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BARBOUR'S MAP TURTLE IN THE DIET OF NESTING BALD EAGLES

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A recent survey of amphibians and reptiles preyed upon by North American raptors (Ross 1991) revealed quite a few species of turtles in the diet of the bald eagle (*Haliaeetus leucocephalus*). Of 14 species of reptiles, 10 (71%) were turtles (*Clemmys guttata*, *Pseudemys nelsoni*, *Malaclemys terrapin*, *Kinosternon subrubrum*, *Stenotherus odoratus*, *Chelydra serpentina*, *Terrapene carolina*, *Chrysemys picta*, *Apalone* sp., and *Graptemys* sp.), all of which were confined to the southeastern U. S. Here we report the first records of Barbour's map turtle (*Graptemys barbouri*), including a few other vertebrate prey remains, that we gathered during the nesting seasons of 1993-1998 under the nests of one pair of bald eagles in Torreya State Park, Liberty Co., Florida.

We picked up vertebrate food remains from the ground under three old loblolly pine trees (*Pinus taeda*), each ~70 cm diameter at breast height and growing within about 100 m of each other on steep (20% grade) slopes about 2.0 km east of the Apalachicola River. The three trees emerged from a mixed hardwood/pine canopy on clay soils and had been used one breeding season at a time by the presumed same pair of bald eagles since at least the winter of 1992-93.

One of us (AH) first noticed turtle remains under a nest tree during the January-April, 1993, nesting season. After the following five nesting seasons, we gathered all vertebrate remains from under the three trees and marked, measured, and stored them for future reference. Straight line measurements of turtle shells were taken with aluminum forestry calipers for carapace length (CL) and plastron length (PL). In order to avoid disturbing the nesting eagles, we did not check systematically under the nest trees. In the last three years, we gathered food remains after the eaglets had fledged. No doubt scavengers had carried away many items we did not recover.

Because parts of the carapace, plastron, and the bridge between them were sometimes missing, we were unable to obtain some measurements. Measurements made on Barbour's map turtle and eastern mud turtle (*Kinosternon subrubrum*) shells are accurate to within ± 0.1 cm because shells of these species are hard and bony. Measurements of the Gulf Coast spiny softshell (*Apalone spinifera aspera*), however, were probably within ± 1.0 cm because this species has cartilage and soft parts around the margins of its shell, which had dried and shrunk considerably.

After each of the five nesting seasons we picked up the remains of vertebrate species that we assume were fed upon by the eagles and discarded from their nests. Among these were the neurocranium of the white catfish (*Ictalurus catus*); 7 left and 5 right cleithra of a catfish (*Ictalurus* sp.); one neurocranium and three cleithra of the lake chub-sucker (*Erimyzon sucetta*); one sternum of a coot (*Fulica americana*); and 45 specimens of three species of turtles. Among the turtle remains were shells of 6 Gulf Coast spiny softshells, 1 eastern mud turtle, and 38 Barbour's map turtle which dominated our vertebrate sample.

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In all five nesting seasons, Barbour's map turtle was the most abundant of the turtle remains: 5 of 8 in 93/94; 19 of 19 in 94/95; 5 of 5 in 96/97 (3 were not available for this study); and 5 of 9 in 97/98. Altogether, Barbour's map turtle accounted for 85% of turtle remains and 78% of all vertebrate remains we salvaged.

The finding of turtles in the diet of the bald eagle is not new, but this is the first report of Barbour's map turtle in the diet of the bald eagle. It is interesting that Barbour's map turtle was the most abundant food item we found over a five-year period. An endemic species of the Apalachicola/Chattahoochee/Flint river system, Barbour's map turtle has been the object of human exploitation for food for decades (Sanderson 1992). Its small geographic range and population decline have resulted in its listing as a state species of special concern (Florida Game and Fresh Water Fish Commission 1997). Human exploitation has focused mainly on females, which are strikingly larger than males, reaching carapace lengths >300 mm. Males do not exceed 130 mm CL (Sanderson 1992).

The bald eagle family in this study, however, fed upon a narrow range of Barbour's map turtle body sizes (\bar{x} CL = 130.3 \pm 2.8 mm; \bar{x} PL = 111.8 \pm 9.3 mm; n = 35), neither choosing young turtles below 108 mm CL, nor adult females >157 mm CL (Figure 1). The sizes of the single eastern mud turtle (CL = 105 mm; PL = 88 mm) and Gulf Coast spiny softshell (\bar{x} CL = 129.8 \pm 22.9 mm, n = 5; \bar{x} PL = 108.0 \pm 19.0 mm, n = 4) also fell within the range of the dimensions of Barbour's map turtle.

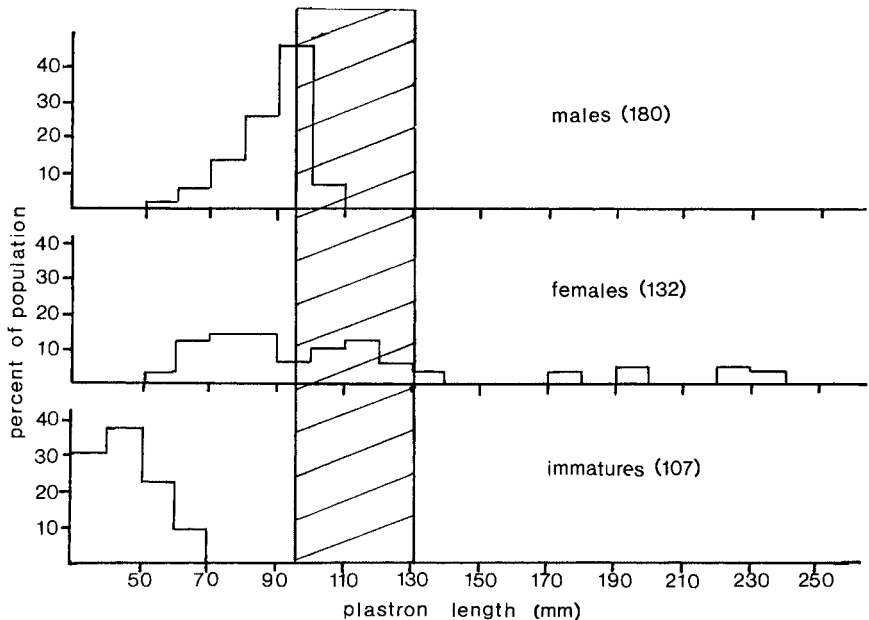


Figure 1. Range of plastron lengths of the shells of 35 Barbour's map turtle, *Graptemys barbouri*, from under a bald eagle nest in Torreya State Park (diagonally hatched bar) compared with a frequency distribution of percent of population by sex against plastron length for a large sample (n = 419) from the Chipola River near Marianna, Florida; Chipola data are from Sanderson (1974).

The narrow range of turtle shell sizes found beneath the nesting trees probably reflects the inability of our eagles to grasp turtles smaller than ~10.0 cm CL, or larger than about 160 cm CL. Male *G. barbouri* do not get larger than about 110 mm PL (or about 129 mm CL) (Sanderson 1974), but 20 (53%) shells of our sample were larger than this (Figure 1). We had no means of determining the sex of our turtle remains, but these 20 were probably all females. Our nesting eagles were eating proportionately more small female Barbour's map turtles, therefore, than males. We have no evidence that the bald eagle prefers female Barbour's map turtles, however. We believe that the upper size limit of turtle shells that can be grasped by the bald eagle is simply greater than the maximum size reached by the males of Barbour's map turtle.

In Torreya State Park, Liberty County, Florida next to the Apalachicola River, Barbour's map turtle figured prominently (84% of all turtle and 74% of all vertebrate remains) in the diet of five broods of the same pair of nesting bald eagles from 1993-1998. All of the turtle shells, including those of the eastern mud turtle and Gulf Coast spony softshell, fell within a range of 101-157 mm carapace length and 85-131 mm plastral length. The 20 largest shells of Barbour's map turtle were probably all of females because males do not grow to these sizes.

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