Demonstrating camera trap techniques and their application for identifying feral cats across a college campus

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Demonstrating camera trap techniques and their application for identifying feral cats across a college campus

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Urban and suburban wildlife can be difficult to study through traditional wildlife techniques using direct, in situ human involvement. The use of remote sensing technology like trip cameras (or camera traps) can allow researchers to obtain high quality photographs of target species to be used to confirm the presence of species and even indentify individuals of a local population. A study at the University of Florida campus employed eight camera traps at four sampling locations to attempt to identify individuals of the feral cat (*Felis catus)* population as well as survey local mesopredator diversity. High-resolution photographs were used to select distinguishing characteristics of each cat in order to assign it an identification code and determine if individuals were moving among the sampling sites. Ten individuals were identified out of 118 total photographs with confirmed feral cat appearances. Only one individual appeared at more than one sampling site. The trip cameras captured photo evidence of four other species, all of which appeared at sites alongside cats suggesting some degree of resource competition may exist between these opportunistic predators.

INTRODUCTION

THE domestic cat (Felis catus) has been a ubiquitous carnivore in urban, residential, and rural environments throughout much of North America, dating back to their introduction by European settlers. The term “feral” refers to cats that spend most of their life in the “wild” and are not tame around humans. Other designations for cats found outdoors include “stray,” or un-owned cats (that have escaped their owners or been abandoned), and outdoor cats whose owners consider them to be pets. If a stray cat reproduces, its young will be considered feral. The outdoor cat has an owner but spends all or most of its life outdoors. Cats in all three situations are called “free-roaming,” and are likely to be seen moving around at night in most urban areas.

Free-roaming cats all have the potential to prey on wildlife populations or spread diseases (Baker et al., 2005) and many residents find them to be a nuisance when their numbers get too high (Wald & Jacobson, 2013). On the other hand, colonies of feral and stray cats that are sanctioned or tolerated by local municipalities can have high numbers of animals living in small areas and sustained by a committed volunteer force (Levy et al., 2003). People hold different opinions about feral cats but they are commonly fed by some members of the community, who leave bowls of cat food outside. Scenes such as those depicted in Figure 1 are common sights in urban and residential areas throughout much of the developed world. The feeding of free-roaming cats is one of the primary reasons cats are a concern to wildlife and conservation advocates. In their view, the direct feeding of outdoor cats by humans (Figure 1, Panel A), or even the scavenge feeding by ferals and strays (Figure 1, Panel B), supports high numbers of this non-native, invasive species (Schmidt et al., 2007). A variety of research projects are underway around the world aiming to better understand the relationships between free-roaming cats, humans, and wildlife.

A

B

Figure 1. Photographs of humans interacting with free-ranging cats. Credits: Panel A Photo, Pavel Vakhrushev; Panel B: UF/IFAS Photo: Michael Bainum

Passive animal capture techniques using camera traps is becoming commonplace for researchers, recreation-minded hunters, and landowners. This capture method has since been used for verifying whether an animal of interest is present in a given area (verifying the absence is considerably more difficult) simply by viewing film data from where the cameras are positioned. Camera trapping is useful for research involving population surveys where wildlife can be captured, marked, and then recaptured through visual recognition without ever having to physically handle or distress the animals. The non-invasive aspect of this technology made it particularly attractive for work with elusive and secretive carnivores. Regardless of public opinion on what the responsible and humane response to stray pet overpopulation, the ability to detect and assess the number of individuals using public or private areas is essential for understanding what (if anything) to do to manage free-roaming cat populations. Camera trapping is a very straightforward way to get a handle on where and when free-roaming cats visit outdoor locations.

METHODS

In our brief investigation, we used eight camera traps to compare the relative abundance of cats across locations on the University of Florida campus. These locations represented the possible range of human activity and allowed us to track how cat activity corresponded to human activity at each of these sites. We expected to see areas heavily traveled by faculty and students to reflect proportionally higher numbers of cats than areas on campus with comparatively less human traffic. This prediction was based on the idea that the likelihood of human-cat interaction (i.e. feeding) increases in areas where the two species are likely to share a considerable amount of time (Liberg et al., 2000). The map in Figure 2 shows the sampling sites across the University of Florida central campus and listed here in increasing level of human activity: the Newins-Ziegler Conservation Woods (NZ), Student Agricultural Gardens (SG), Wilmot Gardens (WG), and Plaza of the Americas (PA). Determining the level of human activity was determined in part by the density of buildings and in part by our observations of daytime activity. Newins-Ziegler Woods is a thicket near the heart of campus with limited foot traffic, and its densely wooded dirt trails keep people from interacting directly with much of the area. The Plaza of the Americas, on the other hand, is an open park-like area with scattered large trees, intersected by several paved sidewalks and closely surrounded by large buildings, including popular libraries and lecture halls. This location serves as a social meeting place for student organizations and foodservice, and therefore the PA represented the highest end on the scale of human activity.

Once a site had been selected for camera trapping, properly mounting the cameras stood as the single most crucial element of the photo capturing effort. Even with multiple cameras occupying an area known to have heavy cat traffic, the camera trapping effort fails if the camera is angled too low to the ground or too high above animal-sized mammals, the cameras were placed about one foot height where cats cannot be photographed. Because the angle of the camera determines the extent of the detection range and all the target species were small- to medium-

Figure 2. Map of the central UF campus showing 4 camera trapping locations: Newins-Ziegler Woods (NZ), Student Agricultural Gardens (SG), Wilmot Gardens (WG), and Plaza of the Americas (PA). Credits: Google Maps @2013 Google

from the ground and tilted slightly downward to ensure the subject being photographed is captured completely. Verifying that the cameras were properly set and aimed was important, so to ensure this, a few test pictures were taken and viewed before the actual trapping days and nights were to take place. Taking into consideration the length of time that each camera would be collecting data (5 or more trap nights), protecting the camera equipment from exposure to rain, wind, and temperature extremes, as well as theft or accidental removal, became a top priority. Fortunately, the majority of commercially available equipment is built to endure outdoor conditions, and we invested in protective metal casings equipped with locking capabilities that were designed specifically for the Cuddeback camera models used in this study. Figure 3 displays the locking mechanism (Panel A) as well as a camera harnessed to a tree in an orientation similar to that used throughout the project. Still, maintaining a successful camera trapping effort meant checking on the camera traps regularly to be sure that they remained set properly and ready to take accurate pictures.

A B

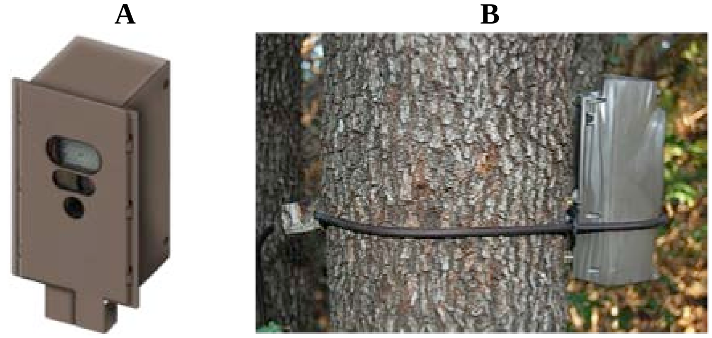

Figure 3. A photograph of a camera trap inside a secure metal casing (Panel A) and a photograph of a camera trap without a metal casing, fastened to a tree and angled towards the target area (Panel B).

Trip cameras were an ideal technology for a study of this kind because they added the capability to take high quality still photos that allowed for the identification of individuals at each sampling site and the verification of cat movement among the sampling sites. Once an adequate sampling effort (at least five trap nights) had taken place at one of the sites, we analyzed the digital output from the trip cameras and selected those photos with the highest resolution and best orientation of the target (clearest photos of the body and/or face). Extra attention was focused on unique physical characteristics that could serve as identifying markers for individual cats. Examples of these details are shown in Figure 4, appearing in the form of scars on the face or body, missing pieces of the ear, or unique coat color patterns. Our study selected at least two such characteristics for each individual in order to improve the accuracy of identification efforts. If the camera trapping effort had included more sites—likely associated with a greater abundance of cats—more identifying markings would need to be considered. For example, the individual in Figure 5 (seen below), whose appearance was variable depending on the site and exposure conditions, was the only all-black cat in our photos. If we had detected more all-black individuals, distinguishing them in photos would have been difficult without additional, fine-scale identifiers.

Figure 4. Photographs of sardines placed to attract local carnivores (Panel A) and 3 different cats feeding in view of baited camera traps (Panels B, C, and D).

Once we had identified individuals, we could then track them as they visited one or more cameras at a single site or across sites. This was important because the collection of identified individuals gave us a baseline, or minimum, for how many cats were active during the sampling period of the study. The pictures also allowed us to observe the distances and locations that individuals were willing to travel within each sampling site, indicating to what degree the animals' home ranges may overlap. In addition to cats, we were able to use the prevalence of other wildlife species in our photo records as an indicator of site-to-site species diversity and the relationship between the site and the level of activity of native and non-native wildlife. We did not attempt to assign identifying marks to other wildlife but feel that a method similar to the one describe here could be used to track individuals of other species.

Figure 5. Photographs of the same cat (Black-B) at 4 different camera trap locations around the Plaza of the Americas.

BAITING

Using baits can be an effective technique to attract wildlife to a camera staging area for photo capture (Cutler and Swann, 1999). In our study, baiting allowed us to efficiently sample sites of interest in the study area. However, there are caveats to consider when baiting camera traps, namely the change in species' behavior that occurs when food is used as a lure (Cutler and Swann, 1999). If study objectives do not depend on natural or largely unmanipulated animal behavior, then baited trip cameras may serve a valuable purpose for obtaining data on the wildlife that are present and willing to forage in a given area. As an ecological research tool, baiting cameras helps to bring animals present in an area to a chosen location, where researchers can then study physical features and obtain general health indicators. Deploying baited cameras can also serve to establish baseline numbers of rare species or confirm the presence of invasive species. Additionally, baited camera traps are often the only feasible way of observing highly secretive carnivores, which makes the technique particularly useful for formerly intractable research challenges. This study, as well as others, has proven the effectiveness of baited camera trapping as a viable wildlife research technique for photographing a broad range of species in addition to feral cats (Cutler and Swann, 1999).

CONCLUSION

The camera trapping effort revealed that local wildlife and feral and stray cats often share the same space, suggesting a possible competition for resources. Raccoons, opossums, armadillos, and squirrels were regular visitors to many of the camera traps with some species apparently foraging in groups; seen here, in Figure 6. Foraging in numbers is considered common for these midsized animals for at least part of the year due to the reproductive and survival advantages during the breeding seasons (McDonough, 1997; Fritzell, 1978). This aggregating or pairing behavior was not observed in any of the cats at the sampling sites. Communal living has been cited in several resource-rich environments, but hunting remains a solitary behavior (Bradshaw, 2006; Hall et al., 2000).

Figure 6. A handful of interesting photos from a much larger selection of common wildlife that visited the camera traps placed at the four sampling sites.

Table 1 shows that both raccoons and opossums appeared frequently at most of the sites, something that was unsurprising given the reputation these animals share as urban and suburban inhabitants. Ten different individual cats were identified out of 118 total photographs of cats, which can be seen below in Table 2. There was little evidence that these individuals were traveling long distances across campus during the camera trapping effort. After carefully studying the pictures with cats in them, we concluded that only one individual visited 2 different sites (Table 2). This, of course, does not mean that some cats did not move across our sites, only that the cameras that were placed at each site were unable to capture proof of such movement. One possible reason why we did not see more significant movement is because we observed an abundance of resources where these cats congregated; many students came there regularly to feed cats during meal times. Without food limitations, cats did not need to cover larger distances foraging.

Table 1. The number of appearances made by wildlife species in numbers of photos taken, according to trap location. Number of individual cats for each site listed in parentheses.

Wildlife Species	*Newins-Ziegler Woods*	*Student Agricultural Gardens*	*Wilmot Gardens*	*Plaza of the Americas*
Raccoon	25	17	0	12
Opposum	4	32	20	6
Armadillo	0	8	15	0
Squirrel	0	2	10	2
Cat	25(2)	4(2)	20(2)	69(5)

Table 2. The presence (P) or absence (A) of ten cats (listed by ID code) that were identified among the four camera trap locations.

Cat ID	*Plaza of the Americas*	*Newins Ziegler Woods*	*Student Agricultural Gardens*	*Wilmot Gardens*
Mix-SF	A	P	A	A
Gray-DSL	A	P	A	P
Black-B	P	A	A	A
Gray-MWS	P	A	A	A
Mix-BF+YE	P	A	A	A
Mix-WJ	P	A	A	A
Orange-OS	P	A	A	A
Black-WL	A	A	P	A
Gray-TS	A	A	P	A
Orange-BS	A	A	A	P

Our findings add support to the literature, reinforcing the connection between feral or stray cat activity and human activity especially in an urban setting (Dards, 1983; Natoli, 1985; Lepczyk et al., 2004). Cameras placed at the Plaza site captured the highest number of different individuals (5) for any site, as well as more total photographs of cats (69) than the other three sites combined. The Plaza of the Americas is positioned on the UF campus near the urban center of Gainesville and represents a major social hub of this large university. The area experiences consistent traffic from students, faculty, and staff throughout much of the year, suggesting a high probability of contact between humans and cats either directly or indirectly. We believe it is this potential contact that provides an opportunity for these animals to receive or scavenge for food scraps, leading to the collection of individuals that was observed during this study. The concentration of human provided resources could also explain why we didn't observe any of the Plaza cats at other sampling sites. Additional research into human-cat interactions would be helpful in determining and predicting the density and overall abundances of cats at various other sites.

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