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THE ROLE OF RACCOONS IN THE ECOLOGY OF BOVINE TUBERCULOSIS

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Abstract: Bovine tuberculosis is a contagious bacterial disease that has had significant socioeconomic impacts on the region of northern lower Michigan. The role raccoons may play in the ecology and maintenance of the disease on farms in the core disease is unknown. Preliminary results of 61 radio collared raccoons have yielded a better understanding of raccoon movement and habitat use within an agricultural complex. Preliminary analysis of raccoons suggests annual home range sizes of .824km^2 and .608km^2 for males and females, respectively. Additionally raccoons and cattle have been documented at resource interfaces, further illustrating the potential for indirect disease transmission among species.

Key words: bovine tuberculosis, livestock, Michigan, *Mycobacterium bovis*, *Procyon lotor*, raccoon, radio telemetry

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Tuberculosis (TB) is a contagious, bacterial disease affecting both human and animals. Accordingly, the intercourse of humans and wildlife, resulting from actual or potential disease transmission, has become a subject of increasing angst. Although red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), and cattle are sympatric relative to distribution and habitat utilization, the effects of interspecific interactions between the aforementioned are questionable. Understanding the potential transmissibility, either directly or indirectly, of disease between mesocarnivores and domestic cattle will garner further understanding of the ecology and epidemiology of bovine tuberculosis. Additionally, as the prevalence within the deer population decreases, a sentinel species would be a valuable determinant by which state and federal governmental agencies can assess the occurrence of bovine tuberculosis in Michigan. The most likely species to fulfill the three criteria are the raccoon and red fox, two species possessing an appreciably small home range size and dispersal distance. Although data on the incidence and pathology of TB in raccoons has been acquired, information on the home range and dispersal characteristics of raccoons has not been investigated in Michigan since 1943 (Stuewer 1943). Similarly, the available literature on the behavioral ecology of the red fox in Michigan is lacking. Information on the average home range size and dispersal distances of raccoons and red foxes is fundamental to determining whether the raccoon and/or red fox would be an effectual sentinel species for estimating the

prevalence of bovine tuberculosis within an area.

Sixty one raccoons (*Procyon lotor*) and 5 red foxes (*Vulpes vulpes*) were live trapped and subsequently radio collared throughout a 90.6 km^2 farmland community in northeastern lower Michigan. Trapping was accomplished utilizing cage traps, egg type trap devices and soft-catch foothold traps. Raccoons and red foxes were immobilized with ketamine/xylazine injections and biological information including premolars, blood samples, body measurements and genetics samples was acquired. Raccoons were the primary focus due to their activity associated with cattle and forestlands where deer are most prevalent. Due to the relatively high prevalence of bovine tuberculosis in red fox we decided to garner supplemental information by radio collaring a sample for investigation.

Individuals were located 3-5 times per week via radio telemetry to ascertain home range, dispersal characteristics, spatial distribution and proximity to livestock. Time intervals for telemetry observation were 1900-2300, 2300-0300 and 0300-0700, designed to capture maximum animal activity. For each animal location, 2-3 compass bearings were taken and subsequently processed utilizing Locate software. In order to reduce the risk of movement related bias, locations were recorded within 10 minutes. Homing techniques were utilized to identify loafing and denning sites throughout raccoon home ranges. Additionally, nine bovine were ear tagged with radio transmitters to minimize the assumption of proximity to radio collared raccoons and red foxes.

Radio collared individuals were further documented at resource interfaces via a D5041A data collection computer and R2100 receiver (ATS, Isanti, MN), which allowed automatic recording of both raccoon, red fox and cattle radio transmitters. The system was designed to record proximity of radio collared individuals around natural watering sources within pastures and grazing allotments. For each animal frequency captured, the system recorded date, time and number of pulses.

Additionally, passive infrared monitors that trigger automatic cameras photographed study animals and non-target species in and around watering sources. We utilized Reconyx cameras to record images, time, date and temperature information at remote field sites. Cameras were mounted on existing vegetation and positioned to observe maximum recordable areas.

Preliminary analysis of raccoons suggests annual home range sizes of .824km^2 and .608km^2 for males and females, respectively. The minimum convex polygon method of home range analysis was used to achieve these results. Further analysis will be conducted using estimators more appropriate for delineating concentrated areas of use. During the study an average of 60-80 locations per animal were recorded. Home ranges are analyzed utilizing ArcView GIS and Home Range Extension for ArcView.

Remote data collection computers were able to document activity of both raccoons and cattle around watering sites. This data allows further analysis of the potential for direct and indirect contact between these two species.

The camera systems captured images throughout the study season, furthering the understanding of the temporal and spatial usage of water resources by cattle and raccoon. Raccoons and cattle were documented utilizing the same space just hours apart which may provide for indirect transmission of disease.

Radio collared individuals that were lost due to mortality were subsequently necropsied and submitted for bovine

tuberculosis testing. Additionally, trapping sessions are presently being conducted to recapture and submit the remaining study animals for testing. Preliminary results for 11 raccoons tested include 1 positive for bovine tuberculosis.

Raccoons demonstrated throughout this study that they live and thrive in close proximity to livestock and therefore could provide a vector for bovine tuberculosis. Additionally they have shown their ability to move over the agricultural landscape exposing themselves to multiple farms and livestock sources.

LITERATURE CITED

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