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OBSERVATIONS OF CAPTIVE ROCKY MOUNTAIN MULE DEER BEHAVIOR

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ABSTRACT.—Observations were made on the behavior of a captive herd of Rocky Mountain mule deer (*Odocoileus hemionus hemionus*). Comparisons in general behavior patterns were made between captive and wild deer. Similar behavior was exhibited by captive and wild deer. Captive deer (as well as other species) may be useful for study of certain behavioral aspects of their wild counterparts.

Literature discussing general behavioral observations of captive deer (*Odocoileus* spp.) is limited (Browman and Hudson 1957). The effects of captivity on many facets of deer behavior are unknown, particularly for deer that are born and raised in captivity. This note summarizes five years of observations on the behavior of tame, captive Rocky Mountain mule deer (*O. hemionus hemionus*) and compares this to behavioral observations reported for wild deer. We suggest that observations of captive mule deer can be used to predict wild deer behavior.

METHODS

Incidental observations were made while conducting other research at an enclosure located 3.2 km west of Fort Collins, Colorado, where deer have been raised for radioecological studies since the early 1960s. The 0.3-ha enclosure was subdivided into four 0.08-ha sections. The northwest subdivision was further divided into several isolation pens. Alfalfa, stock pellets, garden fruits and vegetables, and water were provided in each subdivision *ad libitum*. Deer also grazed upon various forbs and grasses, particularly blue grama (*Bouteloua gracilis*), growing in the enclosures.

Observations were made from August 1972 through August 1977. All tame mule deer in this colony were hand-fed from birth to facilitate easier handling during research studies. There were 12 adult, 5 male and 7 female, and 13 fawns, 5 male and 8 female, held for obser-

vation (Halford and Alldredge 1978). As a safety precaution, antlers were removed as soon as they ceased growing, usually in late August. With the exception of the observers (three during this study), the deer had minimal human contact. Most observations were made from distances of 10 to 30 m by observers who tried to remain inconspicuous. Feeding and bedding, aggressive behavior, fawning and breeding, as well as deer interactions, were observed.

RESULTS AND DISCUSSION

Captive deer showed preference for succulent materials such as grapes, apples, and lettuce. Feeding deer were observed to select red and yellow fruits and vegetables before green fruits and vegetables. The deer fed in an unhurried and relaxed manner, frequently looking up or moving away from the food. Dorrance (1965) observed that wild mule deer fed slowly and appeared to eat the most succulent items first.

After eating, captive deer often bedded down. Dominant deer would occasionally force a bedded deer out of its bed and select that bed. When selecting a bed, a deer approached an area, smelled it, and then lay down in one of several positions. Ordinarily, a deer rested with the forelegs flexed under the chest, with head up and slightly to one side, and with one hind leg exposed along the same side (Linsdale and Tomich 1953, Geist 1981). Deer also extended one foreleg forward or lay the head back upon their side. We occasion-

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ally observed deer resting with eyes closed. Captive deer performed comfort movements described by Geist (1981) when the resting period was over.

Aggressive behavior was most frequently observed during feeding. The one-footed kick was used most frequently in a feeding conflict (Dorrance 1965, Geist 1981). This behavior occurred frequently in the captive deer herd. The dominant animal (usually a large buck or doe) would walk behind a subordinate that was attempting to feed and strike it with a front foot without rearing. Similar behavior was observed in wild deer (Bailey 1960). Aggressiveness was also observed in fawns. For about three months post-partum, individuals would be aggressive toward the handler (lunge at bottle and handler) during feeding but not toward other fawns. This aggressiveness was likely a result of hunger. However, a definite "peck" order appeared to develop after about three months, with the larger (and usually older) fawns being more dominant. Older fawns were removed when unweaned fawns were being fed to prevent aggressive kicking. This kicking was not as frequently observed in fawns as it was in adults.

Captive bucks began to show aggressive behavior after velvet stripping. Velvet stripping by captive deer began in September with the youngest bucks stripping first. Bucks stripped velvet by rubbing antlers on rocks, fence posts, feed and water containers, buildings, and vegetation. When removing velvet on vegetation, a buck would place his antlers in a patch of weeds and shake his head vigorously. We also observed an adult buck chewing on the velvet of a yearling buck. Antler rubbing may provide practice for later contests between bucks (Linsdale and Tomich 1953).

When bucks had antlers, the largest buck became the dominant animal. During feeding, other deer would leave the feeding bin and observe from 15 to 20 m as the dominant buck approached and fed. If a subordinate animal did not yield to the dominant buck, he would often butt the subordinate with his antlers. Bailey (1960) observed that dominant animals (does or bucks) had first choice of food. He also reported that the claiming of a feeding spot was usually done without raising the hairs along the neck and laying the ears back (aggressive posture). Captive deer fre-

quently showed aggressive behavior (kick or butt) at the feeding station as they crowded around the small area. We observed no aggressive behavior when captive deer fed on vegetation in the enclosure.

After antler drop, a large doe frequently became the dominant animal, even over bucks. Dominance was usually observed during feeding with the dominant animal chasing other deer away from the feeding area. Often the one-footed kick was used to drive away persistent deer. The dominant animal would often lower the head and advance toward the subordinate animal. This behavior was also reported in wild mule deer (Linsdale and Tomich 1953, Geist 1981). Bucks appeared to be conscious of their antlers' sensitivity and avoided any confrontations with does and bucks until the antlers hardened (late August). Confrontation between bucks was observed nearly every day after velvet was stripped. Captive bucks placed their antlers together and pushed each other back and forth, each giving way to the other. This activity usually ended after three to four minutes and was followed by feeding. However, Geist (1981) observed that sparring in wild mule deer may occasionally last more than an hour. Dorrance (1965) noted that sparring was not carried out with great vigor in wild mule deer and was engaged in for mutual enjoyment and stimulation of rutting or reproductive behavior.

Vigorous sparring usually occurred during October and November in captive deer, even those with antlers cut off. Captive bucks in our study showed the distinct components of aggression that Cowan and Geist (1961) and Geist (1981) described for wild deer and captive deer. Intensity of aggressive behavior appeared to be directly related to the age of captive deer, the older deer showing the most pronounced aggressive displays (Cowan and Geist 1961, Geist 1981). Usually the dominant deer (and oldest), or the deer initiating aggression, slowly approached the intruder with head lowered so that the neck was parallel to and on the same level as the top of the back; the muzzle was extended, the ears were laid along the neck, and the hair along the shoulders and neck was held erect, making the deer appear larger. The preorbital glands were opened in some confrontations, and a loud hissing sound was often emitted from the nos-

trils (Cowan and Geist 1961, Geist 1981). If the intruder or subordinate animal was not driven away by this display, the dominant animal would lunge with head lowered and drive the subordinate animal away. If both bucks showed aggressive display, the display would continue for two or three minutes with each deer apparently trying to intimidate the other. If neither deer submitted, they would suddenly lunge at one another. The bouts were very vigorous and lasted until one deer was driven away, usually within three to four minutes. There were usually no bodily injuries during these confrontations. However, in two instances, large dominant bucks with antlers saved off were able to kill younger bucks that still had antlers. These confrontations were not observed, but autopsies of the killed animals showed extensive internal injuries. Bucks were also aggressive toward does and often butted them for no apparent reason during the rut. Einarsen (1969) found that wild bucks show a domineering nature during the breeding season, but older does are dominant during other periods.

During September and October captive bucks were observed approaching does and attempting to mount them. None of the does were receptive during our observations. Before attempting to mount a doe, a buck would approach the doe from behind as she urinated. The buck would sniff the urine and then curl the upper lip back, holding the head on a level plane with the back and waving the head from side to side (flehman). Similar behavior has been described in wild mule deer (Dorrance 1965, Geist 1981). Bucks would also place their hind legs together, urinate on the tarsal glands, and rub the glands together. Bucks urinate on their tarsal glands and rub them together at all seasons, but this habit increases during the rut (Browman and Hudson 1957). Linsdale and Tomich (1953) reported that urinating on the tarsals constituted a type of threat during the rut that is not conveyed at other seasons.

Actual copulation was not observed. Most mating occurs at night (Einarsen 1969); thus, observations of this behavior are difficult to obtain. However, all captive deer were observed mounting one another as many as three times in an hour. Adult deer of like and opposite sexes, as well as fawns, mounted one another during all seasons of the year; how-

ever, copulation was never observed. Geist (1981) noted that this behavior also occurs in wild populations but is not commonly observed. Perhaps the close association of the captive deer resulted in a higher frequency of "false mountings" than would occur in wild populations.

Parturient behavior of captive mule deer has been described previously (Halford and Alldredge 1975). Much of the parturient behavior we observed in captive mule deer was similar to that reported for wild white-tailed deer (*O. virginianus*) and black-tailed deer (*O. h. columbianus*) (Haugen and Davenport 1950, Michael 1964, Miller 1965). Several authors (Lindzey 1943, Linsdale and Tomich 1953, Dasmann and Taber 1956, Einarsen 1969) have observed pregnant does seeking thick cover for fawning. As there was little cover in the enclosures, does about to give birth usually were observed selecting sites of shelter along fences, near buildings, or under one of three roofed wind shelters in the pens.

Fawns were removed from the doe immediately after birth, placed in separate pens, and hand-fed to instill tameness (Halford and Alldredge 1978). Does bleated and paced about the pens for about three days after fawn removal. Separated fawns often mewed, and this seemed to distress the does. On several occasions when fawns were handled, they made a loud bleating noise. Immediate response from does usually occurred; the doe would run along the fence, occasionally stopping to look in the direction from which the bleat had come. Similar observations were made on wild deer by Arthur et al. (1978) wherein does became alert and curious upon hearing a fawn distress call.

During the first week after fawns were removed from the does, fawns exhibited an escape behavior similar to that reported by Dorrance (1966). When approached by humans, fawns dropped to the ground, crouched with necks outstretched, and remained motionless. Fawns would not attempt to flee until they were disturbed by the observer. This behavior pattern subsided after about a week, and fawns would then come to the researcher during feeding periods. Captive fawns would raise their tails in a vertical position prior to feeding. The tails were lowered from this position as the fawns became sated. This behavior has also been observed in wild fawns dur-

ing feeding (Linsdale and Tomich 1953).

Fawns were often observed kicking one another lightly and then bucking or running. This behavior appeared to be "play." Dasmann and Taber (1956) and Linsdale and Tomich (1953) have observed wild deer at play and suggested that it may serve as a means for fawns to receive vigorous exercise. Play may also provide a way to gain information by which the fawn is "programmed" to function as an adult (Geist 1981). Fawns also were observed participating in mutual grooming, licking one another. The perianal region of one fawn was occasionally licked by another fawn, and this stimulated defecation. We have observed captive does licking the perianal region of their fawns, and this appeared to stimulate nursing and defecation (Halford and Alldredge 1978). Captive does were also observed eating the feces of their fawns during this grooming. Wild fawns have been observed nursing with their tails to the doe's head, but no mention was made of does licking the perianal region (Linsdale and Tomich 1953).

We observed the reactions of captive deer to a newly introduced tame deer. A three-month-old doe was placed in the enclosure in late August with adult deer. Bucks immediately tried to mount her, but she ran from them, continually giving a high-pitched cry. The does chased the new fawn and kicked her with their forelegs. The following day similar interactions between the does and fawn were observed; however, the bucks showed no aggression toward the fawn. On the third day the does did not actively chase the fawn, but they kicked the fawn when she approached within 0.5 m. The fawn appeared to be accepted by all deer on the fourth day. The adults no longer showed aggression toward the fawn, although she was the last to feed. Bailey (1960) observed that fawns were always subordinate in a wild herd.

Hand-raised fawns were taken to the field as part of a food-habits study (Arthur 1977), and interactions between four tame deer and wild deer were observed. The four tame deer, two yearling does and two yearling bucks, castrated as fawns, were permitted to roam freely. In most of the observations, wild deer were aware of human presence. Wild deer would often observe the tame deer from 50 to 250 m but approached infrequently. When

wild deer approached the tame deer, the wild deer would assume an aggressive posture (both does and bucks) and chase the tame deer. The tame deer were often kicked by wild deer. Wild deer would chase tame deer for about 20 m. Often the tame deer would seek refuge with the observers. In none of these encounters did a tame deer dominate a wild deer regardless of the status of the tame animal within its own group.

CONCLUSIONS

Although incidental, our observations of behavior in captive deer were consistent with observations made on wild populations (Dorrance 1966, Geist 1981). Dominance and parturition behavior in captive deer were similar to that observed in wild deer (Michael 1964, Dorrance 1966, Geist 1981).

Conditions imposed by the close association of tame deer in an enclosure probably altered or intensified some behavior, particularly aggressive behavior. However, some behavioral aspects, such as parturition behavior, are very difficult to obtain in a wild deer population. Also, the mobility and wariness of wild deer make behavioral observations difficult. We also were able to observe fawn behavior in our captive deer, which would be difficult to observe in wild animals.

Therefore, close study of captive deer and perhaps other captive animals to learn about the behavior of their wild counterparts should provide useful insights into animal behavior that may otherwise be difficult or impossible to obtain.

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