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Dogs increase recovery of passerine carcasses in dense vegetation

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Abstract Wildlife managers use carcass searches to assess mortality resulting from biological (e.g., diseases) and physical (e.g., structure collisions) sources. Carcass searches may occur over large areas and need to be completed rapidly because of scavenging and decomposition. However, small carcasses are often missed when dense vegetation is searched. We placed carcasses of house sparrows (*Passer domesticus*) in dense cover of residual and newly grown vegetation and compared searching efficiency of humans and canines. Dogs received no special training in searching for passerine carcasses. In 36 trials conducted in 5 × 40-m plots, human searchers found 45% (SD=19) of the carcasses compared to 92% (SD=13) for dogs (P=0.005). The ratio of recovered to missed carcasses was approximately 12:1 for dogs and 1:1 for humans. The improvement in searching efficiency using dogs was similar (P=0.58) between residual cover (searched in April) and new growth cover (searched in August). A greater rate of searching efficiency is obtained per unit of time by using dogs. Greater efficiency improves quantitative and qualitative assessments of avian mortality in the field.

Key words avian mortality, carcass searching, dogs, passerine, searching efficiency

Avian carcass searches have been used to estimate mortality caused by structure bird-strikes (Avery et al. 1978, McCrary et al. 1986, Faanes 1987, Savereno et al. 1996), agricultural pesticides (Bruggers et al. 1989, Tobin and Dolbeer 1990, Linz et al. 1991), and disease outbreaks (Wobeser and Wobeser 1992). Fewer carcasses tend to be found in densely vegetated habitats, leading to low mortality estimates in these conditions (Rosene and Lay 1963, Wobeser and Wobeser 1992, Philibert et al. 1993). Research has shown that detection of small passerine carcasses may decline 25-50% as vegetative cover increases in height and density (M. L. Avery, United States Department of Agriculture [USDA], unpublished report; Tobin and Dolbeer 1990; Philibert et al. 1993). Further, more time is needed to thoroughly search dense vegetation, effectively limiting the size or number of search areas. For example, searches in weedy orchards take 3 times longer than those in "clean" orchards (Tobin and Dolbeer 1990), and a thorough search for small bird carcasses in ungrazed pasture can require 11-27 hours/ha (Philibert et al. 1993).

In dense cover, the olfactory capabilities of dogs could improve the efficiency of carcass searches. Some dog breeds (e.g., the pointing breeds and retrievers) with an innate ability for scenting birds have been used in gamebird research to census populations (Novoa et al. 1996) and to identify patterns of habitat use (Hines 1986). Although dogs can supplement and improve data collection, they present unique problems. Dogs may cause investigators to alter established field protocols and can introduce unknown biases related to scenting not present in human searches (Gutzwiller 1990). Moreover, dogs can be costly to purchase, train, house, and handle (Dedon et al. 1989; G. Littauer, United States Department of Agriculture, Animal Plant Health Inspection Service, Wildlife Services, personal communication).

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Currently, we are evaluating an avicide (DRC-1339) to manage overabundant blackbird (Icteridae) populations in South Dakota and North Dakota. Post-treatment carcass searches are conducted after each application of avicide; however, concerns have been raised that our searches may underestimate mortality of nontarget passerines. Lands enrolled in the Conservation Reserve Program (CRP) predominate near our DRC-1339 baiting sites. To improve searches in dense herbaceous vegetation characteristic of most CRP fields, we have proposed using dogs. In April and August 1997 we conducted experiments to compare the efficiencies of humans and retriever dogs in searches for house sparrow (*Passer domesticus*) carcasses in dense grassy cover of mature CRP fields.

Human–dog teams were given 10 minutes to search 5 × 40-m transects of dense cover for house sparrow carcasses.

Study area

We conducted our research in east-central South Dakota and south-central North Dakota in the Prairie Couteau and Missouri Couteau, respectively. The topography of the couteaus was shaped by Pleistocene glacial processes and consisted of low, rolling moraines. Row crops, grain crops, and rangeland occupied >85% of this prairie landscape. Numerous undrained lakes and small wetlands occurred throughout. The 30-year averages for temperature and precipitation were 6°C and 49 cm, respectively (North Dakota Agricultural Statistics 1999, South Dakota Agricultural Statistics 1999). The South Dakota experiment was conducted in April 1997 in a CRP field planted in native grasses (e.g., *Panicum virgatum* and *Andropogon gerardii*). The North Dakota experiment was conducted in August 1997 in a field planted with introduced grasses (e.g., *Agropyron* spp. and *Bromus* spp.). Both fields were ≥65 ha.

Methods

We established 6 blocks in each field, with each block consisting of 6 plots (5 × 40 m) delineated by flagging. The blocks were established in the densest areas of standing cover within the fields. Adjacent plots were paired and assigned to one of 3 human participants. All owned hunting dogs; 2 owned Labrador retrievers, one owned a Chesapeake Bay retriever. One plot in the pair was designated for search by the human, the other for search by the human–dog team. Dogs were kept on 5-m leashes during searches. Thawed house sparrow carcasses ($n = 8$) were cast randomly inside plots from 1 m outside (plot density = 400 carcasses/ha). The human or human–dog team was then brought from out of view. A 10-minute search period was allotted, allowing time to conduct the search at a slow walk with stops to inspect denser cover. The humans were active searchers when with dogs. We repeated this process sequentially until all 3 pairs of plots were completed. Unrecovered carcasses were removed from the plot after each search. The order of observers' participation in the searches was randomized. No more than 2 blocks were searched per day. To prevent upwind searches, we aligned plots according to prevailing winds.

The same subjects participated in the April and August experiments. The humans were experienced searchers, having participated in several organized searches for avian carcasses. Despite having no previous training with passerine birds, all dogs showed an intent interest in house sparrow carcasses during pretrial introductions. Searches were not conducted in steady rains or if constant wind ≥32 km/hr. Weather variables were collected hourly from the closest automated National Oceanic Atmospheric Administration (NOAA) weather stations, 55 and 16 km from the South Dakota and North Dakota study sites, respectively.

We estimated vegetation height and percent standing cover in each field by systematically placing 0.25-m^2 quadrats (0.5 × 0.5 m) at 10-m distances on 4 randomly placed 100-m transects. A growing season interceded between the 2 experiments and the vegetation height and percent cover differed between the 2 fields. Thus, for data analyses we classified the blocks into 2 vegetation conditions: residual and new growth. Because searchers were advised to maintain similar intensity of effort between treatment types (i.e., human searches vs. human-dog searches), any difference between treatments was attributed to dogs. Detection efficiency by treatment (human or human-dog), vegetation (residual and new growth), and replication (1 to 6) were compared with a 3-factor repeated measures ANOVA, repeating on all 3 factors (Cody and Smith 1991). We compared differences in average searching efficiency among individual human searchers and among dogs with 1-factor ANOVAs. The dependent variable, percentage of carcasses recovered per plot, was arcsine-transformed to approximate normality (Sokal and Rolf 1981). We used Wilcoxon Rank Sum tests to compare height and density of vegetation between fields. Statistical significance was accepted at $\alpha=0.05$. Means are reported ±SD. We used the coefficient of variation ($CV = SD/\bar{x} \times 100$) to describe variability in detection efficiency between treatments.

Results

The South Dakota experiment was conducted over a 5-day period from 13 to 17 April. Average temperature and percent relative humidity during hourly periods of the April trials were 6° C (range: 3-11° C) and 46% (range: 23-70%), respectively. In North Dakota, the experiment was conducted over 3 days (29-31 August), with an average temperature and relative humidity of 25°C (range: 19-31°C) and 59% (range: 25-91%), respectively. The new-growth vegetation searched in North Dakota was taller (51 vs. 34 cm, $Z=3.4$, $n=40$, $P < 0.001$) and denser (69 vs. 27%, $Z=5.6$, $n=40$, $P < 0.001$) than residual vegetation searched in South Dakota.

Dogs had a 92% (± 13, $n=36$) searching efficiency in plots, more than twice that of humans ($\bar{x}=45\%$ ± 19, $F_{1,2}=209.04$, $P=0.005$). Cover type did not significantly affect percent recovery for humans (residual cover = 42%, new growth = 47%; $F_{1,30}=0.62$, $P=0.438$) or dogs (residual cover = 94%, new growth = 90%; $F_{1,30}=0.29$, $P=0.592$). No interactions were detected for either replication (treatment × rep: $F_{1,10}=0.88$, $P=0.529$) or vegetation (treatment × vegetation: $F_{1,2}=0.44$, $P=0.577$). The percentage of recovered carcasses was similar among humans ($F_{2,33}=1.57$, $P=0.224$) and dogs ($F_{2,33}=0.08$, $P=0.922$). Variability in searching efficiency of the human participants did not differ between residual and new growth cover ($F_{17,17}=1.13$, $P=0.40$), whereas dogs had greater variability in new growth (CV = 20%) than residual cover (CV = 7%, $F_{17,17}=7.76$, $P < 0.001$). The searching efficiency of human participants was more variable (CV = 43%) than that of dogs (CV = 14%, $F_{35,35}=2.05$, $P=0.018$). Overall, dogs recovered 265 carcasses and missed 23 (≅12:1); humans recovered 129 and missed 159 (≅1:1).

Discussion

The dogs adapted quickly to search protocols and were remarkably efficient in recovering passerine carcasses. During the April experiment, dogs recovered either 7 or 8 carcasses in all 18 trials; by contrast, human participants found >5 carcasses only twice in 18 trials. Dogs maintained their efficiency under varying seasonal conditions and vegetation structures. Although during the August trials all dogs had one trial in which they found ≤5 carcasses, in the remaining 15 trials, discovery rate was ≥7. The lesser recovery rates occurred on 3 different days, and trials either prior or post had recovery rates ≥7. No overriding climatic factor could thus be associated with reduced performance of dogs. We speculate that individual responses from working in warm summer temperatures (19°C warmer than April) produced the erratic results. The dogs were worked harder in August, completing the experiment in 3 days compared to 5 in April. Fatigue may have contributed.

Even under experimental conditions of high carcass densities and no carcass scavenging and decomposition, the probability of sighting carcasses in dense vegetation is low (Rosene and Lay 1963, Philibert et al. 1993). For example, in 1-ha plots of ungrazed pasture, searchers found only 14% of wooden-model savannah sparrows (*Passerculus sandwichensis*) and 23% of model western meadowlarks (*Sturnella neglecta*, Philibert et al. 1993). In wetland and riparian habitats, human searchers found only 32% of randomly placed house sparrow carcasses (M. L. Avery, United States Department of Agriculture, unpublished report). Burnham et al. (1980) recommended that to achieve accurate density estimates, transects be set at lengths allowing a minimum detection of 40 objects. During 10 transect searches in which savannah sparrows and western meadowlarks were placed at a density of 50/ha, the minimum detection of 40 was not obtained (Philibert et al. 1993). Without augmenting searching efficiency, it may be infeasible to set adequate transect lengths. Moreover, 5-10% of the total area should be searched (Seber 1982, Wobeser and Wobeser 1992). Both speed and high detection rates, therefore, are needed to make reliable assessments of mortality. Even at very low carcass densities, dogs will maintain a significantly greater detection efficiency than humans and find more carcasses per unit time. This will generate more accurate estimates of the number of individuals affected and the species involved.

We recommend future research on effects of search time, species, and density on search efficiency of dogs. Standards should be established for using dogs prior to carcass searches (Gutzwiller 1990). We advise that baseline assessments of efficiency be conducted under environmental and vegetative conditions that dogs will encounter. Study designs should use randomization to mitigate biases that affect scenting, such as humidity, temperature, precipitation, and wind direction and speed. Changes in behavior during searches should be monitored closely and respites given if dogs show disinterest and fatigue. If these variables can be controlled, precision and accuracy of avian mortality estimates in dense cover may be improved significantly.

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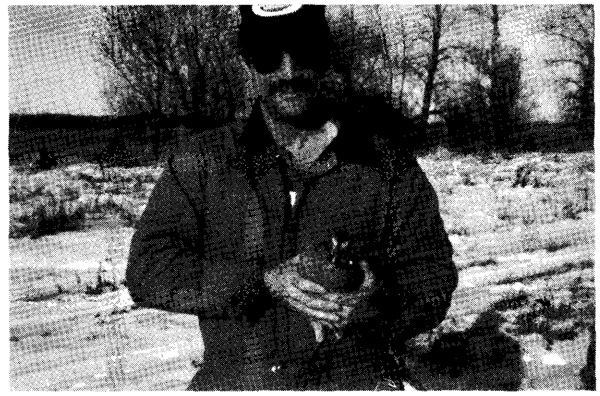

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