

## Vocalization Observed in Starving White-tailed Deer Neonates

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**Abstract** - We observed loud, frequent vocalizations by 5 *Odocoileus virginianus* (White-tailed Deer) neonates that ultimately died of starvation due to abandonment. We did not observe this behavior by other neonates, regardless of survival or cause of mortality. Thus, we believe that neonate vocalization could serve as a useful field indicator of abandonment. Additionally, estimates of predation rates may be inflated because they are masking high rates of undetected abandonment.

Neonate ungulate survival affects ungulate recruitment and population dynamics (e.g., Gaillard et al. 1998). The recent expansion of *Canis latrans* Say (Coyote) into the eastern United States (Gompper 2002, Hill et al. 1987) has the potential to impact *Odocoileus virginianus* Zimmermann (White-tailed Deer) populations. Because White-tailed Deer overabundance is a concern across much of the Southeast, particularly in urban areas (Côté 2011), predation of White-tailed Deer by Coyotes could be welcome. Kilgo et al. (2010) hypothesized that Coyote predation on neonates could explain localized declines in White-tailed Deer populations, and subsequently, Kilgo et al. (2012) determined that neonate survival was low and that Coyotes were the leading cause of mortality at their South Carolina study site.

While conducting a study of White-tailed Deer neonate survival at Fort Bragg Military Installation in North Carolina in 2011 and 2012, we documented 5 cases in which neonates vocalized often and loudly while we were homing to their location. All 5 neonates that vocalized ultimately starved due to abandonment. Abandonment is commonly reported in White-tailed Deer neonate survival studies (e.g., Kilgo et al. 2012, Saalfeld and Ditchkoff 2007, Vreeland et al. 2004), and the reasons for abandonment are attributable to various causes (Langenau and Lerg 1976). Regardless of the cause, abandonment results in starving neonates. Though marking-induced abandonment is possible, research has concluded the risk in White-tailed Deer is minimal, and omitting any neonates from samples can reduce the accuracy of survival estimates (Carstensen Powell et al. 2005, Ozoga and Clute 1988). To reduce potential negative impacts of researchers on the dam-neonate relationship, we always noted the position of the dam (via her radiocollar) and did not approach the neonate if the dam's signal came from its immediate vicinity. In all 5 cases of vocalizing neonates, dams were within a few hundred meters but not with the neonate. Thus, we do not believe our approach disturbed the dam and subsequently elicited vocalization from the neonate. Additionally, we did not observe vocalizations in any other neonates ( $n = 60$ ), regardless of whether they survived or died of other causes.

In this study, we tracked and located neonates via vaginal-implant transmitters. All 5 of the vocalizing neonates died of starvation within 2–3 days of parturition. We confirmed the cause of mortality by field necropsy: all 5 neonates exhibited reduced body weight (compared to birth weight recorded at capture) and a lack of milk in the digestive tract. All dams of the starving neonates were alive from parturition until the neonates died.

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Additionally, all neonates were clean and dry at capture and had expelled their meconium by the time the body was recovered, indicating that dams had at least spent time grooming the neonate after parturition and perhaps stimulating urination and defecation (DeYoung and Miller 2011). All neonates had milk stool in the lower digestive tract, which implied they had fed at least once. We speculate that neonates ultimately starved because they were either too weak to continue nursing or that dams were nutritionally constrained and not able to produce enough milk.

Though neonates could vocalize for many reasons, it is noteworthy that starving neonates were the only ones that we observed exhibiting this behavior during our study. Our intensive monitoring of neonates that survived the study or died from other causes indicates that such vocalizations were uncommon. Thus, it is likely that loud, frequent vocalizations can be used as an indicator of abandonment in White-tailed Deer. Observing vocalization behavior may provide additional evidence for assigning cause of mortality. Interestingly, it is possible that detection of neonate abandonment could be masked by predation (i.e., predators are able to find cryptic neonates that are vocalizing), and estimates of abandonment may be biased toward low rates. Though overall survival estimates would not change, inaccurate estimates of cause-specific mortality could result in inappropriate management recommendations. For example, if an abandoned neonate vocalizes because it is starving and is depredated as a result of the behavior, the ultimate mechanism causing low recruitment might be available nutrition for the dam (i.e., milk production is too low) rather than predation. However, with predation implicated, predator removal might be the suggested management action though this technique would not address the underlying mechanism leading to low recruitment. In areas of high predation risk and documented cases of abandonment, the potential interaction of the two mortality sources should be considered.

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