(forearm, 85–88 mm; epiphyses not fully ossified). One bat contained bone fragments and chewed and partly digested pieces of flesh and skin of a muroid rodent (probably an oryzomyine). The stomach of another had pieces of flesh, skin, bone, and feathers of an unidentified bird. In the third I found pieces of flesh, skin, and some bone fragments of an anuran. I was unable to provide a positive identification of these remains, but suspect that they were of a hylid tree frog.

The diversity of food items in my sample from Ubatuba indicates that *C. auritus* preys on a variety of small vertebrates on an opportunistic basis. My data and those in the literature suggest that this bat takes active nocturnal animals (such as mouse oppossums, mice, geckos, and frogs) as well as diurnal animals on night roosts (birds). The hunting technique employed by *C. auritus* while flying may be expected to consist of visual and acoustical searching for prey on vegetation and on the ground. Judging from the observations by Peracchi and Albuquerque (1976) on a captive *C. auritus*, these bats may visually or acoustically scan their surroundings for prey while at a temporary roost in a manner similar to the hunting behavior Vaughan (1976) described for the African megadermatid, *Cardioderma cor*.

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CASTOR AND ANAL GLANDS OF THE BEAVER (*CASTOR CANADENSIS*)

Beaver (*Castor canadensis*) possess two pairs of large glands located in the region of the cloaca. These glands liberate odoriferous products that may be used in the construction of scent-mounds and in scent communication. The anatomical relationships of these glands to each other and to other organs and tissues are important in the understanding of scent communication in beaver.

Fourteen beaver, five females and nine males, of different age groups were used as subjects for gross dissection of glands and surrounding structures. Gland size was determined by displacement volume of water. An average of three replicates was used as the best estimate of the size of each gland. Contents of the glands were removed for additional analysis.

Beaver of both sexes possess anal and castor glands. The latter have also been called preputial glands, musk glands, or simply "castors." Because these glands occur in both sexes, "preputial gland" is not proper terminology. Both the anal and castor glands lie in a subcutaneous cavity located along the underside of the base of the tail between the cloaca and the pelvic girdle (Fig. 1A). The cavity housing these glands is similar to a scrotum. Testes lie anterior to the glands in the distal region of the inguinal canal. The testes protrude into the gland cavity in sexually mature males but are separated from the glands by tissue of the terminal end of the inguinal canal and the lining of the gland cavity (Fig. 1C).

Anal glands are located posterior to the castor glands, and each member of the pair opens independently to the outside by way of ducts on papillae located on each side of the urogenital openings in the cloaca (Fig. 1C). A few short, stiff hairs are located on the papillae. The ducts run from the papilla, through the neck of the gland, to the enlarged lumen in the distal portion of the gland (Fig. 1B). Secretory cells make up the inner layer of the gland. These large cells

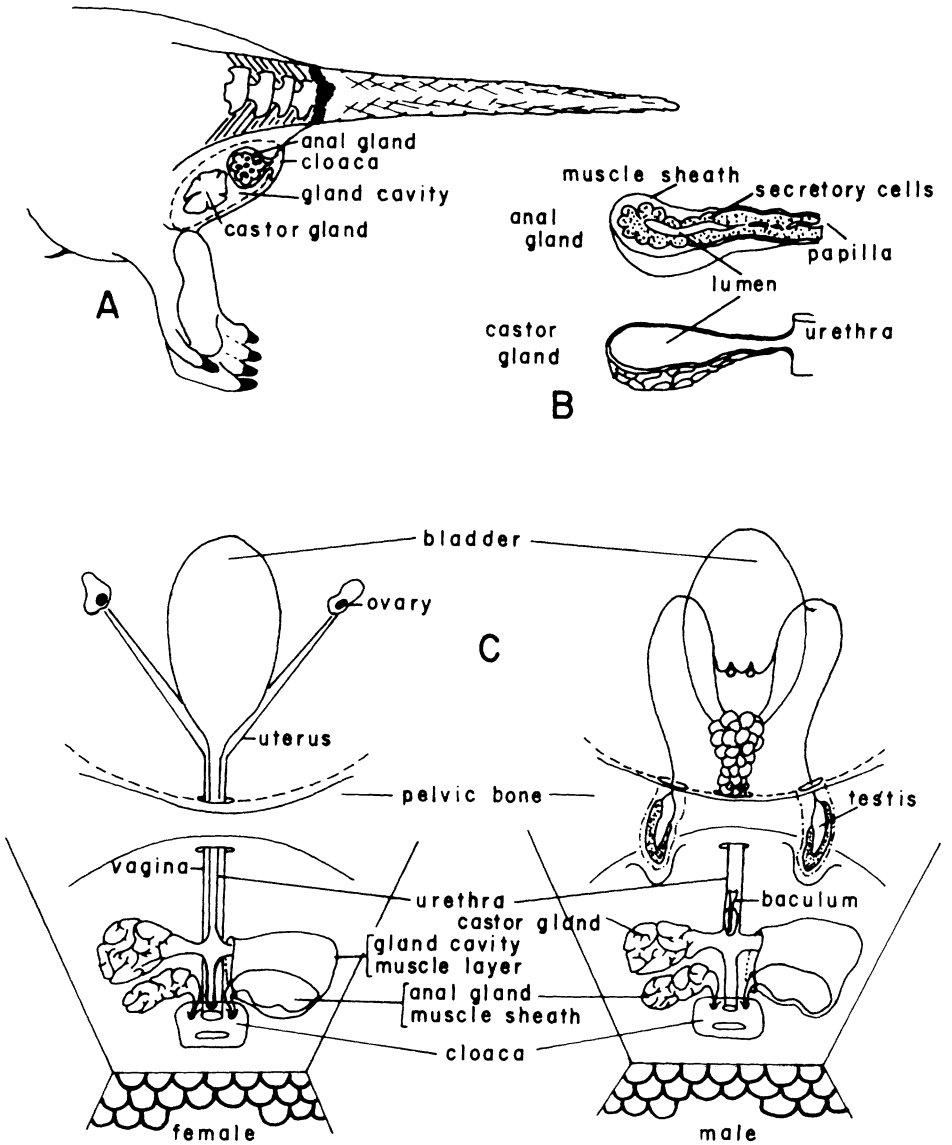

FIG. 1.—The anal gland and castor gland of beaver: A, the position of glands in the subcutaneous cavity; B, longitudinal section of an anal and a castor gland; C, anatomical relationships of the anal gland and castor gland to other structures in the beaver.

resemble cells of sebaceous glands. The entire gland is enclosed in a richly vascularized, connective tissue-striated muscle sheath separated from the layer which forms the envelope around both pairs of glands. Upon constriction of the muscle sheath, contents of the lumen are forced through the ducts and exude from the tip of the papilla. Contraction of the muscle sheath also forces the papillary end of the gland to protrude from the cloaca. The exudate is viscous, straw to brown in color, insoluable in water or ethanol, and has a heavy, pungent odor. Normally, only a drop of anal gland secretion appears on the papilla.

The other pair of prominent glands are the castor glands which lie anterior to the anal glands. The castor glands do not open directly to the outside, but instead join the urethra and open into

the cloaca (Fig. 1C). Castor glands appear to be diverticula off the distal wall of the urethra. The layer of cells lining the lumen is thin. The castor glands do not have a separate sheath of muscle covering them as do the anal glands. The lumen of the castor gland is large and contains a yellowish substance that turns brown when exposed to air and sunlight. Urine washes the lumen, and the composite mixture liberated into the cloaca has a pungent odor and is called "castoreum." Handled beaver frequently expel castoreum into the cloaca.

Size of the glands, as determined by displacement, is correlated with weight of the beaver. The correlations of anal gland size with body weight ($r = 0.87$, $P < 0.05$) and castor gland size with body weight ($r = 0.94$, $P < 0.01$) are significant. Furthermore, correlation of size of anal gland with size of castor gland, when arranged according to body weight ($r = 0.93$, $P < 0.01$) is significant. Regression of anal gland size on body weight is $Y = 3.29X - 17.09$, $SE_b = 0.56$, and regression of castor gland size on body weight is $Y = 4.75X - 27.45$, $SE_b = 0.50$. No sexual dimorphism or seasonal changes were evident.

These data do not support previous suggestions that size of individual castor glands is unrelated to body size (Simon and Brown, Wyoming Wildlife, 12(6):14–16, 1948) but do favor their conclusion that there is no sexual dimorphism in gland development. The anatomical relationship of the castor gland to the distal portion of the urethra in the North American beaver is similar to the condition found in river beaver (*Castor fiber*) in Russia (Kacnelson and Orlova, Voronezj, 5:58–63, 1954). The linear relationship of gland size to body size suggests that the activity of these glands is not an ontogenetic phenomenon related to sexual maturity. This conclusion is supported by histological analysis of secretory activity of the glands (Svendsen and Hikida, unpublished data). It is unknown, however, if there are maturational or sexual differences in the substances produced. Because of no sexual dimorphism in gland size, different functions in different sexes seem unlikely. Chemical analysis of the products is presently underway.

Based on the anatomical relationship of the glands to each other and to other organs, the products of both pairs of glands can be involved in scent-mound construction. Copious amounts of castoreum deposited on scent-mounds result from a process not dissimilar to urination except that the urine flushes out the contents of the castor glands. This material can be deposited on the scent-mound without the animal making contact with the body on the substrate. The anal gland papillae must be rubbed on the substrate in order to deposit the exudate. Scent-mounding behavior consists of a straddle-spray posture but anal rubbing has not been observed in the sequence.

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MATERNAL DEFENSIVE BEHAVIOR IN BIGHORN SHEEP

Predation on bighorn (*Ovis canadensis*) and Dall (*O. dalli*) sheep by wolves, coyotes, and golden eagles has been documented (Geist, 1971; Kennedy, 1948; McQuivey, 1976; Murie, 1944); however, defensive ploys also have been reported. Shank (1977) described the behavior of four rams that grouped together for protection from coyotes and Hornocker (1969) reported his observations on the defensive behavior of three ewes. Geist (1971) suggested that ewes offer little protection to lambs older than about 2-weeks of age. In this paper I describe two instances of maternal defensive behavior in bighorn sheep.

During a 2-year study of bighorn sociality, I witnessed defensive behavior by parous ewes. One example occurred on 8 March 1977 in Deep Canyon, Santa Rosa Mountains, California. A ewe and her 1- or 2-day-old lamb were alone on the face of a cliff when a coyote approached to within 5 m of them. The ewe immediately assumed an attention posture (Geist, 1971), which her lamb ignored. The ewe charged the coyote, which fled. Then a second coyote appeared, ran toward the lamb, and began gaping. The lamb ran toward its mother, but on the way fell out of sight over a 3 to 4 m cliff. The ewe immediately ceased chasing the first coyote and pursued the second for 6 to 8 m and headbutted it on the rump. The coyote was propelled 2 m onto a talus