Hip glands in a field population of *Microtus pennsylvanicus*

R. BOONSTRA AND J. H. YOUSON

Division of Life Sciences, Scarborough College, University of Toronto, West Hill, Ont., Canada M1C 1A4

Received March 29, 1982

BOONSTRA, R., and J. H. YOUSON. 1982. Hip glands in a field population of *Microtus pennsylvanicus*. Can. J. Zool. 60: 2955-2958.

Hip glands are reported to be absent in *Microtus pennsylvanicus*. This paper presents histological evidence that they are present in field populations of this species in southern Ontario. Well-developed hip glands were found in 11 breeding males. No consistent relationship was found between the degree of development of the glands and breeding status in five females. We suggest that histological examination will reveal the presence of hip glands in other populations of this species as well.

BOONSTRA, R., et J. H. YOUSON. 1982. Hip glands in a field population of *Microtus pennsylvanicus*. Can. J. Zool. 60: 2955-2958.

On affirme ordinairement que *Microtus pennsylvanicus* est dépourvu de glandes de la hanche. Des examens histologiques ont démontré que ces glandes sont présentes chez les populations naturelles du sud de l'Ontario. Des glandes de la hanche bien développées ont été trouvées chez 11 mâles reproducteurs. L'étude de cinq femelles a démontré qu'il n'y a pas de relation définie entre le développement des glandes et le statut reproducteur. Il est probable que des études histologiques révéleraient la présence de glandes inguinales chez d'autres populations également.

[Traduit par le journal]

Introduction

Many microtine rodents possess specialized postero-lateral sebaceous glands which secrete a lipid material whose function is uncertain, but which is presumed to be pheromonal (Quay 1968). The positions of the glands

vary among species and have been used to make phylogenetic inferences (Miller 1896; Quay 1968). Quay could not find any such glands in a number of species including *Microtus pennsylvanicus*. Apart from Tamarin (1981), who found one old male *M. pennsyl-*

FIG. 1. Light micrograph of the skin from the hip gland of a 44-g breeding male *M. pennsylvanicus* showing large sebaceous glands (S) associated with hair follicle (F) beneath the epidermis (E). Stained with hematoxylin and eosin. 135 $\times$.

vanicus with hip glands out of over 500 animals autopsied, no other study has reported these glands from field populations. Our object in this note is to report the presence of hip glands in both sexes and various ages of *M. pennsylvanicus* from a field population.

Materials and methods

Animals were trapped near the Toronto International Airport, Ontario. The samples were collected randomly; no attempt was made to choose only those animals with glands visible externally. Eleven males were obtained on 2 July 1981 and five females were obtained on 2 July and 16 July 1981. Males were classified as breeding if the tubules in the cauda epididymis were visible (Jameson 1950). Females were classified as breeding if they were lactating or pregnant. The skin of the posterior portion of the back was folded back and the presence of sebaceous acini in the hip region noted. If present, the length and width of the glandular patch were measured with calipers. That portion of the skin bearing the gland was then cut away, all hair was removed, and the skin was fixed in Bouin's fluid and prepared for histological examination. In animals undergoing a molt, it was often impossible to see the gland macroscopically because of the intense black pigmentation of the everted skin. Because of this difficulty, these animals were not included in the samples examined histologically. All other animals, whether the glands were visible externally or not, were examined. All skin samples were sectioned at 10 μ m and stained with either hematoxylin and eosin or with periodic acid - Schiff (PAS, a

histochemical stain specific for carbohydrates), acid haemalum, and orange G. They were then given an arbitrary score of 0 (no sebaceous acini present) to 3 (large-diameter acini present with heavy production of exudate). The sex and size of the animals were unknown to the individual assessing the slides. To verify that the sebaceous glands in the hip region were qualitatively different from those found in other areas of the skin (Strauss and Ebling 1970), two breeding males from the laboratory were autopsied and sections of skin were removed from the hip gland and from the middorsal region of the back.

Results and discussion

Eleven field-caught males were examined: the one nonbreeding 30-g male was given a score of 2, indicating substantial gland size, and, of the 10 breeding males (mean weight, 47.1 g; range, 30–62 g), five were ranked 2 and five were ranked 3. Thus all breeding males had active sebaceous hip glands. Unlike other species, in which total hair loss often accompanies posterolateral gland development (Clarke and Frearson 1972), all of the hip glands examined in this study were covered with hair, but it was generally less dense and often shorter than adjacent nonglandular regions. In live-trapped populations we have occasionally seen almost complete hair loss. During the height of the breeding season, especially in the spring, the hair over the hip glands often appeared moist from lipid secretions. Figure 1

FIG. 2. Light micrograph of the skin from the hip gland of a 30-g pregnant female *M. pennsylvanicus* showing sebaceous glands equal in size to those shown in Fig. 1. 135 $\times$.

shows a section of hip gland of a young 44-g breeding male with a score of 3. This male was born during the breeding season in 1981, was first caught as a nonbreeding animal at 32 g on June 4 (whereas all overwintering males had been in breeding condition since April), and was finally killed as a breeding adult on July 2. In the breeding males, five had overwintered and five were young-of-the-year. There was no difference in the size of the glands between the two groups ($P > 0.20$) (mean overall length of both right and left glands $\pm$ SE, 18.2 ± 0.76 mm, mean overall width 5.84 ± 0.30 mm), nor for either group to show more active glands: in the overwintered animals, 2 had a score of 2 and three a score of 3; in the young-of-the-year, three had a score of 2 and two a score of 3. Thus, from this small sample, the older males did not show a greater degree of gland development.

In the two males obtained from the laboratory, those sections obtained from the dorsal region of the back in both animals were given a score of 0, whereas those sections obtained from the hip gland were given a score of 2. Thus the sebaceous glands in the hip region are substantially better developed than those in regions such as the back.

There was a great deal more variation among the five field-caught females examined (mean weight, 38.7 ± 3.45 g): the one female that was neither lactating nor pregnant had glands of score 2; the other four females

were either lactating or pregnant or both and had one animal in each of the classes from 0 to 3. Figure 2 shows the hip gland of a pregnant female designated a score of 3. Four females were estimated to have been born in the spring of 1981 based on their weight at first capture and one had overwintered, was at least 10 months old and had five embryos, but showed no enlarged glands at all. Thus there was no consistent relationship between gland size and reproductive status in females. A larger sample size may have indicated a more pronounced trend.

We conclude that this population of *M. pennsylvanicus* does possess hip glands, with breeding males showing them consistently. However, unlike many microtine species such as *M. townsendii* (R. Boonstra, personal observation; MacIsaac 1977), the glands are not always as distinct externally as they are on the everted skin. Perhaps they play a less significant role in intraspecific communication than they do in species with pronounced glands. Their presence in southern Ontario may be a population characteristic as Quay (1968) suggested. He felt that gland development might be reduced within a species at lower latitudes and elevations. We have also seen hip glands in vole populations at Aurora and Nobleton north of Toronto. We suggest that histological examination will reveal the presence of hip glands in all populations of *M. pennsylvanicus* and that therefore it is a species characteristic.

Acknowledgements

This research was supported by grants from the Natural Sciences and Engineering Research Council of Canada to both of us. We thank Ken Fukumoto, Julie Towers, and Samuel Wong for assistance in the field and with the autopsies, and Steve Zaks for preparation of the tissues.

- CLARKE, J. R., and S. FREARSON. 1972. Sebaceous glands on the hindquarters of the vole, *Microtus agrestis*. J. Reprod. Fertil. 31: 477-481.
- JAMESON, E. W., JR. 1950. Determining fecundity in male small mammals. J. Mammal. 31: 433-436.
- MACISAAC, G. L. 1977. Reproductive correlates of the hip gland in voles (*Microtus townsendii*). Can. J. Zool. 55: 939-941.
- MILLER, G. 1896. Genera and subgenera of voles and lemmings. North Am. Fauna, 12: 1-85.
- QUAY, W. B. 1968. The specialized posterolateral sebaceous glandular regions in microtine rodents. J. Mammal. 49: 427-445.
- STRAUSS, J. S., and F. J. EBLING. 1970. Control and function of skin glands in mammals. Mem. Soc. Endocrinol. 18: 341-368.
- TAMARIN, R. H. 1981. Hip glands in wild-caught *Microtus pennsylvanicus*. J. Mammal. 62: 421.