

# Masculinisation of female Spotted Hyenas (*Crocuta crocuta*)

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The Spotted Hyena/Laughing Hyena is a mammal of the order Carnivora. They are moderately large, terrestrial carnivores native to sub-Saharan Africa. These animals have a complicated social order, as well as a unique mating system as no other known mammal species. They live in a highly structured social hierarchy in which females rule and males have to queue for their social status and the access to mates in the pack. Females are not only larger and stronger than males, but they have remarkable anatomical changes in their reproductive tract.

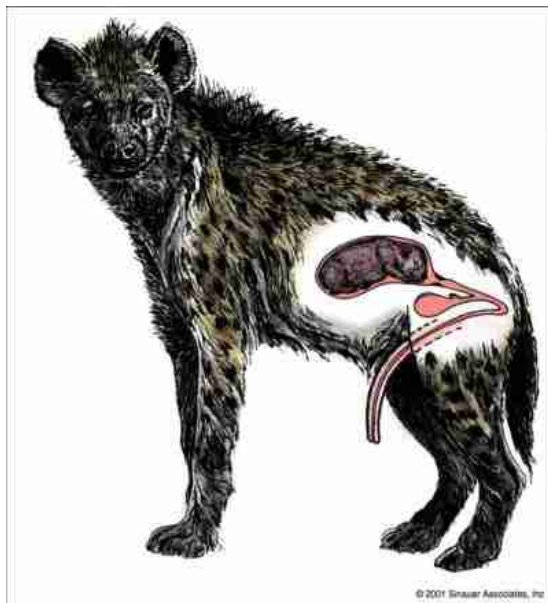
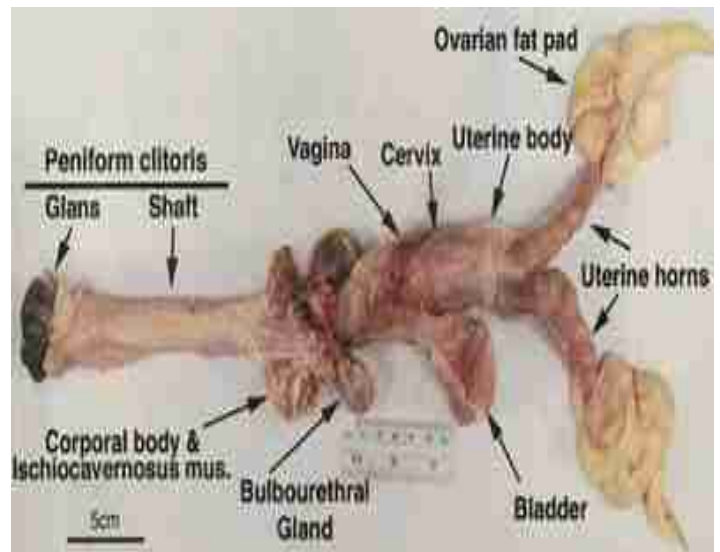
The complexity of the social life of hyenas can be seen in the following example of behaviour.

Top-ranking females have priority of access to large carcasses and this provides increased reproductive success in comparison with low-ranking females. Juveniles gain access to the prey depending on their mother's rank and females are nearly always dominant over males, the exception being male offspring of high ranked females may be dominant over low ranked females. The females remain in their natal group. Previously, it was thought that males always disperse to join other clans, now it is known that there are so called nondispersal males also. If these males were due to their mothers rank, dominant over other females of the clan before the dispersal time, they become subordinate to those females as nondispersal males.

The female's dominance and higher aggressivity might be due to an elevated androgen level in their circulation. Not just the behaviour of female hyenas is masculine but also their reproductive tract is remarkably changed. They have an enlarged clitoris which resembles a penis so it was previously thought that hyenas were hermaphrodites, as quoted by Karen Blixen (Isak Dinesen) in *Out of Africa* (1938):

**“All hyenas, you will know, are hermaphrodites, and in Africa ... on a full-moon night they will meet and join in a ring of copulation wherein each individual takes the double part of male & female... Do you consider now ... that it should be, on account of this fact, harder to a hyena than to other animals to be shut up by itself in a cage? Would he feel a double want, or is he, because he unites in himself the complementary qualities of creation, satisfied in himself, and in harmony? In other words, since we are all prisoners in life, are we happier, or more miserable, the more talents we possess? “**

The clitoris is lengthened to form a fully erectile phallus/ pseudopenis, the vaginal opening is at the tip of this phallus through which the female urinates, mates and gives birth. This pseudo-penis makes it impossible to penetrate without the female's co-operation, therefore female hyenas have even more control over whom they want to mate with. The vulva is fused and forms a scrotum containing fatty pseudotestes. On the picture to the right it can be seen that the female hyenas have bulbo urethral glands and the male penis muscles also, with which they can fully erect their pseudopenis. The erection is used in a greeting ceremony as signal submission not just in adult hyenas but also in young cubs.



Due to this unusual anatomical feature not only is copulation extremely difficult, but parturition also, making it a life threatening experience for both the mother and the offspring. During parturition the fetus has to pass a nearly 180 degree turn towards the clitoris. Another obstacle for the fetus is to pass through the very narrow clitoris. Many cubs of mothers that give birth for the first time are stillborn because of the long times involved. (Up to 60 % in captivity and probably even more in wilderness) After the first birth the clitoris usually ruptures and makes it easier for the next parturition.

All these dangerous factors make it hard to understand how such a unique reproductive system could evolve, that at some point there must have been powerful selective pressures driving the evolution of masculinisation.

The development of the masculine appendages of the females begins during embryological development before the pubertal burst of androgens. There are different opinions concerning the question what cause the development of female masculinisation. Studies have shown that the foetal ovary is not a possible source of the androgens in female foetuses because the genital tubercle appears before the gonads are differentiated properly.

Another explanation for this development could be that the androgens are passed through the placenta to the foetus from the mother.

Although female masculinisation of the *Crocuta crocuta* is accompanied by beneficial attributes like increased dominance, aggression and increased size/muscle mass, it is also associated with increased difficulty in not only conception but also parturition. However the development of the beneficial traits may have evolved independently without having a pseudopenis.

Another explanation for its development could be that there is a lot of aggression towards young female hyenas from siblings, adult females and members of other clans and the enlarged clitoris could act to fool other hyenas into not harming the young females.

As is depicted in this essay, there's interplay of a myriad of social and phenotypical phenomena associated with the evolution and persistence of female masculinisation within the *Crocuta crocuta* with no single answer. However one may conclude that this unique evolution has to be beneficial as it has survived the test and trials of life until now.

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