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A Camera Trap Study of Scavenger Species on the University of Mississippi Campus

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A camera trap study of scavenger species on the University of Mississippi campus

By

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ABSTRACT

This is a camera trap study to understand what kind of mammalian scavenger community we have on the University of Mississippi campus and where they are most prominent. Three motion-triggered cameras were used to survey ten buildings on campus over ten weeks. A low number of individuals were caught on camera during this study. There were limitations on this study such as a low number of cameras and a short span of time. More research needs to be done to understand the scavenger community on this campus.

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Introduction

Bird collisions with building windows are one of the largest sources of direct mortality for birds (365–988 million birds killed annually in the United States) next to cat predation (Loss et al., 2015). In a collision with a window, birds either die on impact or injure themselves enough to be killed more easily by predators. When birds see windows, they often see it as a reflection of vegetation rather than a solid surface that needs to be avoided. The majority of existing research on bird-window collisions has focused on the buildings involved in these events. Research has also been done on the timing of collisions, including documenting peak collision frequencies in the early morning and during spring and fall migration (Borden et al., 2010; Daniel Klem, 1989; Hager et al., 2008). Much of the recent research has focused on how landscape factors, especially increased vegetation, or building factors, especially increased glass area, correlate with increased numbers of avian collisions (Borden et al., 2010; Cusa et al., 2015; Klem et al., 2009). In these studies, human surveying teams are primarily used to count bird carcasses and estimate the magnitude of avian mortality in window collisions (Dunn, 1993; Loss et al., 2014). A major potential bias in these estimates is the inaccurate detection of killed birds (Hager et al., 2012; Smallwood et al., 2010). Due to variables that influence the counts of avian carcasses found, accurately estimating the total mortality would require more study of these biases.

One of the top sources for underestimated avian mortality rates is the removal of bird carcasses before they can be detected by monitors. Scavengers are one of the leading causes of carcass removal (Kummer et al., 2016). This bias has been evaluated for various bird mortality studies, which show that factors such as coverage of carcass, size of carcass, season, and environment could cause variance in carcass persistence (Hager et al., 2012; Kummer et al., 2016). Different species of scavengers and spatiotemporal variance in scavenger communities

also cause variation in persistence of carcasses. Some species will remove and eat the carcass in its entirety while others will eat theirs on site and leave partial remains (Hager et al., 2012). Some researchers suspect that correlations between local habitat and carcass persistence are explained by the activity and habitat selection of local scavenger communities (Pain, 1991; Santos et al., 2011).

There are different methods previously used to conduct research on scavengers. In two studies, bird carcasses were placed beneath windows, imitating the location and look of a bird after a window collision (Hager et al., 2012; Loss et al., 2015). These carcasses were then monitored using motion-triggered and time lapse cameras set up near each site. Each camera shot recorded the time between carcass deposition and carcass removal by a scavenger. Influences of different variables on the times such as coverage of carcass, type of ground the carcass was on, and weather were also recorded (Hager et al., 2012; Kummer et al., 2016). Similarly, in this study on the University of Mississippi campus, I used three digital scouting cameras that are motion-triggered.

The goal for this study was to find what kinds of mammalian scavenger species we have on campus and which of the ten buildings studied had the most scavenger activity around them. I hypothesized there would be raccoons (*Procyon lotor*) and feral cats (*Felis catus*) on campus, and they would be most prominent around three of the buildings: Library, Shoemaker Hall, and Carrier Hall, due to the number of areas with vegetation cover and relative lack of light at night. This was determined by scouting the ten buildings to find areas with large amounts of vegetation such as trees and bushes and areas with limited lighting from lamp posts at night. Squirrels can also be considered scavengers (James & Coady, 2004; Kahle et al., 2016; Klem et al., 2004), and there is an abundance of them on university campus, but I did not think they would be common

immediately around buildings. Such data could be a key resource for other studies on university campuses where scavengers may play a role, including future efforts at the University of Mississippi to quantify bird mortality due to window collisions. Understanding what scavenger species are present and where they are is a first step in estimating how those data may be influenced by scavenger predation on injured birds and carcasses.

Methods

This study was done around ten different buildings on the University of Mississippi campus, during the fall of 2022. These buildings are known from a previous study (Counce, 2020) to have variable levels of bird mortality due to window collisions. I used three motion-triggered game cameras (two Wildgame Innovations Model# x10 cameras, and one Bushnell Core 24MP No Glow Model 119938C camera), each set up at a different building every week. I did not place bird carcasses in front of the cameras as in other studies, but rather just used the cameras to attempt to detect natural movements of scavengers around each building. The study was done over a ten-week span with the first camera setup on October 10th, and the last setup on December 12th. With three different buildings surveyed every week, ten buildings were covered a total of three times each. The cameras were set up at a different vantage point of a building every time, facing away from roads or foot traffic and towards vegetation or corners. The three cameras were set at new buildings every Monday at various times in the evening, recording anything that moved for 72 hours. Each time movement was detected by the passive infra-red motion sensor of a camera, one still photo was taken. A 15 second interval was set between when a photo was taken and when the camera was ready to sense motion again. The cameras were picked up every Thursday evening. Table 1 shows which buildings were covered each week. I reviewed the footage every weekend, recording what, when, and where for every animal species

captured on camera. To determine what was counted as a new individual when there was more than one picture of an animal taken consecutively, I looked at the time stamps on the photos and counted the individual as new after a photo was taken at least one minute after the first photo.

Table 1: Buildings Surveyed Each Week

	Oct 10 -13	Oct 17 -20	Oct 24 -27	Oct 31 - Nov 3	Nov 7 -10	Nov 14 -17	Nov 21 -24	Nov 28 - Dec 1	Dec 5 -8	Dec 12 -15
Carrier			X				X			X
Coulter				X			X			X
Insight Park		X			X			X		
Lamar	X			X			X			
Law School	X				X			X		
Library		X				X			X	
Rebel Market		X			X				X	
RC South			X			X			X	
Shoemaker	X			X				X		
Student Union			X			X				X

Results

Altogether, cameras were deployed for a total of 2160 camera-hours (72 hours per camera per deployment per building x 3 deployments x 10 buildings). Across the ten buildings monitored, three individuals of two mammalian scavenger species I had hypothesized to be most common were caught on camera: one raccoon (*Procyon lotor*) and two different feral cats (*Felis*

catus). One grey and white feral cat was seen at the Library at 5:27 a.m. on October 20th, 2022 (Figure 1), and the raccoon was seen at the Library at 3:44 a.m. on November 16th, 2022 (Figure 2). A black feral cat was seen at Shoemaker Hall at 1:39 a.m. on October 11th, 2022 (Figure 3). Many pictures of grey squirrels (*Sciurus carolinensis*) were caught as well, especially at the Library and Carrier Hall. Figure 4 shows a grey squirrel at Carrier Hall at 2:39 p.m. on October 26th, 2022. Around the Library, there were also five bird species caught on camera including the Blue Jay (*Cyanocitta cristata*), Northern Cardinal (*Cardinalis cardinalis*), Brown Thrasher (*Toxostoma rufum*), Eastern Towhee (*Pipilo erythrophthalmus*), and White-throated Sparrow (*Zonotrichia albicollis*). A count of these individuals is organized in Table 2. Figure 5 shows the number of each animal species caught on camera at each building, and Table 3 displays the same data in a table. As can be seen in Figure 5 and Table 3, the highest number of wildlife species were captured on camera at the Library.

Figure 1: Photo of a grey and white feral cat (*Felis catus*) at the Library building.

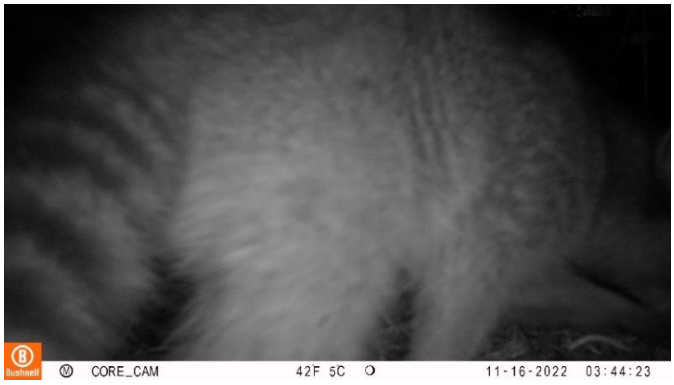

Figure 2: Photo of a raccoon (*Procyon lotor*) at the Library building.

Figure 3: Photo of a black feral cat (*Felis catus*) at Shoemaker Hall.

Figure 4: Photo of a grey squirrel (*Sciurus carolinensis*) at Carrier Hall.

Table 2: Number of Each Bird Species Caught on Camera

Bird Species	**Number of Each**
White-throated Sparrow	33
Blue Jay	2
Northern Cardinal	2
Brown Thrasher	1
Eastern Towhee	1

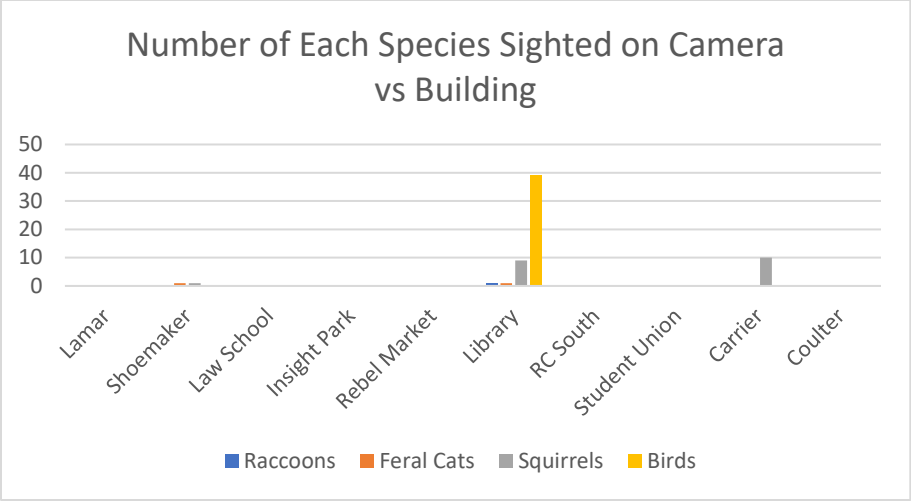

Figure 5: Number of individuals of four species monitored at each building. Most species caught on camera were around the Library building. Each camera was set up for 72 hours per week with a total of 2160 (10 buildings x 3 deployments/building x 72 hours/deployment) camera-hours of surveying buildings.

Table 3: Number of Each Species Sighted on Camera at Each Building

Building	Raccoons	Feral Cats	Squirrels	Birds
Carrier	0	0	10	0
Coulter	0	0	0	0
Insight Park	0	0	0	0
Lamar	0	0	0	0
Law School	0	0	0	0
Library	1	1	9	39
Rebel Market	0	0	0	0
RC South	0	0	0	0
Shoemaker	0	1	1	0
Student Union	0	0	0	0

Discussion

My hypothesis that there would be raccoons and feral cats on campus with greater numbers around the Library, Shoemaker Hall, and Carrier Hall was somewhat supported by the data, although the low number of detections limits the conclusions that can be drawn about those two species. Rather, the results of my study indicate that grey squirrels may be the most common mammalian scavengers on the University of Mississippi campus, in addition to raccoons and feral cats (Figure 5, Table 3).

Overall, most animal activity was recorded at the Library building, with one feral cat and some squirrels recorded at Shoemaker Hall (Figure 5). At Carrier Hall, only squirrels were recorded (Figure 5). Previous studies on scavengers and their effects on bird mortality estimates had mammalian scavenger species recorded in their studies including the raccoon (Hager et al., 2012), the feral cat (Hager et al., 2012; Kummer et al., 2016), the striped skunk (*Mephitis mephitis*) (Kahle et al., 2016), the Virginia opossum (*Didelphis virginiana*) (Riding & Loss, 2018), and the grey squirrel (James & Coady, 2004; Kahle et al., 2016; Klem et al., 2004). In one paper, squirrels were found to be the second most frequent scavenger, after cats (Klem et al., 2004).

The data gathered in this study on bird species on campus could be useful in future studies on bird populations and bird-window collisions (Table 3). This study shows that more birds were camera trapped at the Library building on campus. Having a framework of what kind of bird species were most present in that area, researchers can use it to study that area and other similar locations on campus. For example, one might be studying bird-window mortality and need to know what species of birds most likely fly to those areas in order to accurately estimate migration patterns and survey the area for bird mortality. Knowing that White-throated Sparrows

are the most prominent around the library can be useful (Tables 2 & 3). In addition to having the data on bird species, the data on scavengers would be useful in these studies as well. More accurate bird-mortality estimates can be achieved when knowing the degree of scavenging in the area. The data shows that there is higher animal activity overall at the Library building. Is there a reason for this? Are scavengers more abundant there due simply to the habitat, or due to the high abundance of birds? When comparing the results of this study with the results of Emma Counce's study on campus, more questions can be raised. Counce's results show the most evidence (dead birds) of bird-window collisions at the Law School, Insight Park, and Lamar buildings while my results showed the most scavenger activity around the Library, Shoemaker Hall, and Carrier Hall buildings. Counce's study showed zero evidence of window collisions at the Library (Counce, 2020). Why is this? Are the scavengers around buildings such as the Library affecting Emma Counce's results or could it be another reason? These are other questions that could be explored with more research.

Mammalian scavengers are not easy to capture on camera because they are usually nocturnal and prefer hidden areas. Some limitations of this study were the number of motion-triggered cameras available for use and the time span available for testing. The two camera models used are not certain to have the same sensitivities, so that could be another bias in this study. Some methods I would change if I was to repeat this experiment would be to use more motion-triggered cameras to cover more areas at a time (more buildings) and leave each camera to record for up to two weeks at a time. The time span for the study would be longer, for example, taking up to two years to complete the research. This would be a substantial amount of time for a more accurate study of what species are where on campus. With two years allotted for this study, seasonal differences could also be factored in, such as how the behaviors of different

species changed with the seasons. This would allow for a better understanding of these scavengers.

In summary, my study is a crucial first step into understanding the scavenger community on the University of Mississippi campus. As hypothesized, raccoons and feral cats are present on campus, but further study should be done on those species, and squirrels should also be considered important scavengers at this site. More in-depth research and methods on a larger scale than this study need to be used in order to understand what other scavengers roam the campus and the scope of how many there are.

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