

## COWARDS, BLUFFERS, AND WARRIORS

### What does it take to make a cottonmouth strike?

Pushing aside the large fan of a palmetto and stepping from the dark, muddy edge of the cypress swamp into the even darker shallow water, we headed toward a fallen log where a three-foot-long, muddy brown cottonmouth was coiled. On this cool spring day, it had picked a sunny, dry spot on which to warm itself.

While Mike, a little ways away, held the stopwatch and recorded data, Whit stepped onto the huge cypress log where the cottonmouth was resting. Its tongue flicked out inquiringly as Whit inched closer, and by the time the side of his boot nudged against the big snake's outer coil, the animal's mouth was wide open, exposing the white interior that earned the species its name. The male (it was too large to be a female) held its ground and exposed its fangs; its head and body expanded. It now vibrated its tail in a formidable effort to scare us away.

Our behavior was not entirely foolhardy, as we were wearing snake-proof boots (at least, that's what the label said). We were testing our theory that venomous snakes bite people only as a last resort--once they have determined that an easy escape is not possible or that the intruder cannot be held off by a threat display. The idea was put most succinctly in the 1950s by the late herpetologist Clifford Pope: "Snakes are first cowards, then bluffers, and last of all warriors." Our study was designed to determine at what point the warrior mode comes into play. We'd tested more than forty, cottonmouths in the swamps and wetlands of South Carolina's Savannah River, and they had bitten only when stepped on or picked up.

After twenty seconds, Mike signaled and Whit nudged the snake harder with his boot. It closed its mouth and attempted to escape by slithering partway into the water. Whit placed his boot firmly on the rear half of its body, holding it on the log. The snake turned back to face the boot and reopened its mouth but still did not strike. Again twenty seconds elapsed. We could now detect the unmistakable musk of an alarmed cottonmouth; some people say the smell is like cucumbers. Only when Whit grasped the snake midbody with a leather glove had the cottonmouth finally had enough. The fangs sank deep into the glove, and venom dripped out of the animal's mouth. (The glove, however, was not on Whit's hand but had been fitted onto the open end of a pair of "snake tongs" some three and a half feet long.)

About 10 percent of the snakes we've tested have bitten the boot after being stepped on; only 40 percent have struck when picked up with "the hand." Understanding how a cottonmouth protects itself requires adopting the point of view of a snake: What if you were only a couple of inches tall and a towering beast were approaching? Striking is a last resort. To begin with, by challenging a much larger enemy, the snake is potentially exposing itself to a great danger. It also needs to conserve its precious venom. Composed of complex proteins that require time and energy to produce, venom is vital for capturing prey.

When cottonmouths bite people defensively, they often inject less venom than they have available. The importance of conserving venom is indicated by laboratory studies showing a high proportion of so-called dry bites, in which little or no venom is rejected. Experiments have demonstrated that venomous snakes can control the amount of venom injected during a strike, using only what is necessary to subdue prey. It would seem that natural selection should therefore favor those snakes that use venom only as a last resort for defense.

No reliable snakebite statistics are available to confirm the exact number of bites cottonmouths inflict each year, but the estimated numbers are much lower than for copperheads or rattlesnakes. In the United States, an average of fewer than ten people die each year from the bites of all native snakes. So far, our results show that we should not be so quick to indict cottonmouths as aggressive enemies prepared to attack.



*researcher tests his snake-proof boots.*

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By J. Whitfield Gibbons and Michael E. Dorcas

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