

Laurence Frank has studied spotted hyaenas for over three decades and cannot understand the persistent misconceptions and stereotypes that dog one of Africa's most successful predators. No, they are not primarily scavengers and no, for the last time, the female's distinctive anatomy does not mean that she is both male and female. As for what this unusual anatomy *does* mean, well, Frank has a few ideas... ▶

# GIRL POWER

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PHOTOGRAPHS BY DAVID HAMMAN

With an efficient hunting method and an ability to consume big game completely, spotted hyaenas attain high numbers in prey-rich ecosystems.



## FAST FACTS

SPOTTED HYAENA *Crocuta crocuta*



### Shoulder height

70 to 95 centimetres.

### Weight

Males weigh between 45 and 60 kilograms; females between 55 and 82 kilograms.

### Habitat

Open savannas, montane moors, deserts and grasslands. Dry steppes and plains with abundant herbivores are preferred.

### Breeding

Mating occurs throughout the year. Females give birth to one or two cubs after a gestation of about 110 days. Cubs are weaned at between 12 and 16 months. Females mature at three years; males at two.

### Social behaviour

Where food is abundant, a single clan can number up to 100 individuals; in deserts clans are much smaller. Clans develop around a hierarchy of related females and their offspring; males disperse at around puberty and join new clans. They are vocal, uttering a range of whines, chatters, growls and screams. Socialising intensifies in the evenings before a hunt.

### Diet

Scavenges and hunts medium- to large-hoofed mammals and eats three to six kilograms of meat daily.

**RIGHT** Hyaenas compete vigorously over kills and, as a result, have evolved a complex social system in which all females dominate males.

**OPPOSITE** Female hyaenas give birth at the mouths of abandoned aardvark burrows. Most of the neonatal fighting between cubs occurs underground, where mothers cannot intervene.

**B**ut they are so ugly – why would you want to study spotted hyaenas? ‘So are you, but I’ll try to be nice anyway.’

When I was younger, I was more polite and would answer graciously, ‘simply because they are the most interesting animals in the world’. But after some 30 years of defending them, I am weary of ignorant people slandering these marvellous beasts.

What is so interesting about spotted hyaenas? Try this: the female has essentially the same private parts as a male – she urinates, mates and gives birth through a fully erectile clitoris that is the same size and shape as a penis. And within minutes of giving birth, her twin offspring fight like little demons for dominance, savaging each other with sharp teeth that erupted during their unusually long 110-day gestation.

Their social system is highly complex, very similar to the matrilineal organisation of baboons. Numbering up to 100 individuals in prey-rich ecosystems, the social group (called a clan) comprises several matrilineal or extended female families. Like baboons, females acquire their mothers’ social rank in the clan, so dominance relationships between the clans’ matrilineal remain remarkably stable over many generations.

Unlike baboons, though (and most other mammals), females are far more aggressive than males and are absolutely dominant over them. As an American male, I find this depressingly familiar, but rather more endearing in hyaenas.

Although maligned as scavengers, spotted hyaenas are actually very successful predators of big game. (In fact, I have never understood why people look down on scavengers – what are our trips to the supermarket if not scavenging?) As the most abundant predator in the majority of intact African ecosystems, hyaenas play a crucial ecological role through their influence on herbivore populations. But, as with other large African predators, they are disappearing rapidly under an assault of increasing human and livestock populations.

Like the lion, the modern spotted hyaena was once widespread, occurring across Europe and much of Asia. With the extinction of the great mammals of the Eurasian Pleistocene, the lion and hyaena disappeared as well, but remained ubiquitous in sub-Saharan Africa, with its once-abundant prey and sparse human population.



**T**he peculiar anatomy of female spotted hyaenas has been known from ancient times and has given rise to every conceivable variant of the hermaphrodite myth. They have been variously described as simultaneously male and female, changing back and forth at will and turning from male to female as they mature. In 1938 the young British biologist Leonard Harrison Matthews collected over 100 hyaenas in the Ngorongoro area of what was then Tanganyika. He published a definitive article on hyaena reproductive anatomy, describing the female’s remarkably male-like organs and lack of external female organs, showing that the female’s ‘penis’ is in fact a greatly enlarged clitoris, and that in place of a vagina she has a scrotum-like pouch. Internally, she is a perfectly normal female, with ovaries

and a uterus. Her birth canal, instead of exiting under the tail as in other mammals, makes a 180-degree turn in the pelvis and passes through the clitoris, which protrudes beneath the abdomen as does the penis in male mammals. That should have put the myths to rest but, as recently as 1962, a South African nature magazine stated matter-of-factly that each individual comprises both sexes.

How can you tell males from females in the wild? First of all, sporting an erection tells you nothing, as hyaenas of both sexes get erections in a number of social situations that have nothing to do with mating. Rather, it is a sign of appeasement or subordinate status, displayed by a lower-ranking individual toward its social superior. One of the most common social behaviours is the ‘meeting ceremony’, when two familiar individuals encounter one another ▶







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ABOVE A male spotted hyaena (note how the belly turns up at the hind legs) positions a rib between his forefeet and uses bone-crushing premolars to reduce it to splinters. Fresh bone contains fat and protein, which are available to hyaenas but not other carnivores.

TOP By the age of two weeks, one cub in the litter has become dominant over the other, and play replaces fighting. These cubs are two months old.

after a separation. Standing head-to-tail, each raises the inner hind legs to allow the other to sniff and examine their genital areas – the lower-ranking individual will get an erection; if they are comparable in status, both will.

Male and female genitalia, however, are not quite identical. Although much the same size and shape, the end of the male organ is wedge-shaped, whereas the female's is blunt and symmetrical. It's an obvious difference if you know what to look for. Furthermore, from behind, the clitoris of a female who has given birth is partly pink, the result of tearing that occurred during her first labour. A mature female also has prominent nipples. The body shape is slightly different, too. Older females become noticeably fat, but even young ones have a profile that differs from that of a male. The belly profile of a standing male curves upward at the hind legs, but a female's belly is flat, owing to the development of a small udder at the rear of her abdomen.

Although a few other mammal species display some degree of genital masculinisation, it is most extreme in spotted

## THE PECULIAR APPARATUS OF FEMALE HYAENAS MAKES LABOUR A DANGEROUS UNDERTAKING FOR A FIRST-TIME MOTHER

hyaenas. Female European moles, some lemurs, spider monkeys and hares have an enlarged clitoris, but it is not erectile and all have fully functional vaginas. And it is well that they do, because the peculiar apparatus of female hyaenas makes labour a dangerous undertaking for a first-time mother.

During the prolonged gestation period, the foetuses, usually twins, grow unusually large (an adaptation toward winning the neonatal fight). During birth, they must travel an entire 60 centimetres from the uterus to reach the outside world and air (the umbilical cord is a mere 12 centimetres long and breaks long before they are born). Once through the pelvis, they enter the narrow tube-like clitoris, which in a first-time mother is too tight to allow the large foetuses to pass through it and there is a 70 per cent chance that

the cubs will die of asphyxiation. We have also documented an increase in the death rate of females at the age at which they first give birth, apparently due to such complications. Because the tears do not heal shut (visible as the pink patch), subsequent litters are born quickly, with no unusually high death rate in either cubs or mothers. Why has this species developed such bizarre and costly anatomy?

**M**any hypotheses have been suggested, but only one seems to fit all the facts of spotted hyaena life. They are remarkably abundant in prey-rich ecosystems: in the Ngorongoro Crater, Hans Kruuk estimated a density of 1.7 hyaenas per square kilometre, while my studies indicated a density of up to one per square kilometre in the

A subadult hyaena greets several cubs. The three-month-old cub in the foreground is a male, as indicated by the pointed glans (tip) of the phallus and the constriction where it joins the shaft. A female phallus has no constriction and the glans is rounded. Each hyaena has a distinctive spot pattern and observers can readily learn to identify individuals from photographs.





## A HYAENA IS A BONE-DIGESTING MACHINE, FROM ITS MASSIVE TEETH AND JAW MUSCULATURE TO ITS SPECIALISED DIGESTIVE TRACT

northern Serengeti woodlands. (Gus Mills found correspondingly low densities in the Kalahari.) Compare this with a 'high' lion density of 0.1 per square kilometre. Spotted hyaenas can attain these numbers because they are exceptionally efficient predators – not only do they cooperate to chase and pull down large mammals, but they are also able to consume the entire prey, skin, skeleton and all. A hyaena is a bone-digesting machine, from its massive teeth and jaw musculature to its specialised digestive tract, which extracts all the fat and protein from bone itself. Whereas a lion or leopard leaves much of the carcass uneaten, hyaenas consume everything. This means that a given amount of prey can support more hyaenas than it would equivalent-sized predators that eat more selectively.

What does this have to do with female masculinisation? Everything, we think. Because their cooperative hunting and efficient feeding results in a high density of hyaenas, competition for food is fierce once a kill has been made. Up to 30 animals may compete over a carcass, each squabbling with neighbours and eating as fast as it can until all that is left is blood-stained grass. This may take no more than 20 minutes, hence the hyaena's reputation as a glutton in African folk tales. Although males may make the kill, they are pushed aside as soon as a few females arrive. Such is the competitiveness in these feeding mêlées that even subordinate females are excluded. Soon, only the dominant female and her offspring are left in possession of the remains. High-ranking females raise two to three times the number of surviving cubs compared with lower-ranking ones, guaranteeing that their genetic makeup will be best represented in future generations (which, after all, is the whole point of life).

We believe that these unusually high levels of female aggression linked with anatomical masculinisation arose alongside the communal hunting habit. Other living hyaena species (brown, striped and aardwolf) are not cooperative hunters of big game and show none of the peculiarities of spotted hyaenas. In other large group-hunting carnivores such as lions and wolves, many youngsters die of starvation because they are the last to feed when prey is scarce. Cub starvation is rare among hyaenas, probably because female aggression ensures that females and their cubs, particularly high-ranking ones, always take precedence at the hotly contested kills.



We believe that this intense feeding competition favours more aggressive females. One simple way to increase an animal's aggressiveness is to expose it to higher-than-normal levels of androgens (male hormones) while it is in the womb. (Pregnant spotted hyaenas produce exceptionally high levels of androgens, which flood the foetuses.) However, those same hormones cause the developing genitals to become male rather than remaining in their original female state. So, while evolution may have favoured more aggressive females, they pay the price of masculinised genitalia, with consequent birth difficulties and loss of first-born offspring. Research at the University of California's Berkeley Hyena Project has shown that the actual mechanism of masculinisation is more complex than this early hypothesis implies, but we still believe that something along these lines occurred when the ancestral spotted hyaena evolved from a scavenger into a cooperative hunter of large mammals.

**L**ike other African carnivores, spotted hyaenas are in decline throughout most of their range. Always on the lookout for an easy meal, they are attracted to human settlements where livestock remains are often scattered about and, if disappointed, they may have a go at a poorly maintained goat boma.

Protecting livestock from hyaenas is, however, remarkably easy; in the words of one old Kenyan rancher, 'If a hyaena gets my stock it is my own damn fault. I have let my bomas deteriorate or my herders are leaving animals out at night.' In rural Kenya, we have learned to eliminate hyaena incursions by building each boma with a solid wood or metal gate to replace the scruffy little bush that normally blocks the entrance. Surrounding the thornbush walls with low-cost wire netting eliminates any remaining opportunity for hungry hyaenas to get at the livestock inside.

However, in some parts of Kenya, pastoralists have become sloppy in their herding, leaving goats and cattle in ▶

ABOVE When faced with cubs this fluffy and small, it is difficult to comprehend how hyaenas could be stereotyped as cowardly villains. (*The Lion King* anyone?)





## NEXT TIME YOU ARE ON SAFARI, TELL THE GUIDE THAT YOU ARE TIRED OF BORING OLD LIONS AND WANT TO SEE HYAENAS INSTEAD

Although a group of hyaenas is quite capable of killing a bull buffalo, a single one is no match for an angry ostrich. Hyaenas will, however, eat ostrich eggs. They cannot get their jaws around them, so they break them by knocking one into another, much as a mongoose breaks smaller eggs.

the bush overnight, then poisoning the predators that take them. In some countries, cattle are no longer herded at all. Spears and poison (especially effective on hyaenas) are always cheaper and easier than the hard work required to herd diligently and maintain bomas.

Encouragingly, we have also found that all the large predators much prefer to take wild prey rather than risk human retaliation for taking livestock. Areas with abundant game suffer less livestock loss to predators than do regions where goats and cattle are the only food option. However, in much of Africa, wild prey is becoming rare outside protected areas as livestock herds increase and overgrazing destroys the rangeland for indigenous animals.

Perhaps most disappointing is the attitude of some game departments and national conservation authorities, who still poison hyaenas to protect livestock or in the 19th-century notion that predators are 'bad for the game'. In an echo of Dick the Butcher in Shakespeare's *Henry VI* ('The first thing we do, let's kill all the lawyers') the wholesale slaughter mentality has not disappeared; one African wildlife department planning to eliminate 80 per cent of the hyaenas from a park, just in case they eat a rhino calf. (Would all those snares have a greater influence on the rhino's survival, I wonder?) In the mid-1970s, experiments in the Kruger National Park showed that, because females are reluctant to leave their home territory and female kin,

spotted hyaenas are remarkably slow to recolonise areas from which they have been exterminated.

What can we do to help the hyaena? Go and look for them! Next time you are on safari, tell the guide that you are tired of boring old lions and want to see hyaenas instead. Ask to be taken to a den in the late afternoon and watch as the females mosey in to nurse their young and socialise. See how dominant females harass lower-ranking ones, teaching cubs their place in the clan hierarchy. Watch while they fondly greet each other and try to tell males from females. Admire the rare, brave male who dares to approach a female for a fleeting sniff. If you are lucky, you may see them gather for the evening hunt before melting into the bush. If wildlife authorities thought that people were interested in hyaenas, perhaps they would make a greater effort to understand and conserve them. Oh, and above all, boycott *The Lion King*. ■

*Laurence Frank has a BA from Reed College, an MSc from the University of Aberdeen and a PhD from the University of California at Berkeley. He has been a research associate at Berkeley since 1984, first as part of the Berkeley Hyena Project and currently in the Museum of Vertebrate Zoology. He spent 20 years studying the behavioural ecology and behavioural endocrinology of spotted hyaenas before turning to conservation research. He currently directs the Laikipia Predator and Kilimanjaro Lion Conservation projects.*