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HIP GLANDS IN A NATURAL POPULATION OF MONTANE VOLES (*MICROTUS MONTANUS*)

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Abstract.— We recorded the occurrence of hip glands in a population of montane voles (*Microtus montanus*) in southeastern Idaho. Sexual maturity was positively associated with the presence of hip glands in both males and females. Significantly more males than females possessed hip glands. Males and females with hip glands were significantly heavier than individuals without glands. The possible function of hip glands in scent marking, aggression, and population fluctuations is discussed.

Many species of *Microtus* possess hip or flank glands. The histology and taxonomic significance of these sebaceous glands were reviewed by Quay (1968) and Skurat (1969). Howell (1924) first described hip glands in a population of montane voles (*Microtus montanus*) in California. More recently, Jannett (1978) and Lyons (1979) reported the presence of hip glands in populations of *M. montanus* in Wyoming and Idaho, respectively. Although these glands have been examined in several laboratory studies (e.g., Jannett 1981), limited quantitative data are available on the occurrence of these glands in wild populations. During a population study of small mammals in southeastern Idaho, we recorded the presence or absence of hip glands for 86 male and 99 female *M. montanus* (Groves and Keller 1983). The purpose of this paper is to compare reproductive characteristics and weights of voles in which hip glands were present or absent.

Methods

Our research was conducted on the Radioactive Waste Management Complex of the Idaho National Engineering Laboratory Site. Vegetation in the areas where voles were live trapped consisted primarily of crested wheatgrass (*Agropyron cristatum*) that had been seeded over areas where low-level radioactive waste was interred. We recorded data on the occurrence of hip glands during monthly trapping intervals from April to July 1979. Details on the study area and trapping methods are provided in Groves and Keller (1983).

Results and Discussion

Hip glands occurred on 65% of male *M. montanus* (Table 1). There was a positive association between sexual maturity in males and the presence of hip glands ($X^2 = 25.54$, $P < 0.01$). Males with hip glands were significantly heavier than males without glands ($t = 7.75$, $P < 0.01$). Compared to males, fewer females (12%) possessed hip glands ($X^2 = 55.60$, $P < 0.01$). Like males, sexual maturity in females was positively associated with the presence of hip glands ($X^2 = 6.23$, $P < 0.05$). Females with hip glands were also heavier than females without glands ($t = 2.50$, $P < 0.01$).

Howell (1924), Jannett (1978), and Lyons (1979) observed that only a few female *M. montanus* possessed hip glands in wild populations, whereas most well-developed hip glands occurred in large males. Our data support their notions that only a few females possess hip glands in natural populations. In contrast, hip glands occur commonly in both sexes in many species of *Microtus* (Quay 1968).

Our data suggest that weight (age) and sexual maturity are related to the development of hip glands in *M. montanus*. Lyons (1979) reported a positive correlation between mean monthly weights of male *M. montanus* and

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the percent occurrence of hip glands. Jannett (1978) indicated that hip gland development is androgen-dependent in male and female *M. montanus*, as well as several other microtine species. Clarke and Frearson (1972) positively associated hip gland development in male *M. agrestis* with sexual maturity. Correlations between reproduction and hip gland occurrence were also reported for male and female *M. xanthognathus* (Wolff and Lidicker 1979), male and female *M. townsendii* (MacIsaac 1977), and male *M. californicus* (Lidicker 1980). In a long-term study of population dynamics of *M. pennsylvanicus*, Tamarin (1981) observed only one vole with hip glands, and this individual was an old, sexually mature male. In addition, Boonstra and Youson (1982) reported well-developed hip glands in breeding males of *M. pennsylvanicus* as revealed by histological examination, although no consistent relationship was observed between the degree of hip gland development and breeding status in females.

Jannett (1981) reported that scent marking with hip glands by male *M. montanus* in the laboratory is rare, although other species of *Microtus* do exhibit marking behavior with hip or flank glands (e.g., Wolff and Johnson 1979). Lyons (1979) conducted laboratory experiments that indicated odors from hip glands of male *M. montanus* may be important for individual and group recognition. Stoddart et al. (1975) compared flank gland secretions for different sexes, age classes, and poulations of *Arvicola terrestris*. They found marked differences between age classes and among populations, suggesting a strong social influence on the quality of flank gland secretions. The precise function of the various specialized glands (Quay 1962, 1965, 1968) in microtine rodents is uncertain, but it would appear that these glands exude chemicals (pheromones) that may facilitate recognition among individuals (Richmond and Stehn 1976, Beard 1978, Lyons 1979, Jannett 1981). Additionally, they may integrate breeding of sexually mature individuals (Keller, in press). Thus, hip gland marking may be important in territorial defense, individual recognition, and other social interactions.

Our observations of hip gland occurrence in an increasing *M. montanus* population suggest that these glands may also be important in behavioral changes that occur in fluctuating vole populations (see review, Krebs and Myers 1974). Jannett (1981) has demonstrated that scent secretions from hip glands of male *M. montanus* mediate both intra- and interspecific attacks. He hypothesized that development of hip glands at puberty stimulates aggressive interactions between adult and pubertal voles, and may also reduce recruitment of voles into the breeding population. Future research efforts should investigate the role that secretions from hip glands may play in different phases of a microtine cycle.

TABLE 1. Reproductive characteristics and mean weights of montane voles in which hip glands were present or absent. Males with scrotal testes were considered to be in reproductive condition. Females who had previously lactated and/or possessed open pubic symphyses or perforate vaginas were considered to be sexually mature.

	Hip glands	
	Present	Absent
Males		
Number of sexually mature individuals	44	6
Number of individuals not sexually mature	12	24
Mean weight (g) ± S.E. (n)	41.2 ± 1.3 (56)	24.0 ± 2.0 (30)
Females		
Number of sexually mature individuals	12	56
Number of individuals not sexually mature	0	31
Mean weight (g) ± S.E. (n)	39.7 ± 2.1 (12)	29.6 ± 1.5 (87)

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