klemens, 2000). All of these threats could be affecting the turtles at Point Pelee. DDT concentrations in PPNP exceed the Ontario Ministry of Environment limits for DDT for Recreational/Parkland land use (Crowe, 1999). The effects of DDT on

turtles at PPNP is not known. Previous studies in PPNP suggest that predation (mostly by raccoons) upon turtle nests is very high (Rivard and Smith, 1973; Kraus, 1991; Whitehead, 1997). Past attempts to protect turtle nests from raccoons have failed (T. Linke, pers. com.). Rivard and Smith (1973) recommended that a thorough study of turtles at PPNP be conducted, however until now that has not been done. The objectives of our study were to determine the status of turtle species at PPNP and to investigate possible causes of population declines. Specific objectives were to examine: (1) population size, structure, and distribution of turtles; (2) experimental nest protection methods; and, (3) to collect turtle eggs for contaminant analysis.

Table 1. List of turtle species that have occurred in Point Pelee National Park.

Scientific Name	Common Name	Conservation Status[1]
Chrysemys picta	Painted Turtle	
Graptemys geographica	Common Map Turtle	
Emydoidea blandingii	Blanding's Turtle	Threatened[2,3]
Clemmys guttata	Spotted Turtle	Special Concern[3]
Clemmys insculpta	Wood Turtle	Special Concern[3]
Sternotherus odoratus	Stinkpot	
Chelydra serpentina	Snapping Turtle	
Apalone spinifera	Spiny Softshell	Threatened[1,3]
Terrapene carolina	Eastern Box Turtle	
Trachemys scripta	Pond Slider	

[1]COSEWIC, 2001. [2]Threatened in Nova Scotia. [3]Status tracked in Ontario by the OMNR-NHIC.

Methods

Visual surveys were conducted from 29 April to 21 June 2001 and 16 sites for trapping were selected based on these surveys. Thirteen sites were in the park, one boarding the northern boundary, and two sites at Hillman Marsh. Mark-recapture methods were used to determine the population sizes of turtle species present. Baited hoop traps, basking traps, folding live traps, and hand captures were used to capture turtles. Captured turtles were marked, measured, sexed, and released at the site of capture. Sex ratios and age structure were compared to those reported in the literature and for Pelee (Rivard and Smith, 1973). Turtle nests were searched for from 23 May to 30 June 2001. Three eggs from each nest were collected for contaminant analysis. Nests were protected from predation using a variety of experimental methods (see Results-Table 2).

We compared observed data with expected results using *G*-tests with William's correction applied (Sokal and Rohlf, 1995). Spearman's rank correlation was used to

compare abundance ranks of species captured by Rivard and Smith (1973) to our results. The distribution of carapace lengths for 1972 and 2001 were tested for normality using the Lilliefor's method in the Kolmogorov-Smirinov one sample test (SYSTAT®, version 9). The data was not normal and could not be normalized by transformation so we used non-parametric analysis. The carapace lengths of 1972 were compared to 2001 using a Wilcoxon test. We used a Kolmogorov-Smirnov two sample test to compare the shape and position of carapace length distributions from 1972 to 2001. This enabled us to determine if the age-size structure has shifted over the past three decades. Turtles from Hillman marsh were excluded from analysis.

Results

A total of 510 turtles (305 painted, 145 snapping, 40 Blanding's, 11 map, and 9 stinkpot) were marked from 5 May to 24 August 2001. No spotted turtles or spiny softshell were observed during this study. We can not determine population size yet because only a small number of recaptures were obtained. Species abundance ranks were the same in 2001 as 1972 for extant species, however box turtles and spotted turtles were not found in 2001 (r_s=0.982, n=7, p<0.02). Comparing ratios of turtle captures indicated that Blanding's and snapping turtle abundance compared to painted turtle abundance was greater in 1972 than 2001.

Populations of painted (2.46♂:1♀) and snapping turtles (1.84♂:1♀) still appear to be large but are significantly male-biased (G=41.31, n=225, p<0.001 and G=10.74, n=122, p<0.005, respectively). Blanding's were significantly female-biased (1♂:3.8♀; G=10.45, n=29, p<0.005). Compared to 1972 data, painteds were significantly more male-biased (G=8.531, n=225, p<0.005), Blanding's significantly more female-biased (G=5.66, n=29, p<0.025), and snappers were virtually the same (G=0.0004, n=122, p>0.05).

Painted, snapping, and Blanding's populations were found to have a significant top-heavy age structure (G=41.31, n=238, p<0.001; G=43.30, n=125, p<0.001; and G=7.27, n=30, p<0.01, respectively). The distribution of carapace lengths (≈age) in 2001 when compared to data from 1972 suggests that painted turtle age structure is similar (Figure 1), but there has been a significant shift toward older age classes for both the snapping and Blanding's turtles (Figures 2 and 3).

Figure 1. Distribution of painted turtle carapace lengths (representing age). Turtles captured in 2001 are shown in black and 1972-1973 in grey. Statistics: Kolmogorov-Smirnov and Wilcoxon ($D=0.063^{ns}$, $z=0.025^{ns}$, $n_{1972}=120$, $n_{2001}=238$).

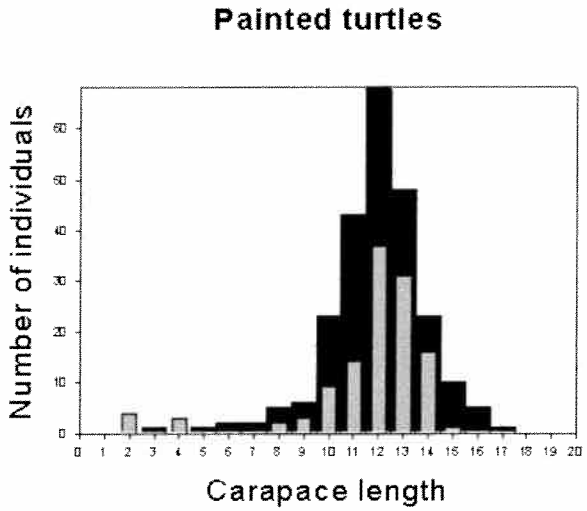


Figure 2. Distribution of snapping turtle carapace lengths (representing age). Turtles captured in 2001 are shown in black and 1972-1973 in grey. Statistics: Kolmogorov-Smirnov and Wilcoxon ($D=0.424^{***}$, $z=5.074^{***}$, $n_{1972}=93$, $n_{2001}=126$).

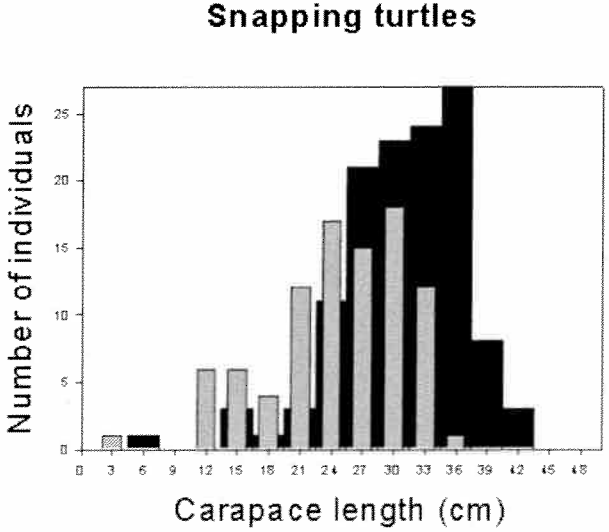
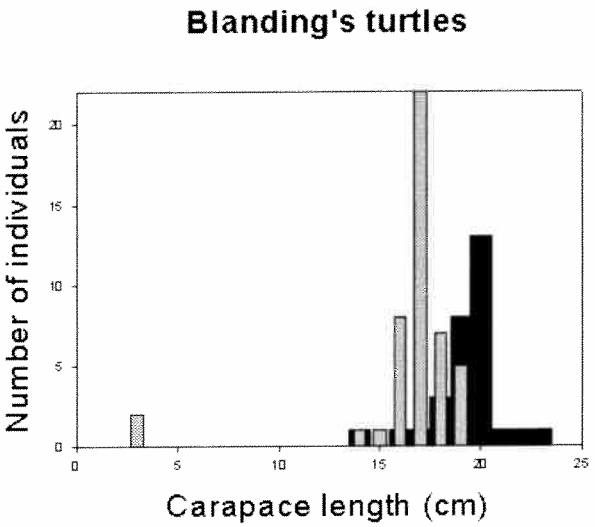


Figure 3. Distribution of Blanding's turtle carapace lengths (representing age). Turtles captured in 2001 are shown in black and 1972-1973 in grey. Statistics: Kolmogorov-Smirnov and Wilcoxon ($D=0.748^{***}$, $z=4.209^{***}$, $n_{1972}=46$, $n_{2001}=30$).



A total of 44 turtle nests were found (39 snapping, 4 painted, and 1 map) between June 2 and 23, 2001. A combination of wire-screen topped boxes and pepper spray was found to be effective in eliminating predation (Table 2). Predation pressures appear to be greater on snapping turtle nests than for painted or map (Tables 2, 3).

Discussion

Despite just one year of study, substantial evidence exists to suggest that there are several serious conservation concerns regarding turtles in Point Pelee National Park. The lack of recent records for the spotted turtle and spiny softshell suggests that extirpations have taken place. Although the spiny softshell was never common in PPNP, the spotted turtle was reported to be "equally represented as painted turtles" in early herpetofaunal surveys (Patch, 1919). Therefore, this is a substantial loss for the turtle community. Map and stinkpot turtles still exist in the park, however they are not common. We did not capture enough of either of these species to examine population structure. None of the three introduced species were found, therefore, it appears that none have established populations. This rules out the possibility that declines are caused by exotic species competing with natives.

Table 2. Type of nest protection and the outcome of the treatment for snapping turtles in five different locations.

Treatment	Outcome	Location				
		Roads	Blue Heron	Camp Henry	North Bound.	East Beach
Cayenne	not predated	0	0	0	0	2
Cayenne and objects	not predated	0	0	0	0	1
Box and cayenne	not predated	5	0	1	0	2
Box and pepper spray	not predated	7	0	3	11	0
Large box and pepper spray	not predated	0	1	0	0	0
Box and cayenne	predated	1	2	0	0	0
Cayenne	predated	1	0	0	0	0
Nothing	predated	2	0	0	0	0

Table 3. Type of nest protection and the outcome of the treatment for Emydid turtles in three different locations.

Treatment	Outcome	Location		
		Roads	North Boundary	East Beach
Box and Cayenne	not predated	0	0	1
Cayenne and objects	not predated	0	0	1
Nothing	not predated	1	2	0

Of the extant species there are serious concerns because of top-heavy age structures. Data from 1972 suggests that these concerns already existed (Rivard and Smith, 1973), and have worsened over the past three decades for Blanding's and

snapping turtles. The majority of individuals had carapace lengths of 24-30 cm (snapping turtles) and 17 cm (Blanding's) in 1972, and 36 cm and 20 cm, respectively in 2001. It is possible that these may actually be the same turtles. Therefore, if these trends continue the majority of the population will likely die of old age within another three decades. It appears that recruitment is limited to such an extent that it will not permit the continued existence of these two species. A significantly greater male bias in painted turtles in 2001 than 1972 may mask a shifting age structure because male turtles typically have smaller carapace lengths than females. Although species abundance ranks are the same now as they were three decades ago, the number of captures indicate that snapping and Blanding's abundance has declined relative to painted abundance. Capture numbers were greater in 2001 than 1972 because trapping efforts were much greater in 2001.

Sex ratios were biased for all three species. It is possible that these biases may be normal for these populations. The female bias in the Blanding's population is consistent with other populations reported in the literature (Ernst *et al.*, 1994). However, the painted turtle population is significantly more male-biased than it was 30 years ago and has a greater male bias than other populations (Ernst *et al.*, 1994). A male bias may be caused by females being killed on roads while they are searching for nesting sites. Painted turtles would likely be more susceptible to road mortality because of their smaller size.

Past attempts to protect turtle nests with protective boxes have failed because raccoons were persistent and dug under the boxes (T. Linke, pers. com.). The combination of protective boxes and pepper spray (vegetable oil and cayenne pepper) was found to be 100% effective. Our observations are consistent with earlier reports of high predation on nests which suggests that juvenile recruitment may be insufficient to sustain turtle populations. Predation pressures appear to be much greater for snapping turtles than painted. This may explain why a shift in age structure was observed for snapping but not painted populations.

It appears that predation upon turtle nests is limiting recruitment to such an extent that snapping and Blanding's populations may not be sustained. However, further study is necessary to completely assess the impact of predation on turtle populations. There are a number of other possible factors that may cause declines in turtle populations which have not been examined. The cumulative effect of a number of factors may be causing declines rather than just one cause, therefore it is important that all aspects which may be significant be examined.

Future Directions

This study will form the basis for future research on turtles at Point Pelee National Park. A number of objectives have been set for 2002. Marking will continue to obtain population size estimates and population structure will be assessed further.

The effects of road mortality will be examined with the use of models once population size estimates are made. Predation rates upon turtle nests will be examined and the efficacy of the wire screen box and pepper spray nest protection method will be examined further. Relative population size of raccoons will be examined through line transect surveys to compare to nest predation rates. Hatching success of protected nests and contaminant levels will be determined and compared to each other.

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