Small Mammals Associated with Roadside Litter in Payne Co. Oklahoma

Authors: Kalyn L. Dealy, Tabby S. Gunnars, Courtney M. Manly, Karen McBee*
Department of Integrative Biology, Oklahoma State University, Stillwater, OK 74078

Abstract

In this experiment, we observed vegetation patterns, weather conditions, and physical aspects of the types of litter in which small mammals were found along a one-mile long segment of Highway 177 between 32nd and 44th streets. Tabby Gunnars investigated the relationship between the occurrence of small mammals in litter and vegetation patterns. Kalyn Dealy monitored weather data available through Mesonet in relation to occurrence of small mammals in litter. Courtney Manly measured sizes, shapes, and colors of bottles, cans, and other containers and the material (plastic, glass, metal, paper) and compared which types of containers were used by small mammals and compared that to containers that were not used. We did not find any remains in roadside litter in four sampling periods, but we did find nesting material in one cardboard box and in one aluminum can.

Keywords: Shrews, Roadside Litter, Small Mammals

Introduction

Small mammals (Fig. 1) have been found in bottles and cans along roadsides and in dumps in England (Morris and Harper 1965), Ontario (Courtney and Fenton 1976), Virginia (Pagels and French 1987, Benedict and Billeter 2004), and Illinois (Gerard and Feldhamer 1990), but use of discarded bottles and other roadside litter has not been investigated in the central plains. We investigated the relationships among weather, vegetation patterns, litter characteristics, and presence of skeletal remains from small mammals to determine if litter serves as an effective way to investigate occurrence of small mammals in grassland habitat. Morris and Harper (1965) found that shrews used bottles with all sizes of opening but rodents used only bottles with larger openings. Courtney and Fenton (1976) found that omnivores like *Peromyscus leucopus* (White footed mouse) and *Tamias striatus* (Eastern chipmunk) were more likely to use areas with garbage compared to other species such as *Blarina brevicauda* (Northern short tailed shrew) and *Microtus pennsylvanicus* (Meadow vole). Pagels and French (1987) found 14 species of small mammals in discarded bottles along Virginia roads, with shrews (*Blarina*) making up the most captures. Benedict and Billeter (2004) found about 4% of bottles contained remains of vertebrates also in Virginia. Because some species of small mammals may be attracted to bottles, cans, and other kinds of containers that are tossed onto roadsides as sources of shelter or food, this roadside litter may represent a cause of death when interior surfaces are slick, containers are tilted at a sharp angle, or containers are fluid-filled and animals cannot climb out to escape (Benedict and Billeter 2004; Pagels and French 1987). Investigators also have used surveys in which discarded bottles were examined for the presence of skeletal remains of small mammals as a means of determining geographical distributions of

*=Mentor

rare or hard to capture species of small mammals (Gerard and Feldhamer 1990, Taulman et al. 1992). We found no previously published studies of associations between roadside litter and small mammals in Oklahoma or in any other area dominated by grassland habitat, therefore we wanted to determine if small mammals in Oklahoma also use roadside litter as shelter.

Figure 1 - Two species of small mammals previously found in roadside litter. Left—Cryptotis parva, Least shrew, photo from Animal Diversity Website. Right—Peromyscus leucopus, White footed mouse, photo by Marie-Eve Jacques.

Methods

We sampled a one-mile transect in Payne Co., Oklahoma located between the towns of Stillwater and Perkins on Highway 177 between 32nd to 44th street during winter, transition to spring, and spring. We chose Highway 177, because of a preliminary study done in February 2014 on Highway 51. The previous study examined Highway 51 because of its high levels of traffic. We wanted to compare results from a different highway to this preliminary study. To choose our site, we drove down Highway 177 looking for a section that had both areas with buildings or structures such as barns, and rural, open fields with no buildings or structures. We sampled every every 2 weeks, beginning February 24th, and ending April 6th, 2015. Five days before every sampling period, Dealy accessed data for the amount of rainfall, high and low air temperatures, and temperature of the soil at 2 inches and 10 inches below ground for each of the 5 days and the day of sampling from the Oklahoma Mesonet Station located in Perkins, OK. On each sampling day, we walked first north along the west side then south along the east side of Hwy. 177 and searched for any type of litter. When litter was found we searched through it for evidence of nesting material such as densely packed grass and skeletal remains or carcasses of small mammals. For the first 3 sampling periods, we collected only litter that contained nesting materials or remains. We marked the area where litter containing nesting material or remains was found with a flag and then recorded longitude and latitude. We took a picture from above the object and then from 50 feet away. We chose 50 feet away because it was a good distance to compare what a predator might see from far away. Gunnars determined estimated percentage of 4 types of plant cover (dead [brown] grass, live [green] grass, forbs, leaf litter) and 2 types of ground (bare soil, rocks) in a 0.5 X 0.5 m area around the object, using a Daubenmire frame (Daubenmire and Daubenmire, 1968). Gunnars also recorded plant cover and ground cover in 20 randomly chosen plots along the transect (Fig. 2) for comparison to vegetation characteristics at sites where remains or nesting material was found. While sampling, we chose these 20 plots by walking a randomly chosen distance from the last plot.

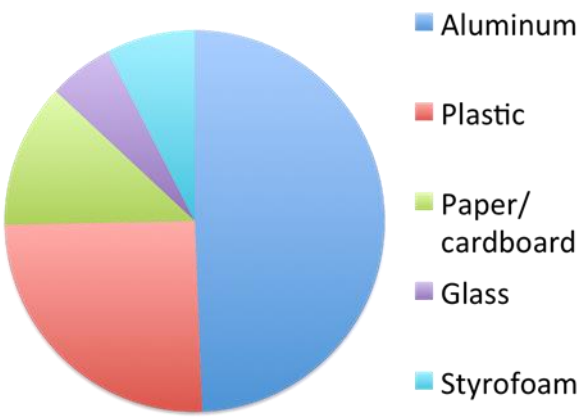
Each time a container with nesting material or a carcass was found, it was returned to the lab for further investigation, but all other litter was left in place until the last sampling period of the study. After the

last sampling period, we collected all of the litter along both sides of the road and returned it to the lab (Fig. 2) where litter was sorted into classes and Manly measured the size of the opening, diameter, height and length of the objects, volume, width, color, shape (e.g., cylindrical, rectangular, tapered cylindrical), and type of material (glass, plastic, Styrofoam, paper/cardboard, aluminum). We then examined objects for nesting material, feces, and carcasses.

Figure 2 - Left—Daubenmire frame for vegetational sampling. Center—selecting random sampling points for vegetational sampling. Right—sorted litter types.

Results

The total weight of all recovered litter was 6.1 kg. We found five classes of litter (Fig. 3). Aluminum made up nearly 50% and plastic accounted for almost 25% of the total amount of litter. The average temperatures and precipitation as measured at the closest Mesonet station (Perkins, OK) are presented in Fig. 4. Average high temperature ranged from 43˚F to 80˚F during the study. Average low temperature ranged from 23˚F to 52˚F. Average soil temperature at 2 inches depth ranged between 40˚F and 61˚F and at 10 inches depth ranged between 41˚F and 61˚F. There was little difference in soil temperature between 2 and 10 inches of depth and as the air temperature increased so did soil temperatures. There was little measurable precipitation during our study. By far, the vegetation patterns showed that the largest average percentage for any cover class was that for dead grass (Fig. 5). Both rocks and leaf litter were each found at only one plot. Only 2 of 237 containers showed evidence of nesting material and no containers held carcasses of small mammals. Nesting material consisted of dried grasses with some rodent feces. One container with nesting material was an aluminum can (Fig. 6), which contained both short, clipped, dried grass and rodent feces. The other container with nesting material was a cube-shaped, 24-count Coca Cola cardboard box (Fig. 6). Both containers with nesting material were found on the west side of Hwy. 177. Volume of nesting material in the aluminum can was approximately 0.5 cup and in the cardboard box was approximately 1 cup. Both containers containing nesting material were found during the first sampling period when air and soil temperatures were lowest. Additionally, it had snowed 2 days prior to sampling. The cardboard container was found in an area composed of 25% bare ground and 75% dead grass and the



aluminum can was found in an area with a 50% dead grass, 25% live grass, 25% leaf.

Figure 3 - Total number of containers in each class of litter.

Discussion

A preliminary study that was done in February 2014 resulted in two *Cryptotis parva* (least shrew) being found in a single tapered cylindrical container from over 38 kg of litter collected along Highway 51; however, we found no carcasses and only two containers held nesting material. Brannon et al. (2010) sampled 220 independent sites over a 2-year period and found skeletal remains of 553 small mammals. Benedict and Billeter (2004) sampled 4.32 km of roadway over 2 years and found 10,681 containers. Only 429 containers held remains with a total of 795 small vertebrates. Brannon et al. (2010) also found a positive correlation between moisture class and the occurrence of shrews

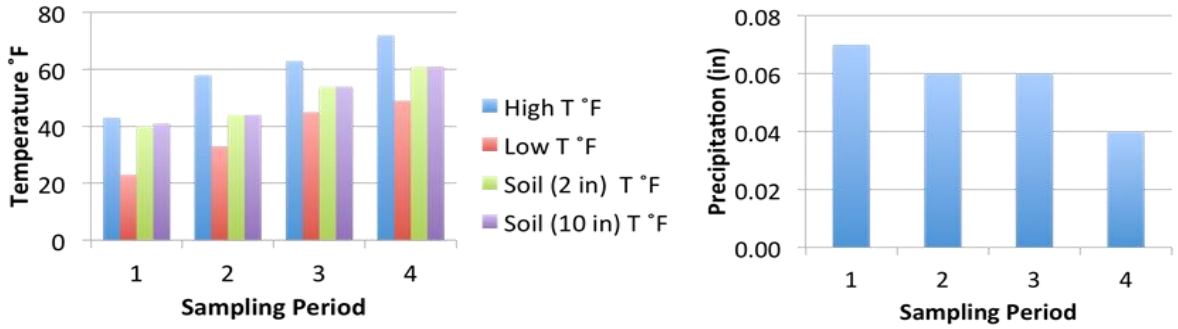


Figure 4 - Left—Average temperatures and right—average precipitation for 5 days prior to and day of sampling during 4 sampling periods.

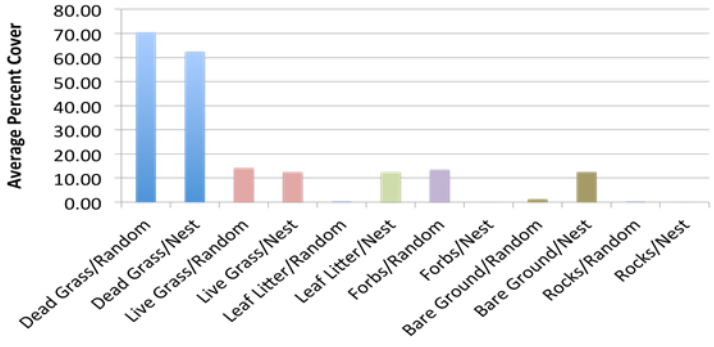


Figure 5 - Average percentage of each cover class at 20 randomly selected sites and 2 sites with nesting material.

in litter, but their study was conducted on the Blue Ridge Escarpment in North Carolina, South Carolina, and Georgia. Because we did not find any remains, we were not able to statistically analyze relationships between weather conditions and when remains were found, nor could we compare types of litter that contained remains and nesting material with containers that didn't. Relationships among proportions of different classes of vegetation cover at sites where remains and nesting material were found

also could not be compared to random sites along the transect. Both Brannon et al. (2010) and Benedict and Billeter (2004) sampled over much greater distances and for 1.75 years longer than our study. The average annual rainfall in Payne County was 33.32 in. for 2000-2014 (Oklahoma Mesonet). The annual rainfall in some parts of the Blue Ridge Escarpment can range up to 100 in./year. Had we been able to sample for greater distances and longer time periods, we possibly would have found evidence of carcasses and more evidence of nesting in roadside litter. The much more mesic habitat in all the other study areas in the literature, however, may suggest that because of the xeric habitat in the central plains small mammals may not use roadside litter often enough to be found in a survey such as ours. However, before we can make this conclusion, we would need to have more sampling periods.

Figure 6 - Left—aluminum can containing nesting material after being cut open by investigators, center—rodent feces found in aluminum can, right—nesting material found in cardboard box.

Acknowledgements

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