

THE ROLE OF INTEGUMENTAL GLANDS IN THE SOCIAL AND MATING BEHAVIOUR OF THE HUNTING DOG *LYCAON PICTUS* (TEMMINCK, 1820)

J. VAN HEERDEN, Faculty of Veterinary Science, University of Pretoria, Onderstepoort 0110

ABSTRACT

VAN HEERDEN, J., 1981. The role of integumental glands in the social and mating behaviour of the hunting dog *Lycaon pictus* (Temminck, 1820). *Onderstepoort Journal of Veterinary Research*, 48, 19-21 (1981).

The marking and mating behaviour of captive hunting dogs, *Lycaon pictus*, is described. Urine scent-marking was the most frequent marking behaviour observed, but anal dragging, body-rolling and body-rubbing were also recorded. The mating behaviour was typical of that of Canidae but the copulatory tie in this case was of very short duration. There was a dense accumulation of sebaceous glands in the praeputium and these secretions are probably important in the urine scent-marking. There is no tail gland in *L. pictus*.

Résumé

LE RÔLE DES GLANDES INTÉGUMENTALES DANS LE COMPORTEMENT SOCIAL ET D'ACCOUPEMENT DU CHIEN CHASSEUR *LYCAON PICTUS* (TEMMINCK, 1820)

Le comportement de marquage et d'accouplement de chiens chasseurs, *Lycaon pictus*, en captivité, est décrit. Le marquage à l'urine odoriférante fut le comportement marquant le plus fréquemment observé, mais le "trainage anal", "le roulage du corps" et "le frottage du corps" furent également observés. Le comportement d'accouplement fut typique à celui des Canidae mais la coït fut dans ce cas de courte durée. Il y avait une dense accumulation de glandes sébacées dans le praeputium et ces sécrétions sont probablement importantes dans le marquage à l'urine odoriférante. Il n'y a pas de glande de queue chez *L. pictus*.

INTRODUCTION

Many mammals possess skin glands which secrete substances that are important in social behaviour and the production of these secretions may be regulated by steroid hormones (Johnson, 1976).

Urine scent-marking in hunting dogs *Lycaon pictus* has been reported by Van Lawick (1970), Reich (1977) and Frame, Malcolm, Frame & Van Lawick (1979).

This study was undertaken to describe (a) marking behaviour and (b) mating behaviour in captive hunting dogs. Morphological aspects of particular skin areas were also examined to relate morphological features of the skin to behavioural patterns.

MATERIALS AND METHODS

Observations were made on the behaviour of 3 captive groups (A, B & C) of hunting dogs held at 3 different localities. Group A comprised 3 individuals, 2 males and 1 female, housed at the Faculty of Veterinary Science, University of Pretoria. Macroscopic and microscopic observations on the skin as well as marking and mating behaviour were recorded from this group. After immobilization of the 2 males with ketamine*, biopsies for histological examination were taken of the skin from the scapular, interdigital, tailbase, flank, dorsal neck area and the praeputium. Praeputial biopsies were also taken from one male 2 weeks after the last of 3 injections of stilboestrol dipropionate** (1 mg/kg) given at fortnightly intervals. Histological sections were stained with haematoxylin and eosin as well as with Mallory Azan and examined with the ordinary light microscope.

Group B consisted of 8 individuals (4 pairs) which were housed in 4 adjacent camps on the research farm of the National Zoological Gardens. Observations on marking and mating behaviour were made on this group.

Group C consisted of 7 animals which were held in captivity in the Kruger National Park. The external genitalia of these animals were inspected after they had been immobilized with ketamine.

* Ketalar, Parke-Davis

** Maybaker

Received 20 January 1981—Editor

RESULTS

Observations on marking and mating behaviour

Marking behaviour was very intense during the period of sexual attraction of the females and was observed in all 4 of the courting couples from Groups A and B. The unpaired male in Group A did not show any marking behaviour and the separated pair in Group B showed such behaviour only occasionally. Urine scent-marking, anal dragging, body-rolling and body-rubbing behavioural patterns were observed.

Urine was always deposited at a specific spot in each enclosure. Depositions occurred many times each day and were often repeated several times in rapid succession. Urination was usually initiated by the female when a few drops of urine were deposited by the animal in a semi-crouching position. This was immediately followed by the male depositing urine while lifting a hind leg. Urine dribbled from the sheath of the male and at no stage was the penis visible. The animals also often defecated at the same site. Dribbling or deposition of urine was sometimes followed by straining which then produced some faeces—with the dog semi-crouching and with the tail raised. It almost appeared as if defecation were unintentional and that the straining had some other objective.

Although all the animals possessed anal sacs, anal dragging was performed by a few individuals only. This behavioural pattern was restricted to a specific area within the enclosure and was more commonly observed during the period of sexual attraction of the female. The animal would sit with its hind legs extended along the ground and drag itself forwards with its forelegs.

Body rolling was carried out mainly by males next to a sleeping or resting female and often followed copulation or repeated mountings. It often occurred in places where materials such as urine, faeces or food remnants were detectable.

One male often rubbed its body on the fence and bushes near the entrance of the den.

When sexual attraction commenced, the females were constantly and closely followed by their suitors and sometimes, when they rested or slept, there was

physical contact between the courting dogs. Head-pushing, body-lifting (Fig. 1), skin-nibbling, licking of genitalia and mounting increased in frequency and intensity as oestrus approached. Males nibbled the skin of inguinal, flank, scapular and neck regions as well as the hindlegs and base of the ears. Vigorous and persistent nibbling caused an ulcerative dermatitis at the base of the ear of one female (Fig. 5). The males stood behind the females to lick their genitalia and this often led to nibbling which again resulted in the male lifting the female's hindquarters with his head. On some occasions such lifting was combined with simultaneous movement forwards so that a wheelbarrow action developed. The male also stood at right angles to the female, pushed his head into her flank, nibbled the skin of the flank and finally lifted her. This lifting was sometimes so vigorous that the female was tossed over the male's back.

Resting and/or sleeping females were often disturbed or forced to get up by their suitors who pawed and nibbled them. Brief but repeated mountings, which lasted from 5–10 seconds, were also an important part of the sexual foreplay during pro-oestrus and oestrus. Males mounted females when the females were standing firmly on all 4 legs with a slightly raised head and with the tail held to the side.

In the mounted position, the females were held tightly by the males' forelegs. The males usually performed a short series of strong thrusting movements. The penis often protruded slightly from the sheath, but actual introduction of the penis into the vagina did not take place. After mounting, the females frequently licked the males' genitalia or attempted to do so. This sometimes resulted in the males being chased by the females until the pair finally stood against one another, while mock-biting the head, neck and ears.

When the female was in oestrus and mating was permitted, mating usually occurred shortly after the animals were fed. During this time the male ate less as he was preoccupied with the female. On several occasions mating took place while the female had a piece of meat in her mouth. True mating was associated with a tie which lasted from 50 seconds to 1 minute and 52 seconds. During this the female stood firmly on all 4 legs with the head slightly raised (Fig. 2). The male was above and behind her, often with his head pressed into her scapular region, clamping her firmly with his forelegs (Fig 3). The female did not stand throughout coitus but assumed a semi-sitting position so that the male in the locked position was in fact sitting behind her (Fig 4). On occasion a mating pair also lay down (Fig 5).

Aggressive interactions were frequent between adjacent pairs in Group B. An individual would approach another individual on the other side of the fence with ears erect, body rigid, the head slightly lowered and with the tail raised, while staring intently at the offender. There was no clear vertical retraction of the lips and the biting movements were performed in complete silence.

Observations on skin morphology

Macroscopic examination of the praeputium of 6 males (Groups A and C) showed: (1) The lamina externa at the praeputial orifice was densely covered with a tuft of rough longish hair which had a slightly matted appearance. (2) The orifice was triangular in shape with flabby thickenings of the ventrolateral walls (Fig 6). In an adult male this thickening was 13 mm in diameter whereas in younger males (approx-

mately 2 years old) the diameter was about 10 mm. (3) The antero-dorsal aspects of the praeputial orifice were connected to the ventral body wall with what appeared externally to be 2 skin folds (Fig 6).

Histological examination of the skin from the praeputial orifice of 2 males (Group A) showed a dense aggregate of sebaceous glands (Fig 7) which opened either in a collecting duct in the shaft of the hair or directly onto the epidermal surface. There were very few sweat glands present. Biopsies from the praeputium taken from a male after the administration of stilboestrol revealed severe atrophy of the sebaceous glands with fibrous tissue appearing more prominent (Fig 8).

No tail gland was found when the skin of the tail and its base were examined macroscopically. Histological examination of skin from the root of the tail did not reveal any massive glandular structure but as in the skin from the flank, scapular and dorsal aspect of the neck, there were a few sweat and sebaceous glands. Skin from the interdigital areas contained many sweat glands.

DISCUSSION

Urine-marking was the commonest behavioural pattern observed before and during the period of sexual attraction of the female and its frequency increased markedly as oestrus progressed.

The macroscopic flabby thickening of the praeputial orifice in *L. pictus* is due to an aggregation of sebaceous glands. It is believed that the secretions from these praeputial glands may possibly play a role in scent-marking which may be associated with sexual or other activities. In the mature male *L. pictus* the lamina externa of the praeputium seems to be at its largest. In the adult male the tip of the praeputium (orifice) is also densely covered with coarse hair. Microscopically there is evidence that the praeputial sebaceous glands open either directly onto the mucosal surface of the lamina externa of the prepuce or into the shaft of the hair. When the lumen of the gland is overfilled, the contents are secreted into either the praeputial lumen or into the hair-shaft. It seems therefore that urine is mixed with glandular secretions before it is voided.

The atrophy of the praeputial glands after the administration of stilboestrol indicates that the size of these glands is probably under hormonal control.

The praeputial glands described here differ markedly from those in rodents. According to Brown & Williams (1972), the praeputial glands of rodents are "conspicuous, discrete, paired glandular organs which lie variably between the pubic skin and the body wall". These glands open by means of a long duct "at the free margin of the prepuce and alongside the tip of the glans penis". In rodents these glands often undergo seasonal variation in size but this is not the case in *L. pictus*.

Double marking, i.e. when 2 overlapping marks are made, has also been recorded in wolves, *Canis lupus*, and Rothman & Mech (1979) believe it is of importance in pair-formation and courtship success. They base this assumption on the following:

1. It is absent in pairs that later fail to mate.
2. It is associated with high frequency of mutual investigation.
3. It is most frequent after pairing.
4. It is carried out almost exclusively by high-ranking breeding pairs.

Double marking is thus another example of the similarities in the behavioural patterns of *L. pictus* and *C. lupus* (Mech, 1975).

The skin folds which connect the preputial area to the ventral body (Fig. 6) are probably the well-developed praeputial muscles, muscoli protractor preputii. Evans & Christensen (1979) described the praeputial muscle in the dog as "a divergent strip of cutaneous trunci muscle which extends from the area of the xiphoid cartilage to the dorsal wall of the prepuce. There it inserts in opposition with the preputial muscle of the opposite side. Two functions have been attributed to the praeputial muscle, namely, (a) stabilization of the cranial free end of the prepuce during non-erection and (b) to pull the prepuce back over the glans penis after erection."

In comparison with that of the domestic dog, the praeputial free end in *L. pictus* is a better developed structure and it seems appropriate that *L. pictus* should possess better developed praeputial muscles.

In some of the mongooses anal sac secretions are applied to horizontal surfaces using the "simple anal drag" (Ewer, 1973). The bottom rubbing behaviour is suggestive of scent-marking as it was carried out at certain places only and the posture assumed during this action brings the anal sacs in close contact with the ground surface. The fact that it was more commonly observed during the period of sexual attraction of the female also implies a sexual connotation. (The author is well aware that bottom-rubbing in domestic dogs is usually caused by an infection of the anal sacs or anal irritation by crawling tapeworm segments).

The strong odour of *L. pictus* is a well-known characteristic of the animal and has been reported by Bere (1956) and Estes & Goddard (1967). Sebaceous glands are probably not confined to those areas of the skin that were examined, but probably occur over the whole body. These unspecialized glands might well be responsible for the production of odiferous substances. The body-rolling and body-rubbing recorded might well be a further attempt of the animal to scent-mark an area.

Reiger (1979) is of the opinion that body-rubbing is a form of scent-rubbing, during which scent substances from the environment are transferred onto the

animal's body. The origin and significance of scent-rubbing in carnivores have been reviewed by Reiger (1979).

The absence of glands at the tail base confirms the findings of Pagenstreicher (cited by Hildebrand, 1952). Moreover the tail base was not given any attention by the animals either before or during coitus.

The mating of *L. pictus* is typical of Canidae in that the introduction of the penis is followed by swelling of the bulbus glandis which makes withdrawal impossible. *L. pictus*, however, differs from other Canidae in that the copulatory tie is of very brief duration.

ACKNOWLEDGEMENTS

The author wishes to express his appreciation of their assistance to Miss E. Bigalke, Dr R. I. Coubrough, Miss Y. Doron and Mr P. G. Shenton.

REFERENCES

- BERE, R. M., 1956. The African wild dog. *Oryx*, 3, 180-182.
 BROWN, C. J. & WILLIAMS, J. D., 1972. The rodent preputial gland. *Mammal Review*, 2, 105-147.
 ESTES, R. D. & GODDARD, J., 1967. Prey selection and hunting behaviour of the African wild dog. *Journal of Wildlife Management*, 31, 52-70.
 EVANS, H. E. & CHRISTENSEN, G. C., 1979. Miller's anatomy of the dog. Philadelphia: W. B. Saunders Company.
 EWER, R. F., 1973. The carnivores. London: Wedenfeld & Nicolson.
 FRAME, L. H., MALCOLM, J. C., FRAME, G. W. & VAN LAWICK, H., 1979. Social organization of African wild dogs (*Lycaon pictus*) on the Serengeti Plains, Tanzania, 1967-1978. *Zeitschrift für Tierpsychologie*, 50, 225-249.
 HILDEBRAND, M., 1952. The integument in canidae. *Journal of Mammalogy*, 33, 419-428.
 JOHNSON, E., 1976. Steroids and specialized skin secretions in mammals. *Biochemical Society Transactions*, 4, 602-605.
 MECH, D. L., 1975. Hunting behaviour in two similar species of social canids. In: Fox, M. W. (Ed). *The wild canids*. London: Van Nostrand Reinhold Company.
 REICH, A., 1977. The wild dogs of Kruger National Park. *African Wildlife*, 31, 12-15.
 REIGER, I., 1979. Scent rubbing in carnivores. *Carnivore*, 2, 17-25.
 ROTHMAN, R. J. & MECH, D. L., 1979. Scent-marking in lone wolves and newly formed pairs. *Animal Behaviour*, 27, 750-760.
 VAN LAWICK, H., 1970. Wild dogs. In: Van Lawick-Goodall, H & J. Innocent killers. London: Collins.



FIG. 1 Male *L. pictus* licking and lifting the genital area of a female



FIG. 2 Beginning of a true mating while female holds a piece of meat

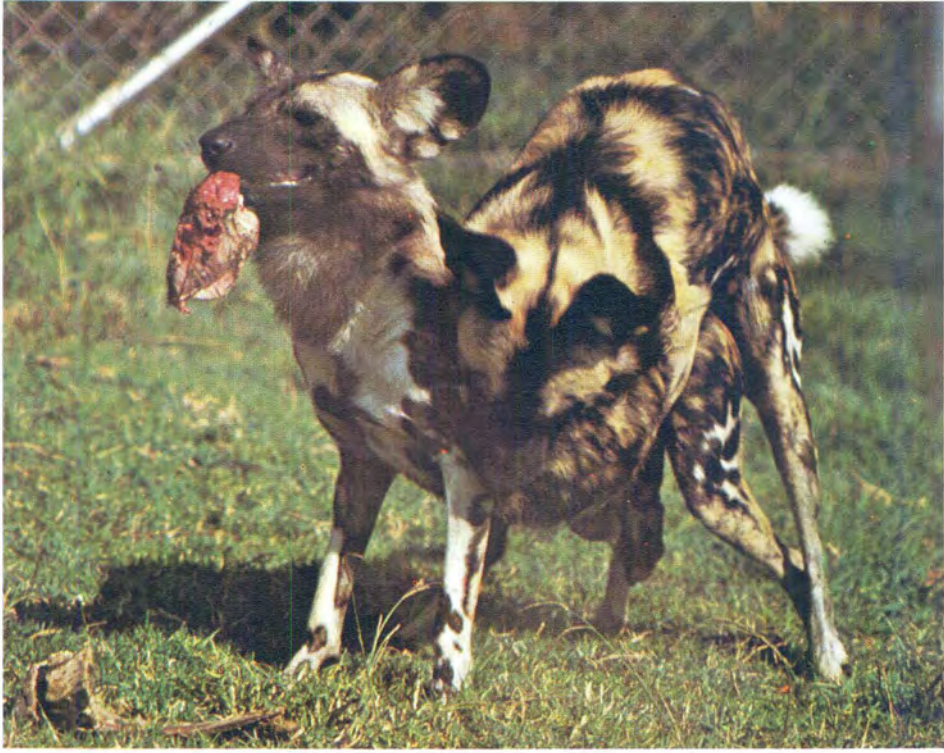


FIG. 3 Male in the mounted position



FIG. 4 During the copulatory tie the male sits behind the female



FIG. 5 The male lies behind the female during the copulatory tie. The ulcerative lesion at the base of the left ear of the female is just visible



FIG. 6 Distal end of the preputium with some of the hair cut away to demonstrate the triangular orifice, the ventrolateral walls at the preputial orifice A and B and the 2 skin folds C connecting the preputium to the ventral body wall. The animal is in lateral recumbency with its head towards the left side of the photograph.

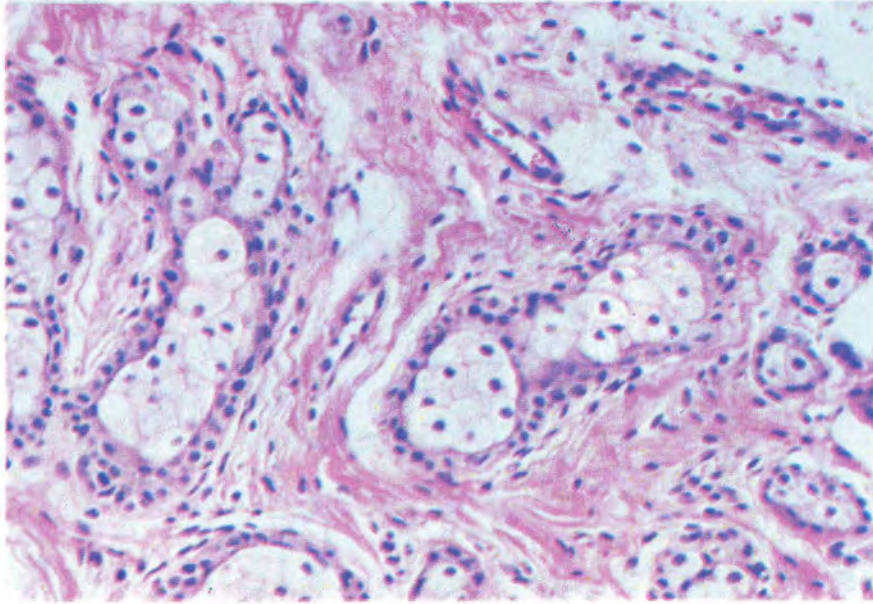


FIG. 7 Part of the dermis of the lamina externa of the prepuce showing the sebaceous glands. Mallory Azan $\times 40$

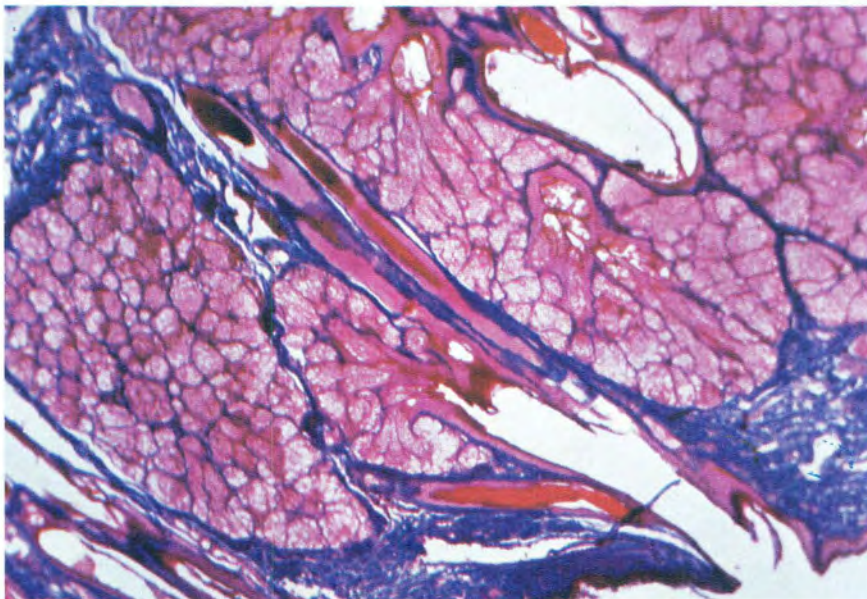


FIG. 8 Part of the dermis of the lamina externa of the prepuce after the administration of stilboestrol dipropionate, showing atrophy of the sebaceous glands. HE $\times 200$