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ABSTRACT

The northern bobwhite (*Colinus virginianus*; hereafter, bobwhite) requires intensive monitoring to evaluate management efforts and determine harvest rates. However, traditional monitoring techniques (e.g., covey-call surveys) are labor-intensive and imprecise. Small unmanned aerial systems (sUASs) mounted with thermal cameras have demonstrated promise for monitoring multiple avian species and could provide a less intensive and more effective approach to monitoring bobwhite coveys, assuming coveys produce a recognizable heat signature. To assess sUAS monitoring, we evaluated the influence of bobwhite covey size (3, 6, and 12) and cover type (grass, shrub, and forest) on covey detectability by a sUAS equipped with a thermal camera. We hypothesized that forest would have the lowest covey detection due to trees obstructing detection of the thermal signature and that larger covey size would improve covey detection due to the formation of larger, more visibly distinct thermal signatures. We placed groups of known-size, pen-reared bobwhites in steel mesh cages (3, 6, and 12 individuals/cage) in 3 vegetation types (grass, shrub, and forest) among predetermined locations on a private farm in Clay County, Mississippi, USA (3 replicates, 27 total cages). At civil twilight on 5 March 2020, the sUAS flew a systematic route over the cage area at 30 m above ground level, capturing thermal infrared photographs every 5 seconds. To assess detection, we distributed 57 photographs to 31 volunteers and asked them to assign a binary value for detection (1, 0) regarding covey presence in each photograph. Overall true positive rate was 0.551 but improved with increasing covey size. By vegetation type, simulated coveys in grass had the lowest true positive rate by photograph (0.403), followed by forest (0.562) and shrub (0.605). Results indicate that sUASs and thermal camera technology could be a viable method for surveying intact bobwhite coveys, especially if detection of smaller groups and those in denser vegetation improves. As this technology advances, we recommend that future research focus on evaluating the efficacy of this novel methodology through assessing the influence of weather conditions, camera specifications, flight speed, and altitude, as well as assessing machine learning for processing photos.

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Key words: Black Belt Prairie, *Colinus virginianus*, far infrared, northern bobwhite, small unmanned aerial system, sUAS, thermal imagery

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