

THE BOG TURTLE, SMALLEST OF NORTH AMERICAN TURTLES

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Of all the turtles known to occur in the United States, none has remained more elusive and poorly understood than the bog turtle, *Clemmys muhlenbergi*. It is one of our rarest and most secretive reptiles and until recently information concerning this small turtle accumulated very slowly. It is adapted to life in poorly drained, muddy bottomed, grassy habitats that are usually spring fed. The springs supply the marsh or bog with a constant flow of cool water throughout most of the year. Unfortunately, marshlands are considered wastelands by many land developers and can be purchased rather inexpensively; therefore, they are often the first areas to be sold. As a result, the bog turtle and other marsh animals are victims of our shortsighted tendency to fill in or drain wetland cow pastures, bogs and marshes. Authorities have considered the bog turtle rare for many years and it is now on the endangered species list in several states as well as the federal endangered species list.

Clemmys muhlenbergi occurs in at least nine of our eastern states. Its range is spotty and discontinuous, extending from southwestern Massachusetts, western Connecticut and eastern New York, southward throughout most of New Jersey and southeastern Pennsylvania to northern Delaware and northeastern Maryland. Other populations have been discovered in southwest Virginia and southwestern North Carolina at elevations up to 4,000 feet. There are also disjunct colonies in western New York and northwest Pennsylvania.

Bog turtles are the smallest species of turtle found in North America. The average adult size is 3 to 3½ inches. They rarely exceed 4 inches; the record size is 4½ inches.

The shell is somewhat elongated, slightly domed, with an inconspicuous keel. The upper shell or carapace may or may not be rough, depending on the age of the turtle and the make-up of the substrate in which the turtle lives. Some individuals have very smooth shells with indistinct annuli (growth rings), whereas others, even old specimens, have sculptured shells with pronounced annuli. This variability in the epidermal scutes on the shell is due to the strong burrowing propensities of the turtle. A well developed bridge connects the carapace to the plastron. The male has a long, thick tail and the anal opening extends past the margin of the carapace. His plastron is concave and he has larger front limbs than the female. The female has a small, slender tail and the anal opening does not extend past the margin of the carapace. Her plastron is flat or slightly convex with a wide notch at the posterior end. The female also tends to have a higher, wider carapace.

Bog turtles have poorly webbed feet with strong, sharp claws which help them dig burrows in the soft, muddy bottoms of the bog or marsh.

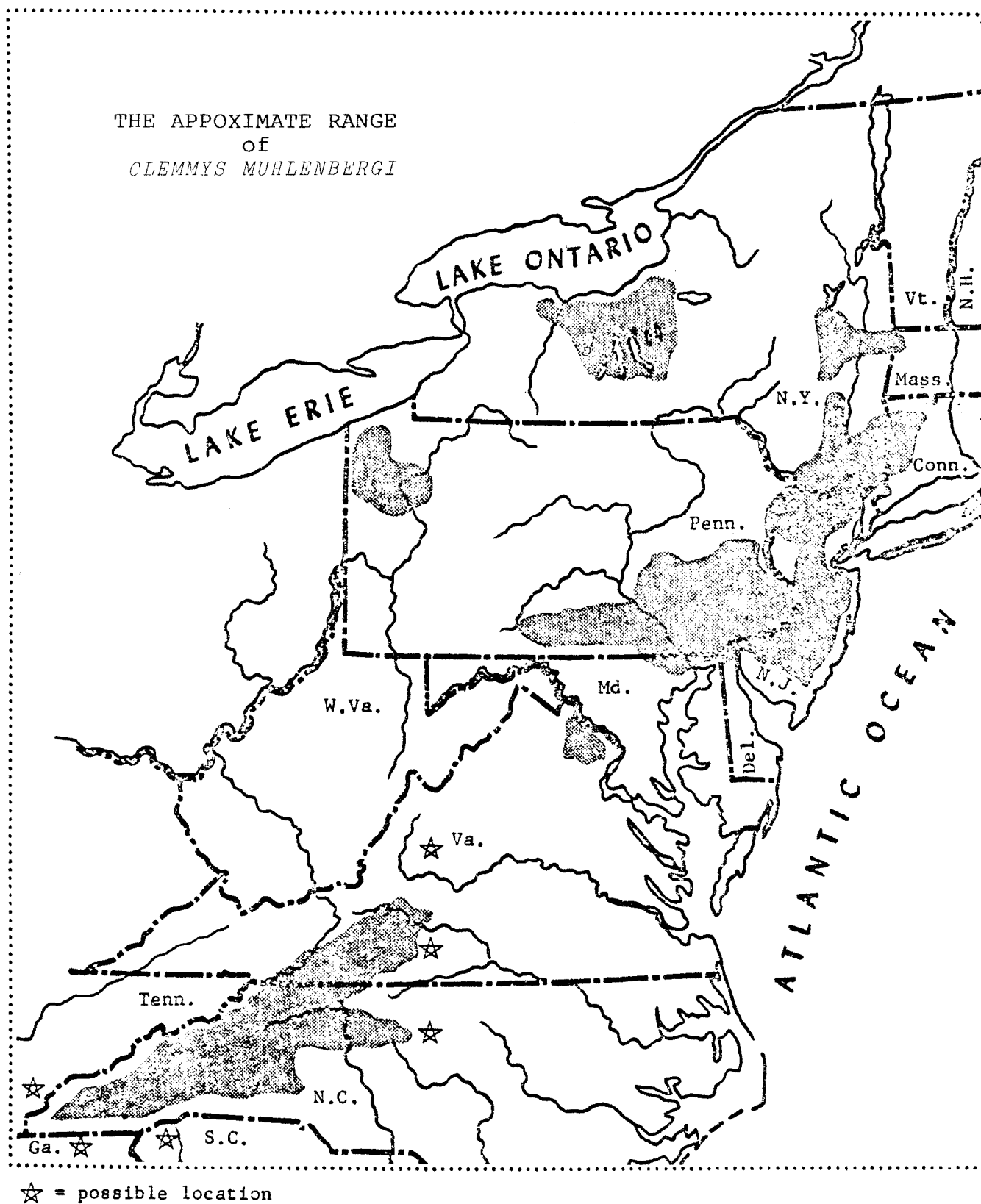


Fig. 1. The historic range of the bog turtle. The species has been extirpated at many of the old locations. Map by Ernst Hoffman & Florence Bramley.

The most outstanding colors on a bog turtle are the bright orange or yellow (sometimes coral red) blotches located in the temporal region on either side of the head. Between the large tympanic head blotches and around the eyes and lower jaw there is usually a strong marbling pattern of reddish orange. Very old specimens may have faded or obscured head blotches. The limbs and fleshy underparts vary from dark yellow, brownish orange or light red with some dark mottling. The carapacial color may range from light to dark brown, mahogany, dark maroon or black. Some individuals may have a light brownish or orange sunburst pattern radiating from the center of each scute. Others may have only a few light lines on each scute or lack markings entirely.

Until recently little was known about the courtship, mating, and nesting behavior of *Clemmys muhlenbergi*. Most of the literature dealt with captive matings and nestings under semi-natural or totally un-natural conditions. Almost nothing had been reported on their breeding habits in the wild. Studying this has been one of my main concerns and the following summarizes my research and observations of this species in New Jersey and North Carolina.

In New Jersey *Clemmys muhlenbergi* usually breaks hibernation in mid-April or early May, varying with geographic location and other environmental factors. Bog turtles become active when daytime air temperatures remain above 70°F. At this time they climb out of the cool water onto the tops of grassy tussocks, or other high and dry places, to bask in the rays of the warm spring sun. Basking behavior is very important to the bog turtle because it helps raise body temperature (thermoregulation) which in turn stimulates appetite and triggers the mating urge.

The breeding season for the bog turtle begins with the approach of warm spring days when air temperatures remain above 75°F. At this time, the males actively search for the more secretive females, who tend to remain somewhat secluded during the early part of spring. Although most matings take place in May, some occur as late as June. A single male may mate with several females during the course of a season.

Mid-June to early July is the primary egg-laying season for the bog turtle. From my observations, I believe most females nest in the grassy or mossy tussocks which grow profusely in the bogs. The female must deposit her eggs above the water level, in a nest that will remain relatively dry, even in the event of heavy rains. The mechanism behind the choice of nest sites is poorly understood, but most females select suitable sites with good drainage. A gravid female will migrate to an area in the bog which has low plant growth. Such places are exposed to sunshine and will provide the nest with plenty of warmth during incubation, which usually lasts 45 to 55 days. Once a suitable site is selected, the female climbs up to the center and begins to construct the nest. She separates the moss and blades of dried grass with alternate movements of her hind



Bog turtles
mating.

A study bog in New Jersey, the
natural habiat for the bog
turtle.



Bog turtle habitat in western
North Carolina.





A hatching
bog turtle.

Taking the cloacal temperature
of a bog turtle.



All photographs by
the author.

A female bog turtle foraging
in a small stream.



feet. The posterior portion of her shell is gradually lowered into the depression as she digs into the soft rich topsoil (sometimes sphagnum) below. The depth of the nest is about $1\frac{1}{2}$ to 2 inches. Females usually dig as far down as their hind legs will reach. The diameter of the nest is 2 inches at the opening, but is somewhat larger in the chamber below (about $2\frac{1}{2}$ inches). Once the female is satisfied with the depth of the nest egg laying begins. The average number of eggs per clutch is 3 but the exact number will vary with the size of the female and the frequency of matings. Older, more mature females may lay as many as 5 eggs, whereas, younger females will lay only 1 or 2. The eggs are white and oblong, with no markings. They are about .1 inch long and $\frac{1}{2}$ inch in diameter.

After the breeding season is over and egg laying has taken place, males and females return to their home range within the bog. Basking and foraging for food become the main activities during the rest of the year. Basking takes place in or out of the water. Sometimes the turtles will climb up on a sedge clump to thermoregulate. Once the proper amount of sunlight has been absorbed, the turtles will forage for food. *Clemmys muhlenbergi* is an omnivore and can feed in or out of the water, showing no apparent preference for either situation. Bog turtles feed on: frogs and their tadpoles; field crickets; Japanese beetles; slugs; snails; nestling birds; newborn field mice, and meadow voles; crayfish; young shoots of skunk cabbage; leaves and stems of watercress; and the seeds of pond weeds such as arrowhead and sedge. When daytime temperatures reach 85° F., bog turtles are somewhat inactive, especially the juveniles. During extreme heat they probably estivate in a watery burrow. This would account for their absence during the late summer and early fall.

The New Jersey Department of Environmental Protection, Endangered and Non-Game Species Project, and the National Audubon Society are supporting my research in New Jersey. In North Carolina I received a grant from the University of North Carolina and carry on my work at the Highlands Biological Station.

Old records and localities are being checked to see if the habitats are still suitable and if turtles are still present. Potential areas are being investigated as well; if turtles are found, these new colonies will be mapped and catalogued accordingly. Additional data will be obtained through mark-recapture studies of this secretive turtle. Information on population structure, individual growth, reproduction, nesting activity and home range movements will also be collected. The development of management and conservation programs are also proposed.

Natural encroachment of forest into the marsh areas may have played a role in the spotty distribution of these turtles and has caused their disappearance in some localities. Collecting by humans has added to their dwindling numbers but is not the major cause of the diminishing populations. Mass destruction of their habitat is the most serious threat. Ironically, this land recla-

mation continues unchecked. Most federal and state agencies are not familiar with the bog turtle's distribution and habitat requirements. In order to save bog turtles from extinction, the first priority should be to continue to locate and map all populations and potential habitats. Once state and federal agencies know where the turtles are found, proper protection of them can be enacted. Save their specialized environment and we shall save the bog turtle. The solution is as simple as that!

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Editor's Note: For a more complete discussion of bog turtle management problems and a bibliography on *Clemmys muhlenbergi* see: Kiviat, E. 1978. Bog turtle habitat ecology. Bull. Chi. Herp. Soc. 13(2):29-42.