

## LACK OF RESPONSE BY MULE DEER TO WILDLIFE WARNING WHISTLES

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During the last decade, a mean of 3,075 mule deer (*Odocoileus hemionus*)/year were killed on roadways in Utah (Ut. Div. Wildl. Resour. 1980-1991). Additional deer were undoubtedly killed because injured animals can leave roads and die undetected. Nationally, 200,000 deer are killed on highways each year (Williamson 1980). Deer are valued biologically and economically; reductions in their populations because of highway mortality are of concern to the public. Human injury or death and damage to vehicles also are alarming.

Efforts have been made to find an effective, cost-efficient method of reducing the numbers of deer-vehicle collisions on highways. Deer-proof fencing (2.4 m high) with appropriate structures to allow animal passage to the other side of the highway reduces deer-vehicle collisions (Reed et al. 1982). Wood and Wolfe (1988) showed intercept feeding of mule deer to be useful at reducing deer-vehicle collisions, but only during short time periods where concentrations of deer existed. Swareflex wildlife warning reflectors were ineffective at reducing mule deer highway mortality (L. B. Dalton and M. C. Stanger, Ut. Div. Wildl. Resour., Price, unpubl. data, 1989).

Another potential method of reducing deer-vehicle collisions is to equip vehicles with ultrasonic whistles. Wildlife warning whistles, of which there are many brands, have been widely distributed in the United States and Europe. The devices are purported to operate at frequencies of 16-20 kHz and were first invented in Austria during 1979. Manufacturers' adver-

tisements generally claim that whistles warn animals of the approach of vehicular traffic, resulting in substantially fewer deer-vehicle collisions (T. Waugh, Sav-a-life Inc., Chicago, Ill., pers. commun., 1990). Nygren (1981) tested wildlife warning whistles in Finland and concluded that canids, bears, deer, and elk heard the devices because their ears moved. Unfortunately, the tests were deemed deficient in terms of timing, numbers of species, and replication.

Objective studies demonstrating effects of wildlife warning whistles on mule deer are lacking. Our pilot study evaluated the responses of free-roaming mule deer to wildlife warning whistles.

### STUDY AREA AND METHODS

The study was conducted during January and February 1990 along a 9.7-km stretch of dirt road at the Gordon Creek Wildlife Management Area in Carbon County, Utah. Vegetative composition was predominantly sagebrush (*Artemisia tridentata*) with scattered pinyon pine (*Pinus edulis*) and juniper (*Juniperus* spp.) trees. Mule deer used the area as winter range, and deer-vehicle collisions were common, averaging 0.25 deer/km/year between 1980 and 1989 (J. Karpowitz, Game Manager, Ut. Div. Wildl. Resour., Price, pers. commun., 1990). Although the terrain was rolling and bisected by deep canyons, the road allowed speeds of up to 85 km/hour and was traveled by mine employees, coal trucks, and recreational traffic.

Two brands of warning whistles were mounted on the front of a truck following manufacturer's specifications. The same truck was used in all tests. Game Tracker's Game Saver<sup>®</sup> and Sav-a-life Inc.'s Deer Alert<sup>®</sup> whistles were each independently tested on free-roaming mule deer. Whistle testing was restricted to late afternoon and early evening, when deer generally were visible within 100 m of the road. To determine whether deer reacted to the whistle, 2 passes at 65 km/hour were made past each group of deer. A group of deer was not tested unless it was a distinct group visually isolated from other deer in the area. The first pass always was conducted without whistles, and the second pass was with whistles. This was necessary to preclude

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any latent response by a group of deer to the test truck that had been equipped with whistles. After the first pass, the truck was driven  $\geq 0.8$  km and out of sight of the deer. Upon turning around, the second pass was conducted.

Deer distances perpendicular from the road were recorded for each pass as 0-10, 11-20, 21-30, and 31-100 m. Responses by deer beyond 100 m were not recorded because it was unlikely that an animal at that distance could be involved in a collision.

Responses of deer were recorded as: no response, lifts head, changes orientation, runs away, and runs toward. Each response was recorded, as well as the number of animals in each group. A response by 1 deer in a group was indicative of a response by the complete group.

Chi-square contingency analysis was used to test the null hypotheses that there was no difference between reactions of the deer to the vehicle with or without whistles and that there was no difference ( $P < 0.05$ ) in distances of deer from the road between pass 1 and pass 2. Expected values were based on observations without whistles.

## RESULTS AND DISCUSSION

Observations were recorded for 150 groups of mule deer ( $\bar{x} = 6.1$ ,  $SE = 2.1$ ). For each group, deer responses were observed with the whistle and without the whistle for a total of 300 observations. Including "no reaction" observations, we recorded 152 responses (76 with and without whistles) in the Sav-a-life test, and 148 (74 with and without whistles) in the Game Tracker test. Deer did not respond differently to a vehicle with or without either brand of whistle. Chi-square analysis pooled data from both brands of whistles (Table 1) for all distances. Interestingly, deer more often exhibited a response to a vehicle without whistles (59 responses) than to a vehicle with whistles (47 responses). Distances of deer from the road (Table 2) did not change between pass 1 and pass 2.

Habituation to the test vehicle was not a concern because many other vehicles were present at the time of testing. We assumed that the deer were accustomed to vehicular traffic. Any difference in reactions by deer to the test vehicle with whistles as compared to without whistles would be attributed to the whistle noise.

Table 1. Responses of 150 groups of free-roaming mule deer  $\leq 100$  m from a vehicle equipped either with or without wildlife warning whistles, Carbon County, Utah, 1990.<sup>a</sup>

	Behavior				
	No response	Lifted head	Changed orientation	Ran away	Ran toward
No whistle	91	31	5	18	5
Whistle	103	25	3	9	7

<sup>a</sup>  $\chi^2 = 4.74$ , 4 df,  $P = 0.33$ .

Incidental traffic was of concern only if it had potentially altered deer response to moving traffic by coming to a stop near a group of deer. Deer groups exposed to this situation were not tested. The possibility that other vehicles may have been equipped with whistles was not a concern. In both the Sav-a-life and Game Tracker tests, deer exhibited no response to the test vehicle with or without whistles (Table 1). We had no reason to expect differing responses to other moving vehicles. Hypothetically, if our results indicated that deer responded to the whistles, such whistles would be virtually ineffective if short-term habituation to other whistles resulted in no response.

We realize the possibility that some of the same deer were retested over the course of the study. However, numbers of deer using the area favored a high proportion of independent observations. Approximately 6,000 deer wintered in the study area; 909 were tested during our study. Deer were never retested in the same day. Potential repetition of the test on any deer during the course of the study did not necessarily render results invalid. If accli-

Table 2. Perpendicular distances from the road of 150 groups of free-roaming mule deer during each of 2 vehicular passes, Carbon County, Utah, 1990.<sup>a</sup>

Vehicular passes	Distances (m)			
	0-10	11-20	21-30	31-100
Pass 1	30	29	35	56
Pass 2	25	29	37	56

<sup>a</sup>  $\chi^2 = 0.124$ , 3 df,  $P = 0.95$ .

mation to the whistles could occur that readily, the overall effectiveness of the whistles would be suspect.

Observations of deer near the road (within 10 m) are important because animals at this range presumably were most likely to initiate a collision. Twelve groups of deer near the road showed no reaction to the vehicle without whistles, and 18 exhibited a response. When whistles were mounted, 14 groups of deer showed no reaction and 14 responded. Reactions of deer did not differ between presence or absence of whistles ( $\chi^2 = 0.59$ , 1 df,  $P = 0.31$ ).

Generally, deer in the road continued to travel in the direction they were headed. Fawns that lagged behind a group would run into the road to follow the adults that had already crossed. Deer sometimes remained standing in the road, showing "no response" and forcing us to slow the vehicle to avoid a collision. There also were occasions when deer crossed the road and, then turned to run back in front of the vehicle. We regarded this as an unexplained reaction and included it in the "ran toward" category. In addition, some deer clearly ran away from the vehicle. All of these responses were observed regardless of the presence or absence of either brand of whistle.

We do not know if the whistles produced any sound, nor do we know if deer heard the 16–20 kHz frequencies reportedly produced by the whistles. These or any other sounds may not be particularly alarming to deer. The devices may not produce a sound loud enough to be heard by deer above the vehicle noise (G. W. Hicks, Packer Engineering-Troy, Inc., Troy, Mich., unpubl. rep., 1987; Fitzwater 1990).

We are unaware of any research demonstrating that deer are frightened by a particular frequency or decibel level of sound. A. Stattleman (retired research professor [1968], Dep. Vet. Med., Univ. Georgia, Athens, pers. commun., 1990), using operant conditioning, tested a single captive white-tailed deer (*O.*

*virginianus*) and concluded that it could not hear in the 16–20 kHz range.

#### SUMMARY AND CONCLUSIONS

We did not detect any differences in responses from 150 groups of free-roaming mule deer to a vehicle mounted with and without Game Tracker's or Sav-a-life's wildlife warning whistles. Although these deer were accustomed to vehicular traffic, some had been involved in collisions with vehicles. Had the wildlife warning whistles affected their behavior, differences in responses to a vehicle with or without whistles should have been observed. To further substantiate results from this pilot study, evaluations of whistle effectiveness should be performed with replications on various deer species in different areas.

We did not test whether mule deer heard the sound (frequency or decibels) produced by either brand of whistle. If they heard the whistles, the sound elicited no behavioral response.

*Acknowledgments.*—This project was supported by the Utah Department of Natural Resources, Division of Wildlife Resources. We appreciate the assistance of personnel who reviewed and prepared the manuscript.

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Received 14 March 1991.

Accepted 13 May 1992.

Associate Editor: Swihart.