

Blanding's Turtles in the Crex Meadows Wildlife Area

Abstract Little is known about the Blanding's turtle (*Emydoidea blandingii*), a threatened species in Wisconsin. The study's objective was to determine the status of the species in the extensive wetlands of the Crex Meadows, Wisconsin's largest wildlife management area. From 10 June to 17 July 1997, 51 Blanding's turtles were captured, measured, marked, and released to determine sex and age and estimate the population size. Eleven Blanding's turtles were recaptured, providing population estimates for Crex Meadows that ranged from 107 to 161 turtles. The sex ratio was highly skewed towards females, which was probably an artifact of the sampling methods used. Because 95% of the turtles captured were adult females, the population estimate provided only an estimate of the numbers of female, not male, Blanding's turtles. The age ratio was highly skewed towards adults. This again could be sampling bias or could be due to high nest and juvenile mortality. The many deep and permanent marshes and open brush prairie uplands of the Crex Meadows Wildlife Area apparently provide good habitat for the Blanding's turtle.

The Wisconsin Natural Heritage Inventory lists the pine barrens as rare globally (G3) and imperiled in the state (S2) (Temple 1995), with only 1% of the original 2.3 million acres of pine barrens remaining in Wisconsin (Curtis 1959). These remnants are fragmented and isolated (Shively 1994), potentially endangering the continued existence of plant and animal species, including the Blanding's turtle.

The State of Wisconsin lists the Blanding's turtle as a threatened species (NR 27.03, effective October 1979). The Blanding's turtle is a long-lived species, not reaching sexual maturity until 15 to 20 years of age (Ross 1989, Rowe 1992, Congdon et al. 1993, McGown 1999). Long-lived species need high juvenile survival or large numbers of offspring to main-

tain a stable population. Recent declines in nest survival, measured by low recaptures of juvenile turtles and attributed to increases in mammalian and avian predators (Congdon et al. 1993, McGown 1999), have caused concern for the species. Despite its wide geographical distribution in the state (Casper 1996), the status of the species in Wisconsin is poorly known. Only one study of the Blanding's turtle has been completed in Wisconsin, and that was conducted in the central part of the state (Ross 1985). Little is known about the Blanding's turtle in the northwest pine barrens (Hay 1993).

This study attempted to determine the status of the Blanding's turtle inhabiting the extensive wetlands and pine barrens of the Crex Meadows Wildlife Area in northwest Wisconsin.

Study Area

Crex Meadows is the largest state-owned wildlife management area in Wisconsin and the largest restored pine barrens in the state. Crex Meadows Wildlife Area is a 10,800-ha brush prairie-wetland complex managed by the Wisconsin Department of Natural Resources (Vogl 1964, Zicus 1964). It is an area of many large deep marshes, numerous small shallow wetlands, and an extensive system of all-weather roads. The slightly rolling uplands surrounding the wetlands consist of brush prairie (Strong 1880), maintained by intensive prescribed burning, and young jack pine (*Pinus banksiana*), Hill's oak (*Quercus ellipsoidalis*), and aspen (*Populus tremuloides*) forests.

Methods

Blanding's turtles were captured by hand by slowly driving on roads in June and July 1997, looking for turtles on or adjacent to

the roads. Turtles were also captured in hoop-net traps (Lagler 1943, Legler 1960) and seine nets from 10 June to 16 July 1997 in roadside wetlands where turtles were observed.

Turtles were aged by counting plastral annuli (Sexton 1959). Annuli develop by periods of rapid growth (summer), followed by periods of slow growth (winter). However, the annuli of older turtles are worn and difficult or impossible to count. Annuli lengths were measured to the nearest mm using dial calipers. Plastron and carapace lengths were measured to the nearest mm using outside calipers.

The sex of the turtles was determined by plastron and tail characteristics (Graham and Doyle 1977), with males having concave plastrons and females having flat plastrons and an anal opening on the tail anterior to the carapacial margin.

Turtles were weighed to the nearest 0.1 g on a spring scale, marked with notches in the carapace (Cagle 1939), and released at the capture site. Recapture of marked turtles provided population estimates using the marked/recapture methods developed by Schnabel (1938) and Schumacher and Eschmeyer (1943). Recaptures, especially in the future, could provide information about recruitment, survival, and habitat use.

Results and Discussion

Sixty-two Blanding's turtles were captured, of which 51 individuals were first-time captures and 11 were recaptures of turtles previously marked in this study. In addition, two mortalities were recorded. One unmarked turtle was found dead in a cultivated field, and a marked turtle was found killed by a vehicle on a road.

The locations of the 62 captures and recaptures were as follows: 54 on road, 5 in

hoop nets, 2 in hand nets, and 1 in a seine net.

The first turtle was marked on 10 June 1998 and the last turtle on 17 July, a period of 41 days. Eighty-four percent of the turtles were captured and marked during the first 10 days of the sampling period. Peak capture success occurred from 15 to 20 June when an average of eight turtles was captured per day.

Marked/recapture estimates of the population size of Blanding's turtles in Crex Meadows ranged from 107.3 (Schnabel 1936) to 161.3 (Schumacher and Eschmeyer 1943) turtles (Canfield and Evrard 1997). Because these estimates don't agree, their validity is questionable. Koper and Brooks (1998) recently compared mark-recapture population estimates with known population sizes of painted turtles (*Chrysemys picta*) and found that almost all the estimates were far below the true population sizes. Based on their findings, our highly variable population estimates of Blanding's turtles in the Crex Meadows Wildlife Area should probably be considered a minimum estimate.

Because the population estimate of 107–161 turtles was based upon a sample of animals that was 95% female, the population size is more correctly an estimate of the number of nesting female Blanding's turtles rather than the total population inhabiting Crex Meadows.

In our study, the sample of turtles captured was skewed heavily towards adult females (48 females vs. 3 males or 16:1). Other studies (Congdon and van Loben Sels 1991, Piepgras et al. 1998) have reported sex ratios favoring female Blanding's turtles, but none were as skewed as in this study. This skewed ratio is understandable since female turtles select sandy road edges for nesting, and 44 of the 54 turtles captured on roads were female. All 3 males and 4 females were captured in the water. The sex ratio for those turtles captured in the water was less skewed (1.3:1) and similar to that range reported in earlier research (Joyal 1996).

Mean carapace lengths and widths were similar between 47 female and 3 male Blanding's turtles, although the male sample size was limited (Table 1). This

Table 1. Measurements of Blanding's turtles captured in the Crex Meadows Wildlife Area, Wisconsin, 1997.

Sex - Age	Number	Carapace Length ^a		Carapace Width ^a		Plastron Length ^a		Weight ^b		
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Female	47	234.2	10.6	157.6	6.6	186.1	9.7	1942.0	253.4	
Male	3	234.3	20.8	158.0	13.4	173.7	16.9	1866.7	365.3	
Annuli										
4	1	105.0	0.0	81.0	0.0	80.0	0.0	200.0	0.0	
10	2	231.0	60.0	154.5	36.0	182.0	49.0	1850.0	825.0	
11	11	228.5	11.6	154.4	7.5	181.5	13.3	1859.1	251.7	
12	7	228.0	10.1	155.3	7.7	181.2	10.0	1804.2	224.4	
13	6	234.2	12.0	156.0	7.3	188.3	9.9	1937.5	236.2	
14	7	232.9	9.6	159.3	7.6	182.4	7.2	1885.7	219.9	
15	5	234.0	3.6	158.6	3.6	184.2	3.9	1920.0	119.8	
16	3	236.3	0.9	160.0	2.4	187.3	1.9	2000.0	204.1	

^amillimeters

^bgrams

similarity agrees with previous work done by Rowe (1987), Congdon and van Loben Sels (1991), Rowe (1992), and Joyal (1996).

However, there appear to be differences in Blanding's turtle sizes from one geographic area to another (Joyal 1996). For 47 female Blanding's turtles in our study, the mean carapace length was 234 mm, the mean carapace width was 158 mm, and the mean plastron length was 186 mm (Table 1). Sizes of Blanding's turtles in adjacent Minnesota were similar—mean carapace length for 37 adult females was 237 mm (Piepgras et al. 1998) and 245 mm for 42 adult females (Sajwaj et al. 1998).

However, mean carapace lengths for 11 adult females in southern Maine and for 20 adult females in Nebraska were 206 mm and 185 mm respectively (Joyal 1996, Germano et al. 1998). Differences also apparently existed between mean measurements for males from northwest Wisconsin and from southern Maine. However, this comparison is questionable due to small male sample sizes in our study.

Age structure and/or food quality and availability could possibly be responsible for these size differences (Quinn and Christiansen 1972, Graham and Doyle 1977).

The age structure, determined by counting plastron annuli, indicated that the Blanding's turtle population inhabiting Crex Meadows apparently has many adults but very few young. Another explanation might be that capture techniques used in this study could be unsuitable for sampling young turtles.

Male Blanding's turtles reach sexual maturity at approximately 12 years of age (Graham and Doyle 1977) and females at 14–20 years (Petokas 1977, Ross 1989, Congdon and van Loben Sels 1991). Twenty-seven or 66% of the turtles cap-

tured were breeding adults (≥ 12 years of age), 13 or 32% were subadults (10 and 11 years old), and only 1 or 2% was a juvenile (4 years old).

Other Blanding's turtle studies have reported finding very few young animals (Gibbons 1968, Graham and Doyle 1977, Congdon et al. 1983, Kofron and Schreiber 1985, Petokas 1987, Ross 1989, Joyal 1996, Standing et al. 1997, Germano et al. 1998, Piepgras et al. 1998, Sajwaj et al. 1998). Either nest success is very low and/or survival of young turtles is low due to predation, or juvenile turtles' behavior or habitat (Ross 1989, Pappas and Brecke 1992, Congdon et al. 1993, Herman et al. 1998, McMaster and Herman 1998, Morrison et al. 1998) is considerably different than that used by adult turtles (Sexton 1995).

The limited information gathered in this study did not permit determining habitat preferences of Blanding's turtles. However, in general, the deep, large, permanent marshes interspersed with upland brush prairie of the Crex Meadows Wildlife Area apparently were preferred compared to nearby heavily wooded river valleys. In an extensive two-year survey of turtles on the nearby St. Croix River, Donner-Wright (1997) found only one Blanding's turtle.

Joyal (1996) in southern Maine found that Blanding's turtles preferred permanent, deep marshes in large wetland complexes in areas sufficiently open for abundant sunlight to reach the wetlands. She also found that the turtles needed open uplands for nesting, short-term basking, long-term estivation, and travel between wetlands. Linck and Moriarity (1998) found that recently burned upland prairies are important nesting habitat in Minnesota. Crex Meadows provides the appropriate wetland and upland habitat, but the many roads may provide barriers and danger to migratory turtles (McGown 1999).

Recommendations

The apparent absence of young Blanding's turtles in this study and other studies (Standing et al. 1997), whether a reflection of actual numbers or inadequate sampling techniques, might be a factor limiting the population of this threatened species. Small radio transmitters attached to newly hatched turtles (Herman et al. 1998, McMaster and Herman 1998, Morrison et al. 1998, Tanck and Thiel 1998, McGown 1999) as they emerge from their nests might help determine juvenile turtle survival and habitat preferences or reveal potential techniques to increase their capture. Transmitters attached to adults of both sexes could also reveal habitat preferences and mortality patterns. This knowledge could ensure the continued survival of the Blanding's turtle in Crex Meadows.

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