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- ground squirrel species (Sciuridae): an evolutionary approach. *Canadian J. Zool.*, 54:1294-1306.
- LINSDALE, J. M. 1946. *The California ground squirrel*. Univ. California Press, Berkeley, 475 pp.
- MAZDER, E., M. R. CAPONE, AND L. C. DRICKAMER. 1976. Conspecific odors and trappability in deer mice (*Peromyscus leucopus noveboracensis*). *J. Mamm.*, 57:607-609.
- MULLER-SCHWARZE, D. 1974. Olfactory recognition of species, groups, individuals and physiological states among mammals. Pp. 316-326, in *Pheromones* (M. C. Birtch, ed.). North Holland, Amsterdam, 495 pp.
- OWINGS, D. H., M. BORCHERT, AND R. VIRGINIA. 1977. The behavior of the California ground squirrel. *Anim. Behav.*, 25:221-230.
- RALLS, K. 1971. Mammalian scent marking. *Science*, 171:443-449.
- ROWE, F. P. 1970. The response of wild mice (*Mus musculus*) to live traps marked by their own and foreign mouse odour. *J. Zool.*, 162:517-520.
- SALMON, T. P. 1979. The anal gland of the California ground squirrel (*Spermophilus beecheyi*). Unpubl. Ph.D. dissert., Univ. California, Davis, 139 pp.
- STEINER, A. L. 1974. Body rubbing, marking, and other scent related behavior in some ground squirrels (Sciuridae): a descriptive study. *Canadian J. Zool.*, 52:889-906.
- . 1975. "Greeting" behavior in some Sciuridae, from an ontogenetic, evolutionary and sociobehavioral perspective. *Nat. Canadian*, 102:737-751.
- STODDART, D. M. 1982. Does trap odour influence estimation of population size of the short-tailed vole, *Microtus agrestis*? *J. Anim. Ecol.*, 51:375-386.
- STODDART, D. M., AND P. A. SMITH. 1986. Recognition of odour-induced bias in live-trapping of *Apodemus sylvaticus*. *Oikos*, 46:194-199.
- SUMMERLIN, C. T., AND J. L. WOLFE. 1973. Social influences on trap response of the cotton rat, *Sigmodon hispidus*. *Ecology*, 54:1156-1159.
- THIESSEN, D., AND M. RICE. 1976. Mammalian scent gland marking and social behavior. *Psych. Bull.*, 83:505-539.
- TOMICH, P. Q. 1962. The annual cycle of the California ground squirrel, *Citellus beecheyi*. *Univ. California Publ. Zool.*, 65:213-281.
- VAN DEN BERK, J., AND D. MULLER-SCHWARZE. 1984. Responses of wild muskrats (*Ondatra zibethicus* L.) to scented traps. *J. Chem. Ecol.*, 10:1411-1415.
- WUENSCH, K. L. 1982. Effect of scented traps on captures of *Mus musculus* and *Peromyscus maniculatus*. *J. Mamm.*, 63:312-315.
- YEATON, R. I. 1972. Social behavior and organization in Richardson's ground squirrel (*Spermophilus richardsoni*) in Saskatchewan. *J. Mamm.*, 53:139-147.

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RESPONSE OF FEMALE WHITE-TAILED DEER TO SCRAPES AND ANTLER RUBS

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Scrapes and antler rubs produced by male white-tailed deer (*Odocoileus virginianus*) during the reproductive period have been investigated widely in recent years (Kile and Marchinton, 1977; Miller et al., 1987a, 1987b; Moore and Marchinton, 1974; Ozoga and Verme, 1985). Nevertheless, little definitive information exists about the function of these signposts in communication of reproductive information. Moore and Marchinton (1974), and later Hirth (1977) and Kile and Marchinton (1977), proposed that antler rubs serve as both visual and olfactory signals through which males mark areas and establish dominance in preparation for the breeding season. The role in olfactory communication was illustrated further by Atkeson and Marchinton (1982) who demonstrated that the forehead skin of white-tailed deer contains large numbers of tubular apocrine sudoriferous glands that become active during the breeding season. Similarly, scrapes were reported to play a role in dominance expression among males (Hirth, 1977; Miller et al., 1987b; Moore and Marchinton, 1974). Scrapes probably also serve in communication between sexes as females in estrus may leave an olfactory signal at scrape sites (Moore and Marchinton, 1974), although conclusive observations are lacking.

Recently, Ozoga (1985) reported that females may respond to artificial antler rubs by smelling and licking them. Woods (1988) reported that females frequent scrapes and play an active role in maintenance of scrapes and in scent marking. Females also may produce scrapes (Sawyer et al., 1982). Furthermore, Miller et al. (in press) hypothesized that signposts produced by males may be a source of priming pheromones that assist in the induction and synchronization of estrus, in addition to advertising social status. Because of these recent observations, we find it relevant to report on a previous study that characterized responses of female deer to scrapes and antler rubs.

The study was conducted on the 337-ha Whitehall Forest owned and operated by the University of Georgia's School of Forest Resources. Habitat types included natural and planted pines (*Pinus* sp.), pine-hardwood, and hardwood types interspersed with grass openings.

Between 30 May 1979 and 21 February 1980, intensive observations were recorded on three free-ranging, tame female white-tailed deer. Ages of the deer ranged from 1 to 4 years at the beginning of the study. Food habits, movement patterns, and home-range size appeared typical of wild deer in the area. All three females were bred by wild males during the study period.

Forty-five, 24-h observation periods were conducted during the study. Periods were distributed systematically throughout the study. Each observation period consisted of two sessions, each 12 h in duration and 24 h apart. Observations typically were made at distances of 2–5 m. Behavioral events were recorded using the focal-animal approach and employing both all-occurrences and instantaneous-sampling methods (Altmann, 1974).

From 18 September 1979 through 18 February 1980, 100 incidents were recorded during which an individual was within 20 m of an antler rub. Between 6 October and 14 January, two behavioral patterns occurred in apparent response to these rubs. First, when walking or feeding within reach of a rub, a female paused for several seconds and sniffed the exposed xylem. It usually licked or nibbled the rub and the surrounding frayed bark. This behavior was exhibited by all three deer; however, the dominant female accounted for nearly one-half of all observations. Sniffing, licking, or nibbling were noted in 23 of the 100 (23%) incidents in which an individual was observed in the vicinity (<20 m) of a rub. Rate of response was similar throughout the 6 October–14 January period.

The second behavioral pattern associated with rubs was exhibited only by the dominant female. On four occasions (5%) it rubbed its forehead on the antler rub, sometimes directly on the exposed xylem and other times on an adjacent area. This rubbing was not intense and did not alter the signpost visibly. Forehead rubbing always was combined with sniffing, licking, or nibbling.

The three deer often travelled together and at times two or all three were in the vicinity of a rub. On these occasions only one responded to the rub. The 100 individual encounters actually represent 61 encounters when one deer alone or a group was in the vicinity of a rub. Of these, 23 (38%) involved an apparent response. Individual responses during group encounters did not appear related to dominance status.

Reaction rates were much greater to fresh rubs than to older rubs. Of 29 group encounters to rubs estimated to be <2 days old, 17 (59%) elicited a response, whereas a reaction occurred in only one of 24 group encounters with older rubs.

Between 27 October and 7 December 1979, 24 incidents were recorded during which an individual was within 20 m of a scrape. As with rubs, females appeared to encounter scrapes by chance. Three behaviors were recorded: urinating in the vicinity (<20 m) of the scrape, walking through the pawed depression, and sniffing the pawed depression. Two females exhibited all three behaviors, whereas the third did not exhibit any. Although walking through scrapes or urinating in their vicinity could have occurred by chance, sniffing of fresh scrapes certainly was an overt response. Sniffing involved only fresh scrapes but the other behaviors were not limited to fresh scrapes. At least one of these behaviors was recorded on nine of the 24 (38%) individual encounters. Walking through or sniffing occurred on six occasions and urinating in the vicinity occurred on three occasions. Smelling or licking the overhead limb as reported by Woods (1988) was not recorded in this study.

Our data suggest that scrapes and antler rubs function in communication of reproductive information between sexes in addition to their role in dominance advertisement among males. The type of information obtained by females is unknown, but likely they are able to discern the dominance status or physiological state of potential breeding partners. The activity of the forehead gland, used by males in anointing rubs, is correlated positively with age and probably dominance status (Atkeson and Marchinton, 1982). Urine deposited at a scrape by males also may communicate age and dominance status as suggested for goats (*Capra hircus*—Coblentz, 1976). In addition, Moore and Marchinton (1974) reported that females in estrus may leave an olfactory signal at scrape sites. In this study, none of the three females was under direct observation during the time period in which mating was calculated to have occurred. Therefore, observations of estrous

female-scrape interactions were not recorded. It is notable, however, that telemetric observations indicated that all three females made an unusual excursion outside their normal ranges during the time when conception occurred. These excursions ranged from 1.6 to 2.3 km from the center of the females' core area and lasted approximately 24 h. We believe this unusual behavior to be a breeding excursion during which the females attempted to locate suitable partners or their signposts.

The odor of a rutting male contributes to the reproductive behavior and physiology of many ungulates. The termination of seasonal anestrus and the synchronization of estrus resulting from some factor associated with the male has been demonstrated in sheep (*Ovis aries*—Martin and Scaramuzzi, 1983; Oldham et al., 1979; Schinckel, 1954) and goats (Ott et al., 1980). Kennaugh et al. (1977) similarly suggested that the rutting odor of male fallow deer (*Dama dama*) synchronizes estrus in females. Because the sexes in solitary species such as white-tailed deer may not associate long enough for the odor of the male to alter the physiology of the female, signposts could serve this purpose (Miller et al., in press). Our observations that females respond to signposts support the hypothesis that scrapes and antler rubs are a source of priming pheromones that assist in induction and synchronization of estrus.

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LITERATURE CITED

- ALTMANN, J. 1974. Observational study of behavior: sampling methods. *Behaviour*, 49:227-267.
- ATKESON, T. D., AND R. L. MARCHINTON. 1982. Forehead glands in white-tailed deer. *J. Mamm.*, 63:613-617.
- COBLENTZ, B. E. 1976. Functions of scent-urination in ungulates with special reference to feral goats (*Capra hircus* L.). *Amer. Nat.*, 110:549-557.
- HIRTH, D. H. 1977. Social behavior of white-tailed deer in relation to habitat. *Wildl. Monogr.*, 53:1-55.
- KENNAUGH, J. H., D. I. CHAPMAN, AND N. G. CHAPMAN. 1977. Seasonal changes in the prepuce of adult fallow deer (*Dama dama*) and its possible function as a scent organ. *J. Zool.*, 183:301-310.
- KILE, T. L., AND R. L. MARCHINTON. 1977. White-tailed deer rubs and scrapes: spatial, temporal and physical characteristics and social role. *Amer. Midland Nat.*, 97:257-266.
- MARTIN, G. B., AND R. J. SCARAMUZZI. 1983. The induction of oestrus and ovulation in seasonally anovular ewes by exposure to rams. *J. Steroid Biochem.*, 19:869-875.
- MILLER, K. V., R. L. MARCHINTON, AND W. M. KNOX. In press. White-tailed deer signposts and their role as a source of priming pheromones: a hypothesis. *Proc. 18th Congr. Internat. Union Game Biol.*
- MILLER, K. V., K. E. KAMMERMEYER, R. L. MARCHINTON, AND E. B. MOSER. 1987a. Population and habitat influences on antler rubbing by white-tailed deer. *J. Wildl. Mgmt.*, 51:62-66.
- MILLER, K. V., R. L. MARCHINTON, K. J. FORAND, AND K. L. JOHANSEN. 1987b. Dominance, testosterone levels, and scraping activity in a captive herd of white-tailed deer. *J. Mamm.*, 68:812-817.
- MOORE, W. G., AND R. L. MARCHINTON. 1974. Marking behavior and its social function in white-tailed deer. Pp. 447-456, in *The behaviour of ungulates and its relation to management* (V. Geist and F. Walther, eds.). *Internat. Union Conserv. Nature Publ.*, 24:1-511.
- OLDHAM, C. M., G. B. MARTIN, AND T. W. KNIGHT. 1979. Stimulation of seasonally anovular Merino ewes by rams: I. Time from introduction of the rams to the pre-ovulatory LH surge and ovulation. *Anim. Reprod. Sci.*, 1:283-290.
- OTT, R. S., D. R. NELSON, AND J. E. HIXON. 1980. Effect of presence of the male on initiation of estrous cycle activity of goats. *Theriogenology*, 13:183-190.
- OZOGA, J. J. 1985. Marks of excellence. *Michigan Sportsman*, 10:44-46.
- OZOGA, J. J., AND L. J. VERME. 1985. Comparative breeding behavior and performance of yearling vs. prime-age white-tailed bucks. *J. Wildl. Mgmt.*, 49:364-372.
- SAWYER, T. G., R. L. MARCHINTON, AND C. W. BERISFORD. 1982. Scraping behavior of female white-tailed deer. *J. Mamm.*, 63:696-697.
- SCHINCKEL, P. G. 1954. The effect of the presence of the ram on the ovarian activity of the ewe. *Australian Vet. J.*, 30:189-195.
- WOODS, G. R. 1988. Scrape behavior and physical characteristics of scrapes and rubs of white-tailed deer. Unpubl. M.S. thesis, Southwest Missouri State Univ., Springfield, 44 pp.

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