Allogrooming by Rocky Mountain Bighorn Sheep, *Ovis canadensis canadensis*, in Glacier National Park, Montana

K. A. KEATING

National Biological Survey, Glacier National Park, West Glacier, Montana 59936

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Allogrooming between adults has been reported for many ungulate species, but not for sheep (*Ovis* spp.). I observed nine instances of allogrooming between adult Rocky Mountain Bighorn Sheep (*O. canadensis canadensis*) in Glacier National Park, Montana. Observations failed to support the hypothesis that an individual's role during allogrooming is related to social dominance. Seasonality, grooming behaviors, and observations of ticks (Acarina, Ixodidae) being consumed all supported the hypothesis that allogrooming is an adaptation to ectoparasites.

Key Words: Bighorn Sheep, *Ovis canadensis*, Ixodidae, ectoparasites, ticks, allogrooming.

Allogrooming (i.e., the grooming of one individual by another) has been observed between adults of many ungulate species (Browman and Hudson 1957; Struhsaker 1966; Miller 1971; Hafez and Bouissou 1975; Signoret et al. 1975; Waring et al. 1975; Dubost and Feer 1981; Hall 1983; Hart and Hart 1988; Forand and Marchinton 1989). However, observations of allogrooming between adult sheep (*Ovis* spp.) are conspicuously lacking (Hall 1983; Hulet et al. 1975). This note reports on allogrooming between adult Rocky Mountain Bighorn Sheep (*O. canadensis canadensis*) and considers these observations in light of hypotheses about the underlying determinants of such behavior.

During April 1987 and May 1988, I observed nine instances of allogrooming between adult Bighorn Sheep on the Mt. Altyn winter range in Glacier National Park, Montana. Grooming consisted of nibbling along the back and lower neck. In all cases, allogrooming was non-mutual and was initiated by the groomer, an adult female. In 1988, two unsuccessful grooming attempts were inferred when the groomer approached another female but was rebuffed with head butts; successful groomings of other individuals immediately preceded and followed these consecutive attempts. Of nine successful allogroomings, seven were with other adult females and two were with an approximately four-year-old male. The same female was the groomer in eight consecutive events during an approximately 30-minute period in 1988, and may also have been the groomer in the one event observed in 1987. Hall (1983) similarly reported that the same female was the groomer in 78% of observed allogroomings in Red Deer (*Cervus elaphus*).

Observing that dominant individuals initiated allogrooming between adult Mule Deer (*Odocoileus hemionus*), Miller (1971) suggested that allogrooming reinforces social bonds between dominant and subordinate animals, thereby strengthening group unity in a manner "beneficial to the species." Although the selective mechanisms underlying this hypothesis remain unclear, the idea that social dominance is related to an individual's role during allogrooming is, nonetheless, implicit in recent work: Hall (1983) observed that most allogrooming in Red Deer was conducted by a single, socially dominant female, while Dubost and Feer (1981) reported that allogrooming in Blackbuck (*Antilope cervicapra*) did not normally involve the alpha female. Among the Bighorn Sheep I observed, no clear relationship existed between social status and an individual's role during allogrooming. In one instance, the female being groomed rubbed her forehead and horns against the side and flank of the groomer, indicating that she was subordinate to the groomer (cf. Geist 1971). However, the groomer was subordinate to the female that rebuffed two grooming attempts and to the four-year-old male. Dominance behaviors were absent in the remaining interactions.

Mooring (1989) and Hart (1990) hypothesized that allogrooming is an adaptive response to ectoparasites, noting that tick loads may be much greater on animals prevented from self-grooming or allogrooming (Snowball 1956; Hart 1990), and may cause reduced growth rates, lower body weights, and increased mortality (Little 1963; Seebeck et al. 1971). This hypothesis is supported by the fact that allogrooming in ungulates is often focused around the head, neck, and shoulders (Struhsaker 1966; Miller 1971; Dubost and Feer 1981; Hall 1983; Hart and Hart 1988; this study) — areas inaccessible to self-grooming (Struhsaker 1966; Mooring 1989). This hypothesis also is supported by the observation that allogrooming is common in Mule Deer and Impala (*Aepyceros melampus*), which "frequent brushy areas that presumably place the animals more at risk for acquiring ticks" (Hart 1990: 278), but is rare or absent in grassland species such as Grant's Gazelle (*Gazella granti*) or Wildebeest (*Connochaetes taurinus*) (Hart and Hart 1988).

My observations were consistent with the ectoparasite hypothesis. Allogrooming was observed only during spring, the period when ticks (Acarina: Ixodidae) most often are encountered in Glacier National Park. Ticks commonly were seen on Bighorn Sheep during this period, and individuals often were observed rubbing the back of the neck and shoulders with the tips of their horns, sometimes until the skin was quite raw. Geist (1971:276) observed similar responses to ticks by Bighorn Sheep in Canada. Together with the prevalence of ticks, this behavior suggested that ticks were a common irritant on areas of the body that were inaccessible to self-grooming and which received the most attention during allogrooming. During allogrooming, nibbling and chewing behavior suggested that ectoparasites were being actively sought and consumed. I watched as one tick was removed and eaten during allogrooming, and saw another consumed during self-grooming.

Although Rocky Mountain Bighorn Sheep typically occupy grassland habitats (Buechner 1960; Geist 1971), they were commonly observed foraging in brushy areas at the base of Mt. Altyn, particularly during spring. Thus, my observations were consistent with the hypothesis (Hart 1990) that allogrooming is adaptive for ungulates occupying brushy, tick-infested habitats. However, the fact that Bighorn Sheep usually are associated with montane grasslands or meadows suggests that allogrooming may be part of the behavioral repertoire of even so-called "grassland" species. Correlations between habitat and allogrooming (Hart and Hart 1988) may, therefore, reflect differences in tick abundances rather than inherent constraints upon species' behavioral responses. Genetic and environmental determinants of allogrooming should be distinguishable by comparing allogrooming behaviors among experimentally infected individuals of both grassland- and brushland-associated species.

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