

Cheetah Information

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A. Comparative Information

CHEETAH (*Acinonyx jubatus*)

- Distinctly different from other cats in anatomy and behaviour: fastest animal on land, it is the felid version of the greyhound.
- Long-legged, slender bodies are built for speed not power or strength.
- Much smaller and lighter than lions.
- Cheetahs on average are 8 cm taller than leopards; male leopards normally outweigh male cheetahs but female leopards usually weigh less than female cheetahs.
- Jaws not as large and strong as leopard or lion.
- Blunt claws are semi-retractable and straighter than other cats.
- Black 'tear marks' run from copper-coloured eyes to mouth.
- Single, round, solid black or blackish-brown spots cover most of body.
- Not good tree-climbers though they use sloping trees for vantage points.
- Diurnal, hunting in early morning and late afternoon.
- Eyes specialised for day vision; can apparently see detail up to 5-1/2 km away.
- Specialised to prey on the fleetest antelope.
- Hunt prey smaller themselves though male coalitions will sometimes hunt larger animals.
- Stalk within 50m or less of prey before racing at high speed for a few hundred meters and using momentum of speed to knock prey down.
- Almost never scavenge but often have their kills stolen by other predators, especially lions and hyenas.
- Generally solitary animals though males often live together in coalitions.
- Gestation period is between 90 and 95 days.
- Litters range from 1 to 9 cubs (average 3 to 5 cubs).
- Females look after their young alone - cubs do not reach independence until 18 months of age.
- After separation from mother, cubs may associate in sibling group for up to 6 months.
- Average life expectancy in captivity is 10 to 12 years (up to 16); in the wild, few survive beyond 7 or 8 years.
- Cannot roar, but purrs when content.
- Prefers open habitat with broken cover in order to get close to its prey. Avoids forest or woodland with thick understorey.
- Sparsely distributed in sub-Sahara Africa with more living in unprotected areas than in parks and reserves.
- With approximately 9,000 to 12,000 left in the wild, is one of the most endangered big cats in the world.
- The least aggressive of the big cats, cheetahs avoid confrontation and are not a threat to humans.

Body size and proportions:

Total length	Tail	Shoulder height	Mass
180 - 220 cm	65-90 cm	70-90 cm (/Avg: 78-80 cm)	35-65 kg (Male Avg: 45-55 kg) (Female Avg: 35-40 kg)

LEOPARD (*Panthera pardus*)

- More aggressive and powerful than the cheetah.
- More muscular and stocky than the cheetah, with shorter legs, bigger head and jaw, larger canines, and sharper claws.
- Males capable of weighing more than male cheetahs, but most females weigh less than cheetahs.
- Eyes are green with no tear markings on face.
- Rosettes of large black spots with brown centres cover back, with solid black spots on head, legs, sides and hindquarters.
- Coat is more heavily spotted and less coarse than the cheetah's.
- Climb trees to rest, eat, store their prey, and escape other predators.
- Predominantly nocturnal but can be active during the day.
- Eyes, with more light-sensitive cells in retina, are specialised for night vision.
- Opportunistic hunter of everything from insects and rodents to giraffe and buffalo calves--a much broader spectrum than cheetahs.
- Capable of killing prey twice its own body weight.
- Use cover to stalk and pounce on their prey before it can react; do not rely on running at high speed like the cheetah.
- Secure prey by dragging it up a tree or into thick bush or rocks, and will return to feed on kills later.
- Will scavenge kills from other predators and feed on rotten carcasses.
- Usually solitary though a male will occasionally join up with a female and her cubs on a temporary basis.
- Gestation period is between 90 and 105 days (average 100 days).
- Litters range from 1 to 3 cubs (average 2 cubs).
- Cubs stay with mother for 18 to 24 months (average 22 months).
- Unlike cheetahs, females and offspring may continue to associate after separation.
- Life expectancy in the wild is between 15 and 20 years; in captivity, up to 25 years.
- One of 4 cat species that is able to roar.
- Leopards are adaptable to a variety of habitats, including woodland, savanna, bushveld, forest, mountains, and even semi-desert. Prefer areas with good cover.
- Most ubiquitous of African cats; adapts to presence of man better than cheetah or lion.
- Widespread and abundant throughout sub-Saharan Africa though some populations are endangered.
- Leopards can and do attack humans, mainly when trapped, wounded or threatened.

Body size and proportions:

Total length	Tail	Shoulder height	Mass
160-210 cm	60-110 cm	60-80 cm (Avg: 70 cm)	(M) 20-90kg / (F) 17-60kg

LION (*Panthera Leo*)

- Largest of African cats and only truly social cat.
- Much larger and more muscular than the cheetah, weighing up to 4 times more.
- Uniform tawny colour (sometimes reddish or ash grey) with dark-tipped tail. Only males have long mane.
- Predominantly nocturnal, they spend an average of 20 to 22 hours a day resting.
- Will eat anything from mice to elephants.
- Lions use skilled stalking techniques, taking advantage of any cover, followed by short, fast run or charge as prey tries to escape.
- Single lions can kill animals twice their own weight; groups can kill buffalo 4 times an individual lion's weight.
- Most hunting is done by the females and they often hunt together in a cooperative effort.
- Will scavenge and steal kills from other predators.
- Unlike cheetah and leopard, lions are highly social, living in prides of 2 to 40 (average 2 males, several adult females and their sub-adult and young offspring).
- Males, like cheetahs, form coalitions of 2 to 6 to defend territory against intruders.
- Gestation period is \pm 110 days
- Litters range from 2 to 6 cubs (average 3 cubs).
- Breeding is non-seasonal but often synchronized within the pride so several females give birth at the same time. Females will suckle each other's cubs.
- Male lions commit infanticide when taking over a pride to insure they are not protecting another male's offspring and to force females to come into estrous so the new pride males can mate with them.
- Cubs are independent of mother by 18 months, but still depend on the pride for up to 3 years; males are forced to leave pride at 3 but females may stay with pride for life.
- Pride outcasts of same sex often associate with each other.
- Life expectancy in the wild is 10 to 12 years; in captivity, more than 20 years.
- Both sexes roar to communicate with pride members and discourage territorial intrusion by other lions.
- Found in wide range of habitat except most extensive forests and driest deserts.
- Mostly found in parks and reserves; population has sharply declined outside protected areas.
- Along with cheetah, is one of the most endangered big cats in the world; approximately 20,000 left in the wild.
- Present greatest threat to cheetah by killing cubs, stealing kills, and occasionally killing adults.
- Will attack humans under unusual circumstances.

Body size and proportions:

	Total length	Tail	Shoulder height	Mass
Male	2,5 - 3,3 m	60-100 cm	120-128 cm	150 - 260 kg
Female	2,3 - 2,7 m	60-100 cm	75-100 cm	120 -180 kg

B. Appearance

- * The uniqueness of the cheetah is reflected in its scientific name, *Acinonyx jubatus*:
 - Genus *Acinonyx* derives from the ancient Greek words *akantha*, a thorn, and *onux*, a claw, referring to the dog-like claws of the cheetah. An alternative derivation is *a* and *kino*, Greek for 'not' and 'move', perhaps referring to the cheetah's poorly developed ability to retract its claws.
 - Species name *Jubatus* derives from the Latin *iubatus*, meaning 'maned', referring to the distinctive cape of light fur that cheetah cubs are born with.
- * India gave the cheetah its common name. Cheetah is derived from the Sanskrit *citraka*, meaning spotted or speckled. The Sanskrit gave rise to the Hindi word *citta* (species name and plural), and its derivatives, *citto* (male) and *citti* (female). Cheetahs were also called hunting leopards in India.
- * Though it is definitely a felid, the cheetah is sometimes considered dog-like because of its semi-retractable claws, greyhound-like shape, and habit of hunting during the day.
- * Overall coat colour varies from region to region, depending on type of habitat (i.e., Saharan cheetahs are much paler in colour with fewer, lighter spots than other cheetahs).
- * The chin, throat and posterior parts of the belly are white.
- * A crest or ruff of brown/greyish hair up to 70mm on the nape of the neck and shoulders is prominent in some cheetahs and hardly noticeable in others. This ruff helps camouflage the cheetah when it is hunting by blending in with tall grass when the cheetah drops its head below its shoulders while stalking. The ruff is a remnant of the cub's mantle.
- * Coat pattern is distinctive in that no other felid has so conspicuous a pattern of single, round, solid black or blackish-brown spots without any tendency to form streaks or bars.
- * There are an estimated 2,000 spots on a cheetah's coat.
- * Spots are made of longer, finer fur than rest of coat to break up outline of cheetah and help camouflage it in grass.
- * Cheetahs have two distinct black 'tear marks' from the corner of each eye to the corner of the mouth. These tear marks may serve several functions:
 - The tear marks, like all facial markings, serve to emphasize movements of mouth and eyes, enhancing facial expressions, increasing the fierceness of a snarl when the cheetah must defend itself or intimidate a competitor. Black outlines of lips become a continuation of the black tear marks.
 - Facial markings may relate to social grooming by directing the groomer's response to that particular region. Tear marks may serve this function since social grooming is concentrated on the face in cheetahs.
 - Because cheetahs hunt in the morning or late afternoon and early evening, they often have to look directly into the sun; the black hairs may absorb the sun's rays, aiding better vision. (This theory has not been substantiated by any concrete evidence.)
- * The long tail (one-third of the total body length) has spots that merge to form 4 to 6 dark rings at the end. It's conspicuous black and white rings and bushy white tip function as a 'follow-me' signal from a mother to her cubs in tall grass. A female cheetah will raise her tail so her cubs can see it above the grass when she wants them to follow her.
- * Spot pattern on face, ring pattern on tail, and scars and ear nicks are used to identify individual cheetahs in the wild.
- * The cheetah has:
 - Small, round head and flattened face.
 - Small, wide nose, large nostrils and nasal cavity.
 - Small, rounded, low ears on the side of the head.
 - Forward-looking, large and widely spaced eyes for excellent binocular and telescopic vision (field of vision of each eye overlaps). Golden or brown irises.
 - Short, sparse whiskers (as a daytime hunter, has no need for long whiskers).
- * The cheetah's partially retractable claws differ from other big cats:
 - Cheetahs have the physical arrangement of muscles and ligaments to retract and extend claws like other cat species, but due to limited strength and motion in lower forelimbs, retraction is only partial.
 - Cheetahs also lack the protective sheath of skin that hides the claws in most cat species.
 - As a result, their long, straight claws protrude even when retracted and are fully extended when running to act like a sprinter's spikes to maintain grip.
 - Claws on small cubs are sharp but, over time, the tips are worn down from contact with the ground and become blunt and dull like those of a dog.
 - The dewclaw, relative to size, is almost a third larger than the lion's and remains sharp because it is not in contact with the ground.

- * Cubs are smoky grey in over-all colour: darker underneath, with long, silver-grey hair called a mantle running down their necks and backs.
- * The mantle is thought to serve a protective purpose:
 - It may camouflage the cub in grass and shadows, hiding it from predators like lions and hyenas.
 - It may work as a mimicry defense by resembling a ratel or honey badger, a fierce small animal avoided by most predators. The size and gait of a cheetah cub is also similar to a ratel.
 - It also acts as a thermostatic umbrella against sun and rain.
- * King Cheetah
 - First discovered in 1926, when a king cheetah was shot in Zimbabwe.
 - The king cheetah pattern is due to a single recessive gene in both parents. The king cheetah differs from other cheetahs mainly in its different coat pattern, though it is usually larger than normal cheetahs. The king cheetah is the same species as the spotted cheetah, *Acinonyx jubatus*.
 - The king cheetah has spots that run together to form several parallel black stripes down its back and large irregular blotches on its side, slightly resembling a serval.
 - Cheetahs who have a normal coat pattern, but have the king cheetah gene, can produce king cheetah cubs.
 - Cheetahs who have a normal coat pattern, but have the king cheetah gene, can produce king as well as spotted cheetah cubs, but king cheetahs will only produce kings.
 - The king cheetah's hair is usually longer and silkier and its spots tend to stand out more. The mantle also tends to be longer.
 - Extremely rare, king cheetahs may still be found in a few remote areas in Zimbabwe and South Africa as well as the savannas of Burkina Faso. The Ann van Dyk Cheetah Centre specialises in their breeding.
- * Sahara Cheetah
 - Cheetahs found in the Sahara have pale yellowish-sand to off-white coats with faint rusty-coloured spots on shoulders and flanks that darken to black on the back. Spots on flanks and back are arranged in orderly rows running from shoulder to pelvis.
 - In most cats, the black tear marks are completely absent or diffused, and the face is plain with no spots.
 - The top of the head has clustered dark spots.
 - There is also a rare form of cheetah found in the Sahara that is so pale that it is sometimes called a white cheetah.
 - Saharan cheetahs are much smaller than those found in other regions.
 - Due to almost no cover, the Sahara cheetahs flatten themselves on the sand and remain motionless for long periods when stalking prey.
 - The Tuareq nomadic tribe call the Sahara cheetah 'Adele amaya', meaning 'the one who advances slowly'.
 - On the verge of extinction, if not already extinct.
- * Other Variations:
 - A Mughul emperor who ruled India in the 17th century described a cheetah that had small blue instead of black spots on a bluish-white background. It was called a white cheetah and was not an albino, but a mutant of the pigmentation gene.
 - A black cheetah was found in Kenya in 1925.

C. Social Behaviour

- * Cheetahs are said to be "kind of social": females generally live alone unless they have dependent cubs, while males often form coalitions for life.
- * The cheetah's system of solitary females and social males is unique among cats as well as other species of mammals. In no other felid, except the lion, do the males form a lasting bond, probably because reduced competition for females favours asociality in males.
- * There are multiple reasons for group living in an asocial species such as the cheetah and different age-sex classes of cheetahs group for different reasons:
 - Grouping makes males more competitive when fighting for areas of high female density.
 - Grouping allows adolescents to reduce harassment from predators.
 - Grouping in families furthers the mother's reproductive success while cubs are protected from predators and provided with food.
- * There are occasional reports of adult females living together in different regions of Africa, especially in Namibia where sightings of two adult females with and without cubs have been reported. Group sizes in southern Africa may be larger than in East Africa but more research is needed in this area.
- * Most pairs are composed of brothers, but trios may include an unrelated male who has joined two

- littermates.
- * Coalitions are usually composed of 2 or 3 males but can have up to 5 members.
 - * In the Serengeti, 60% of male cheetahs live in coalitions (41% in groups of 2, 19% in groups of 3 or more). Four out of 5 members of coalitions are brothers, with the remainder unrelated males that have joined groups.
 - * Male groups are larger where prey is more abundant, due to the higher survival rate of cubs.
 - * Within coalitions no one male tends to predominate in initiating social activity or hunts and all males tend to share access to food and females.
 - * Coalition partners are very tolerant of one another's close proximity, spending over 50% of their time in contact or less than 1 m apart while resting (in the Serengeti). They rarely separate and call continuously for each other when they do.
 - * Males form coalitions for several reasons:
 - Cooperative defense of best territories through joint scent-marking, chasing off intruders, and fighting when necessary. Coalitions are better able to acquire and hold longer territories in best hunting grounds that are visited by more females. (In the Serengeti, only 4% of lone males held territories while most coalitions acquired territories.)
 - Improved hunting success (ability to hunt larger prey).
 - Greater success in mating with estrous females and passing on genes (since most coalition members are brothers, at least half a male's genes will be passed on to the next generation even if he isn't the one to mate with a female).
 - Greater food intake through hunting of larger prey is a secondary consequence of group living in males.
 - * Cheetahs use places of elevation, including rocks, termite mounds and play trees (sloping trees with large horizontal limbs), as observation points and scent posts.
 - * Scent is the main communication channel among cheetahs and much time is spent searching for and smelling alien scents, and depositing their own scent.
 - * Individual cheetahs can be recognized by their own personal, pungent scent that lasts about 1 day.
 - * Scent marking reduces the number of aggressive encounters between cheetahs by transferring information between them and preventing groups from stumbling on to each other while taking the same routes. Cheetahs will usually alter their direction of movement when they encounter fresh markings of other cheetahs but not if the markings are more than 24 hours old.
 - * Males scent-mark to mark their territories and warn intruders to stay out. Scent may not deter intruders but it will intimidate them.
 - * Females also urine-mark, especially when in estrous, but less frequently than males. A female's urine has no territorial significance but rather shows a high hormone content that attracts males.
 - * Both sexes also defecate on mounds, rocks and trees. Cheetahs will scrape and scuff soil with hind feet into mounds to defecate on.
 - * Leaving claw-marks on trees is not as common as scent-marking or defecating.
 - * Cheetahs have a variety of vocalizations:
 - Two most common contact calls, chirping and churring, are unlike sounds of any other cat and are given alternatively or repeatedly at varying intensity. Both are used by females to summon cubs, by greeting or courting adults, or by cubs around a kill.
 - Chirping is a bird-like call that sounds like a yelp or dog's yip and may be audible for 2 km.
 - Churring (or stutter-calling) is a high-pitched staccato growling sound that carries less distance than a chirp.
 - Bleating or moaning is a distress call, used, for example, when forced to surrender prey to another predator.
 - Growling, snarling, hissing, spitting and coughing are used in anger or fright, but less than other cats.
 - Big cats that roar cannot purr continually, only when they are exhaling, whereas all other cats, including the cheetah and puma, can maintain the purr when taking a breath or inhaling.
 - Purring often indicates contentment, especially when licking or greeting each other, but can also be a soothing vibration when nervous or ill.
 - * Cheetahs tend to be aloof and detached, avoiding close physical contact with each other. They have evolved few interactions that create strong social bonds and most contacts are constrained.
 - * When cheetahs display social behaviour, their greeting ceremony is limited to sniffing, face-licking, and cheek-rubbing. No body-rubbing is involved like lions.
 - * Cheetahs groom each other mainly after meals when their faces have blood on them or after a rainstorm when their coats are wet. Cheetahs purr most often during grooming.
 - * Cheetahs actively avoid looking other cheetahs directly in the face; visual contact is often enough to act as a threat and induce submission without any physical contact.

- * Females not in estrous may behave aggressively toward males, swatting and uttering staccato calls.
- * Though non-associated cheetahs avoid meeting, fights may occur when males gather around estrous females or catch other males in their territory.
- * When threatened, a cheetah will crouch low, snarling with mouth wide open, ears flattened, and eyes glaring upward. At height of display, it will make sudden lunges, stamping or thumping the ground with downward strokes of its front feet, while hissing and moaning.
- * Cheetahs do not pose a threat to human life and are the most easily tamed of all the big cats.
- * Cheetahs are highly vulnerable to interspecific competition with other large predators, including lion, hyena and leopard. This takes the form of direct predation on cheetah cubs, occasional killing of adult cheetahs, and cheetahs being chased off their kills by other carnivores.
- * Interspecific competition is a particular problem in conservation areas where large carnivores are present in high concentrations and is the primary reason so many cheetahs live outside protected areas.

D. Breeding and Reproduction

Breeding

- * Cheetahs produce more cubs more frequently than other large cats.
- * Age at maturity in cheetahs is somewhat earlier than in other felid species: female cheetahs reach sexual maturity between 20 - 24 months and males between 2 - 3 years.
- * The majority of successful breeding for both sexes occurs between 3 and 10 years of age. Females rarely conceive until 3 years of age or rear their young successfully until they are 3 to 4 years old and have gained some experience.
- * Successful parenting has been recorded with cheetahs as young as 2 years of age and as old as 15 years.
- * The cheetah is polyoestrus (having several cycles of between 10 and 21 days in duration). They are most likely induced ovulators (induced by copulation) and none evaluated in a study by Brown et.al. in 1996 were continuously cyclic.
- * Cheetahs do not have a particular breeding season, though cheetah in the Serengeti appear to show a seasonal birth peak that is correlated with that of the Thompson's gazelle, their primary prey there.
- * About 1 to 2 weeks before she is ready to mate, a female cheetah produces urine and faeces with a high reproductive hormone content whose scent attracts males.
The duration of the estrous cycle of sexual receptivity ranges from 1 to 9 days, though the peak usually only lasts for a couple days.
- * If the female doesn't become pregnant, the mating cycle will repeat itself after \pm 10 days.
- * Cheetahs typically breed every 18 months or so, but females can have litters as often as every 15 to 19 months. If a female loses her cubs, she will come into estrous as soon as 19 days to 2 months (avg: 3 weeks).
- * Presence of males and inter-male aggression may trigger estrous in females, though overt aggression between males in a coalition rarely occurs.
- * Signs of estrous in the female include:
 - Rolling on the ground and rubbing on objects.
 - Increased sniffing of trees, bushes and grass.
 - Increased urine-marking, up to every 10 minutes.
 - Genital licking and keeping tail erect.
 - Tree-clawing.
 - Vocalizations such as yelping (chirping) and staccato-purring (churring).
 - Interest by female towards the male.
 - Ceasing to feed.
- * Breeding behaviour in male cheetahs includes:
 - Pacing.
 - Flehmen response when smelling female's urine (inhaling through the mouth).
 - Increased urine spraying and urinating or defecating on soil scraped into mounds, all means of keeping other males away.
 - Yelping and staccato-purring.
 - Aggression among coalition members jockeying for mating rights with female (in the end, most coalition members will share mating with female).
- * Intense aggression shown by the male towards the female is an indicator that the female is not in estrous.
- * Courtship behaviour is typified by the male following the female, sniffing the ground where she has sat and investigating the smells. Males will sometimes hang out with a female, guarding and waiting for her to show signs of estrous.
- * The female may solicit or repulse the male. Females prefer breeding with strangers and are highly selective of their mates.
- * The actual courtship may be short or extended, calm or stormy, depending on female's receptiveness and

temperament, and the number of males involved. A group of males is better able to control a female's movement than a single male.

- * Encounters between females and males are usually brief:
 - They may stay together for up to 3 days, but rarely do so more than 24 hours.
 - Actual copulation is infrequent, about every 8 hours, and brief, lasting only a few minutes.
 - Copulation usually takes place at night and often in thick bush if available.
- * Females may be aggressive toward male in pre-mating behaviour, acting defensively or even attacking him. When the female is receptive, aggression will give way to playfulness, chasing and grooming. Males can be aggressive during mating to stimulate receptiveness of females.
- * The female solicits copulation by crouching down and the male approaches from behind. The male maintains a hold on the female's nape while mating, biting her neck as lions and leopards do. Afterwards the female may roll on the ground and groom herself.
- * The male will stay close to her, following and sniffing the ground where she has been, until the female leaves him.

Reproduction

- * The gestation period is between 90 and 95 days.
- * Cheetah litters vary in size from 1 to 10 cubs with an average of 3 to 5 cubs. Average litter size is higher than all other felids except the European wildcat. This may be a response to a relatively short reproductive life and a high cub mortality rate.
- * Birth takes place in bushy thickets, tall grass, rock cavities, or "borrowed" burrows (the Sahara cheetah has been known to use tortoise burrows). Den sites are chosen for the protection they provide for the cubs.
- * The female eats the afterbirth after removing the fetal membrane with her teeth.
- * Cheetah cubs are born blind and helpless, around 150 to 350 grams and up to 30 cm long:
 - Cubs of lighter mothers weigh less than those of heavier mothers.
 - Males weigh more than females.
 - Those in litters of 4 or more weigh less than those in litter of 2 or 3.
- * Relative litter weight amounts to less than 2% of mothers' weight in cheetahs. Low litter birth weights might be an adaptation to minimize the effect of slowing pregnant females when chasing prey
- * Cheetah cubs develop more quickly than young of any other big cat, gaining about 45 grams daily. Males and females grow at similar rates, but cubs in larger litters grow faster than those in litters of 2 or 3 since they are smaller at birth (Caro).
- * Higher individual and litter growth rates for a given metabolic weight than other felids can possibly be viewed as an adaptation for passing through the period of high juvenile mortality risk as quickly as possible.
- * Newborn cubs can move enough to reach mother's teats and suckle, turn their heads, spit and give soft churring calls.
- * Cubs open their eyes between 4 and 14 days (average 10 days).
- * Cubs can crawl in about 2 to 3 days and walk at 3 weeks.
- * For first 6 weeks of their lives, the cubs are hidden in dense vegetation. The mother returns at night to suckle and groom the cubs. If she makes a kill, she'll return immediately to the cubs after eating.
- * The female calls her cubs by chirping, a bird-like sound that may be a mechanism for deceiving other predators.
- * The mother may move her cubs frequently to different dens, carrying one at a time by the nape of the neck. She may move them for several reasons:
 - To keep smells from accumulating and attracting predators.
 - When dens become flea-ridden.
 - To move closer to concentration of game so she doesn't have to travel so far to hunt.
- * Cubs are born with conspicuous colouring: dark (nearly black) underneath and light on top, a smoky or bluish-grey mantle of hair up to 8 cm long that develops from 14 days on and helps to camouflage them in long grass or dappled shade. Colouring of young of most other species is usually the opposite: dark on top and light on the bottom.
- * Dark coat gradually lightens and cubs develop longer, fluffier fur than adults.
- * Spotting is indistinct until 2 months, giving cubs a smoky-grey appearance.
- * Their mantle begins falling out around 3 months, but young cheetahs retain a slightly longer ruff on their necks than adults have.
- * Cubs are born with dark-coloured eyes that lighten with age.
- * Cubs get their upper and lower canines at 3 weeks and full set of juvenile dentition or 'milk' teeth at 6 weeks. Adult dentition or permanent set of teeth appears around 8 months and is fully erupted by one year.
- * Cubs will nurse from 2 to 4 months, with weaning usually beginning around 6 weeks, but will occasionally suckle over 5 months if hunting is good.
- * Cubs begin eating meat at 4 to 6 weeks. Regurgitation of food from the mother to her cubs has been observed in captivity but isn't thought to be a normal habit in the wild.

- * At 6 weeks, the cubs begin following their mother, but return to their den until about 8 weeks. After 8 weeks, they will follow her continuously, bedding down for the night wherever they are.
- * From 6 weeks to 3 or 4 months is the most vulnerable time for cubs, with predation and starvation being the major causes of death. Cubs also succumb to disease and even grass fires in places like the Serengeti plains.
- * Cubs are most vulnerable to predation while still in the lair or when left alone for long periods of time while their mother hunts. Once emerged from the den, they can be seen from a great distance and up to about 5 months, lack the motor coordination to react quickly and run from danger.
- * Young cubs show a remarkable failure to recognize danger and respond to other carnivores ahead of time, with the normal response being to scatter when their mother runs.
- * By the age of 5 or 6 months, cubs are more aware of the presence of predators and respond by sitting still or running directly from the danger instead of exploding in all directions. They are usually able to out-sprint most carnivores except other cheetahs.
- * Mothers with newly emerged cubs spend a greater proportion of the day observing their surroundings and are more vigilant during the midday rest period; these measures decline as cubs grow older.
- * A cheetah mother will attack smaller predators and even charge hyenas and leopards that threaten her cubs in order to allow them time to escape; however, she will only be able to make mock rushes and moan when cubs are approached by a lion.
- * The mortality rate among cheetah cubs is extremely high and survival rate is affected by amount of bush available for cover:
 - On the Serengeti plains, where there is little cover to protect cubs, less than 5% reach adulthood and predation accounts for over 70% of mortality from known causes. 72% die before emerging from the den at 6 to 8 weeks and of those who leave the den, 83% die before reaching 14 months.
 - In Nairobi NP and the Kalahari, 50% of all cubs die before reaching 6 to 8 months.
 - In places like Kruger NP and Phinda Game Reserve, where the brush is thicker, the survival rate is higher (about 35% in Kruger and 70% in Phinda) despite the presence of other predators).
- * In the Serengeti, of all cubs killed by predators, lions kill about 82% and spotted hyenas about 12%. Lions are responsible for most cub deaths in the den and hyenas kill a slightly higher percentage once the cubs have left the den.
- * Recent evidence has shown a decrease in cub mortality in the Serengeti in conjunction with a drastic reduction in the lion population due to an epidemic of canine distemper during the 1990s.
- * In Namibia, where large predators are mostly absent, cub survival rates are much higher.
- * Male cheetahs are not known to practice infanticide like lions. There is no benefit to them since females are non-territorial and may be hard to locate when coming into estrous.
- * A remarkable feature of female behaviour is the willingness to adopt unrelated cubs. Unlike other cats, a female cheetah will tolerate unrelated cubs, though she clearly distinguishes between them and her own cubs. Perhaps the female cheetah's non-territorial nature and docility toward other cheetahs predisposes it to being exploited by lost or orphaned cubs.
- * Young cheetahs play spirited, athletic games to release pent-up energy. Stalking, pouncing, chasing, boxing, wrestling, and tug-of-war are all common games. Cubs also climb trees and play king-of-the-mountain on any available mound.
- * Play is more related to hunting tactics than fighting: the most common form of play, beginning at 3 months, is chasing and swatting at each other's hindquarters, the typical way of bringing down prey.
- * Older offspring of 10 months or more take a more active role in observing surroundings and detecting predators, and show levels of vigilance approaching those of adults. As a consequence, mothers benefit from reduced personal vigilance.
- * When cubs are around 18 months old, the mother leaves them. There is no gradual transition to independence and the separation is abrupt and sudden.
- * Females' long-term reproductive considerations are the most important factor causing families to split up and mothers have more to gain from leaving their family than their offspring. A female must put on more fat before her next reproductive bout without competition for food from her cubs.

Adolescents

- * Adolescents usually remain in a sibling group called a sib-group for up to another six months after separating from their mother. In the Serengeti, almost 80% of a sib-group's home range falls within the natal range.
- * At \pm 2 years as females come into estrous, they will leave the group. Young males may remain together, forming a life-long coalition, or separate. Inbreeding avoidance probably prevents continued association with brothers once young females become reproductively active.
- * In the Serengeti, females leaving their sib-group remain within their natal range, overlapping with their mother's by over 60%.
- * Some young males in the Serengeti stay within their natal range until they are 3 years old while others move away immediately after independence. Males usually establish territories some distance from their natal range.

- * Littermates benefit from staying together after independence in the following ways:
 - Individuals are more relaxed and less vigilant, allowing them to rest more often.
 - Cheetahs living in groups are harassed less by other predators, with fewer chances of injury or death.
- * In the Serengeti:
 - Mothers leave their cubs at an average of 18.2 months.
 - Offspring stay together in a sib-group for an average of 6.7 months.
 - Females leave their littermates between 23 and 27 months of age.
 - Females first conceive at an average of 37.3 months of age.

E. Life Span

- * The average life expectancy for cheetahs in captivity is 5 to 10 years; some cheetahs may live up to 16 or 17 years and a few have survived to 20 years.
- * Major causes of death in captive cheetahs:
 - Kidney disease/liver disease (symptoms of FIP).
 - Gastro-intestinal disorders, including enteritis and colitis.
 - Feline infectious peritonitis (FIP), a fatal corona virus disease.
 - Trauma.
 - Respiratory diseases.
 - Heart disease.
- * In the wild, few cheetahs survive longer than 7 or 8 years though they can live to 10 or 12 years.
- * Fewer than 50% of adult males survive to old age, due to fighting over territorial and mating rights. There is generally a higher ratio of adult females to males in wild populations.
- * In the Serengeti, male lifespan averages from 6 to 8.5 years. There is no evidence that males in groups live longer than single males, though territorial males tend to live longer than non-territorial ones. The estimated mean life expectancy for females is 6.9 years (Caro).
- * In conservation areas, the main causes of adult deaths are disease, starvation and injuries.
- * The life span of cheetahs varies according to their circumstances (i.e., availability of food, danger from other predators, intensity of territorial conflicts, conflict with humans, bloodline and gene pool).
- * Longevity in cheetahs is relatively short for their body weight in comparison to other felid species.

F. Food and Hunting Behaviour

- * The cheetah is a fast, frequent, and successful hunter, and a speedy swallower, adaptations that help counter losses to scavengers and other predators.
- * Its specialised hunting behaviour is a product of innate behaviour traits and learned components.
- * Cheetahs are not born with the knowledge of how to stalk, pull down, and kill prey, though they have the inherent ability to do so. They must go through a long training period, watching their mother and eventually helping to kill prey before they can hunt on their own.

Eating and Drinking Habits

- * Cheetahs are far more flexible and versatile hunters than often portrayed, taking around 50 different prey species, compared to over 100 for leopards. Ungulates comprise 80 to 99% of their diet.
- * Favourite prey includes small to medium-sized antelope such as gazelle, impala, springbok, duiker and dik-dik, young antelope and warthog, game birds, young ostrich, and hares.
- * The cheetah is limited by its own size, strength and physical traits in what prey it selects, but primary prey is small to medium-sized antelope up to 50 or 60 kg (ideal size is around 30 kg).
- * Females and single males hunt smaller prey, while coalition males may tackle larger animals like zebra, waterbuck, or young giraffe and hartebeest. Females with sub-adult cubs may also take on larger prey.
- * Some cheetahs specialise in one type of prey animal and may pass specialisation down to the next generation. Local habitat conditions will often influence a cheetah's diet (i.e., gazelle in the Serengeti, impala in Kruger, nyala in KwaZulu-Natal, etc.).
- * Females usually avoid largest herds of prey because these tend to attract other predators, but instead concentrate on intermediate concentrations that are less conspicuous.
- * Bulk of cheetah prey is in good condition; they don't necessarily select weak animals, but rather focus on lone animals that are less vigilant, away from the herd or near cover. Chosen victim is pursued to the exclusion of others.
- * Failure of an individual in a herd to respond in the same way as the others also increases its chances of being singled out and killed. If an animal takes flight before the rest of the herd, it will often be attacked.
- * In the Kalahari, nearly twice as many male as female springbok are caught by cheetahs, due to their greater vulnerability to predation--springbok rams are often on their own while maintaining territories.
- * In the Serengeti, cheetahs usually select females from breeding herds and sub-adult males from bachelor herds as they are more vulnerable and tend to flee first.

- * Usually select juveniles under 1 year over adults and will go after young if available. Though there is less meat, fawns and lambs may be chased from 500 or 600 m away with a success rate of 100%.
- * Pregnant females near the end of the gestation period will concentrate on fawns and lambs as well as hares, all prey that's easier to catch.
- * A female with cubs needs to hunt every day and average a kill per day. Solitary males and females without cubs may hunt every 2 to 3 days. Coalition males kill at greater intervals but spend more time feeding on larger carcasses.
- * Due to a greater absorption rate, lactating females eat almost twice as much as non-lactating ones and have to hunt every day to fulfil nutritional needs and feed their cubs.
- * Of the 5 big African predators, cheetahs are second only to wild dogs in hunting success. Both species need a high rate of success because they expend so much energy in the way they hunt.
- * Success rates range from 10 to 70%, depending on prey species and conditions of the hunt, but the average is around 50%.
- * Coalition males and females with cubs are generally the most successful hunters. Hunting success tends to increase with age and experience.
- * Preference for larger prey increases with group size in most species and all segments of cheetah society attempt larger prey under conditions of increasing demand:
 - Adult females when lactating.
 - Adult females with large litters of older cubs.
 - Males in company of other males.
- * Cheetahs often lose prey to stronger predators though they can usually keep jackals and vultures away. In some habitats, up to 50% of cheetah kills are stolen by other predators.
- * Lions and spotted hyenas are the main *kleptoparasites* or 'food thieves', but leopards, brown hyenas and occasionally striped hyenas and baboons are able to drive them from their kills.
- * Cheetahs rarely scavenge and only if it is very fresh; scavenging is too hazardous for a cheetah. Males occasionally scavenge from female cheetahs with cubs and cheetahs will sometimes take over from jackals that are pursuing young antelope.
- * Cannibalism is rare but may occur in exceptional cases, though some males killed in territorial disputes in Phinda Game Reserve have been consumed by the victors.
- * An individual can consume up to 16.5 kg at one sitting and then go several days without eating. Daily food consumption is estimated at 3 to 4 kg. The average amount of meat in a cheetah kill is 4 kg.
- * In the Serengeti, lactating mothers will eat from 1.5 to 3 kg of meat per day; females with older offspring may eat as little as .5 kg per day due to competition from their large cubs. Mothers with cubs over 8.5 months feed for an average of only 27.5% of the family's total feeding time on a carcass.
- * A group of 4 cheetahs can consume an entire impala in about 15 minutes.
- * Cheetahs are well adapted to living in arid environments and even when water is available, will drink at irregular intervals.
- * In the Serengeti, they regularly go 4 days between drinks of water and will travel 5 to 10 km to water if necessary. In the Kalahari, they can go up to 10 days without water and have been known to travel as far as 82 km to water. Two males once covered 252 km in 20 days without drinking water, but made 2 kills during that time.
- * Cheetahs obtain much of their moisture requirements from drinking blood from the cavity of kills. In an emergency, they will drink urine of prey or in the desert will obtain moisture from tsammah melons.
- * Presence of water is critical for lactating females.
- * Cheetahs obtain minerals from licking mud or licking their fur after rolling in sand.

The Hunt

- * Cheetahs use their outstanding sight to hunt in the early morning and late afternoon, though they will hunt during the day if the opportunity arises and they are really hungry. Reports of cheetah hunting on moonlit nights have been recorded though this behaviour is unusual, except in the Sahara and Kalahari where they may hunt during the night to escape the intense heat of the day.
- * Cheetah require cover to reach the critical distance between themselves and prey; in areas with little or no cover (such as Serengeti plains), it is much more difficult to catch adult antelope.
- * Before beginning a hunt, a cheetah will often use observation points to gaze over the surrounding area to locate and size up prey. While moving, it frequently stops and looks around to find and keep prey in sight.
- * When a cheetah sights prey, it will stop and tense, often lowering its head to shoulder level and pricking up its ears.
- * A cheetah uses any cover available in its path to approach prey, stopping and standing motionless with eyes riveted on prey for up to 10 minutes if the prey becomes nervous. A cheetah may even drop to the ground, sitting or lying crouched, until prey relaxes again.
- * Cheetahs approach from rear or side of prey, but don't take wind direction into account. Stalking can take from a few minutes to over an hour or more.
- * Sometimes cheetahs won't bother to conceal themselves, and trot or run casually toward a herd across open

- ground from 100 to 200 m away.
- * In dense bush, however, cheetahs use element of confusion or surprise more than speed, going from thicket to thicket, flushing out hares, dikdik, steenbok or other small antelope. Young inexperienced cheetahs often use this technique.
 - * Whatever strategy is used, cheetah get as close as possible to prey before charging (within 50 or 60 m, but preferably within 30 m).
 - * Flight of prey is the trigger that usually identifies the target and sets a cheetah off on its chase.
 - * Cheetahs won't go for antelope that are standing still as they need the momentum of their speed to knock down larger prey.
 - * The initial burst of speed may be up to 95 km/h, but the average speed during chases in the Serengeti is about 87 km/h. Speeds of up to 120km/h have been recorded.
 - * A cheetah can only sustain high speeds for around 300 to 400 m before beginning to over-heat and tire (the lion's usual limit is only 50 to 100 metres). Average chase lasts about 20 seconds, rarely over 1 minute.
 - * In the southern Kalahari, the average distance for successful chases is 218 m and the longest successful chase recorded was 550 m. The average distance for unsuccessful chases is 122 m and the longest unsuccessful chase recorded was 650 m.
 - * Cheetahs match every move of their prey, instantly changing direction, even in mid-stride, after swerving and jinking prey.
 - * As the cheetah closes in on its prey, it uses its forepaw to slap the animal's shoulder, thigh or rump, and knock it off balance. Or it will use its razor-sharp dewclaw to hook the leg out from under prey, tripping it into a somersault or flip. The dewclaw can inflict a severe wound and further weaken the prey.
 - * When larger prey falls, the cheetah clamps its jaw on the victim's windpipe or trachea in a strangulation hold. The cheetah's mouth is so small that it must strangle from the ventral side of the prey's throat.
 - * On smaller prey, a cheetah may suffocate by gripping muzzle, dislocate vertebrae or crush braincase of very young animals with a precision bite to the neck, or simply break its prey's back through a strangulation hold.
 - * Cheetahs usually remain at a right angle to prey during kill to avoid dangerous hooves or horns. They hold their prey down with forelegs and mouth, twisting the head so horns point to the ground.
 - * Prey can take 2 to 25 minutes to die (average 4 to 5 minutes), and then the cheetah must recover for up to 30 minutes before actually eating. It may or may not drag prey to nearby shade or cover.
 - * Cheetahs open the carcass by shearing the belly skin with their carnassials or cheek teeth
 - * They eat quickly, constantly glancing around for predators or scavengers. Unlike other cats, they don't hold meat between forepaws, but gnaw or tear off large chunks. A cheetah eats on the side of its mouth, pulling and tearing the meat. The back teeth (molars) are used for cutting and grinding.
 - * Generally, muscle of the thighs and buttocks is eaten first, then the abdomen, rib cage and shoulders. Heart and liver are eaten and blood is lapped up from the body cavity for nutrition and water.
 - * The intestines are usually discarded and most of the articulated bones, skin and head are left. Bone of young prey will be crushed and eaten, even by cubs as young as 6 months.
 - * However, Schultheiss et.al. (1998) suggest that cheetah start eating on the ventral surface - eating the liver, kidney, heart and lungs before the back musculature. Phillips et.al. (1993) report that cheetahs gnaw through the skin and rib cage to feed on the brisket and internal organs of the prey.
 - * Cubs eat immediately while the mother rests. If too young to open the carcass, the mother will do it for them.
 - * When several cheetahs feed together, they form a star shape around the kill and generally feed in an orderly manner with little squabbling (unlike lions). Male coalitions will sometimes exhibit low-level aggression over small or intermediate-sized kills.
 - * Cheetahs usually finish eating in one session and move off, probably to avoid contact with larger scavenging predators. However, there are some exceptions to this behaviour:
 - In Nairobi NP, cheetahs have been known to eat part of their prey, cover it with grass and return later. This is unusual as cheetahs rarely return to kills.
 - If undisturbed, cheetahs have been observed spending as much as 11 hours at large kills, resting and grooming in between multiple feeding sessions. This behaviour has been observed in Namibia where lions and hyenas have been eradicated from farmland.
 - Females with cubs will sometimes cover a kill with grass, leaves or soil while fetching cubs to feed.
 - * If a hunt fails, a cheetah usually has to cool down at least 30 minutes before trying again.
 - * Reasons for failure include:
 - Starting the chase too far away; prey detecting cheetah or wandering away.
 - Prey eluding cheetah through erratic flight pattern (zigzagging).
 - Dense vegetation or difficult terrain adversely affecting a chase.
 - Cubs alerting prey.

Hunting Methods

- * Cheetahs primarily use 3 methods of hunting:
 - Stalking to within chase range of prey.

- Running from 100 to 200 m to within chase range of unsuspecting prey before being detected.
- Walking openly toward alert prey to get close enough (within 50 m) to select victim and chase.
- * When approaching a herd, a cheetah waits until all animals are feeding or looking the other way. It acts more and more cautious as it gets closer.
- * A cheetah starts the chase by trotting a few steps, breaking into a run and then attaining full speed of chase almost immediately. It only runs at full speed after selecting a particular animal.
- * The open approach, whether walking or running, is used when the cheetah fixes on 1 individual that runs first or stands out from the herd.
- * Some species (giraffe, crowned cranes) will watch or even approach a cheetah in the open. This behaviour, called "mobbing", may alert potential prey of the cheetah's presence.
- * Prey are captured in several ways:
 - Larger prey are struck with forepaw and bowled over.
 - Medium prey are slapped or hooked with dewclaw, throwing them to the ground or flipping them over.
 - Small prey are overcome from above and behind as cheetah catches up, batted aside by forepaw and grasped.
- * The faster prey is running, the easier it is for the cheetah to unbalance or trip it.

Hunting Development of Cubs

- * The mother cheetah goes through 3 stages in raising her young:
 - Feeding the cubs from birth to 6 months.
 - Teaching the cubs, age 6 to 12 months, how to hunt while providing most of the food.
 - Hunting with the cubs from 12 months on.
- * Chasing prey may be instinctive, but cubs must learn how to bring prey down, how to direct a bite at the throat, and how to hold victim until it stops kicking, all from watching adults.
- * Cubs learn the stranglehold from watching their mother kill and practice it through play by biting napes of siblings. They sometimes stop eating to imitate stranglehold on dead prey.
- * Mother cheetah uses every opportunity to teach offspring how to hunt by:
 - Releasing stranglehold of prey not yet dead and letting cubs finish it off.
 - Bringing small live animals (fawns, hares, etc.) back to cubs as young as 4 months old to kill.
 - Running slowly during initial chase of prey, allowing cubs to overtake and bring prey down themselves.
- * When teaching cubs to hunt, the mother:
 - With cubs 3 to 4 months old, lets prey go for 5 to 15 minutes while cubs attempt to knock it over; mother normally intervenes and kills prey.
 - With cubs between 5 and 7 months, releases almost one-third of prey caught, allowing cubs to sometimes suffocate prey themselves.
 - With cubs over 10.5 months, about half the prey is eaten alive by cubs before the mother is able to complete the kill.
- * Cubs begin accompanying mother on hunts from 3 to 4 months. She conceals them when prey is spotted and induces them through vocalizations to remain hidden. If hunt is successful, she calls them to the kill.
- * Occasionally, cubs will alert the prey by standing up or moving forward too soon. In the Serengeti about 16% of mothers' hunts fail because of cubs' activities.
- * Cubs start taking a more active role in the hunt from 6 to 7 months and will sometimes follow mother during chase, not staying behind to be called. While mother is strangling prey, they may help by holding the animal down with paws or with a bite to the flank, or will start eating immediately.
- * Cubs will attempt catching and killing small animals on their own from 7 months with little success. They may occasionally catch and kill hares they have flushed out.
- * The second phase of cub-rearing is the most difficult for the female cheetah. The cubs are growing and require increasing amounts of food but are not able to contribute much to the hunt. The female must spend a lot of time teaching them to hunt and they sometimes scare game away and disrupt hunts.
- * Small and medium-sized birds make up majority of inappropriate prey for young cubs. Small carnivores make up majority of inappropriate prey for middle-aged and older cubs, with jackals being favourite targets.
- * Cubs don't take substantial responsibility for initiating hunts until they are over 12 months old, when they are capable of catching and killing prey themselves.
- * At 15 months, cubs are as big or bigger than mother and often take initiative in hunt though they may still need assistance from mother with the actual kill.
- * By 16 to 18 months, cubs are almost fully grown and can usually survive on their own, though they are poor hunters at the time of separation from their mothers and still have much to learn about identity and behaviour of potential prey.
- * Mistakes made by cubs learning to hunt on their own include:
 - Not being properly concealed from prey.
 - Beginning chase at too great a distance from prey.
 - Not watching prey closely enough.

- Stalking animals too large for them.

Hunting Development in Adolescents

- * Young cheetahs improve their hunting skills most after their mother leaves and they hunt together in a sib-group. They rarely starve but initially survive on small prey, such as hares and neonate antelope.
- * Males spend a greater amount of time searching for prey and hunting after independence. While still with their family groups, males tend to rely on their mothers and sisters to stalk and capture prey for them.
- * In mixed-sex litters, females tend to be the instigators in group movement, rousing their brothers to hunt.
- * Adolescents are poor at catching prey:
 - They begin their hunts at greater distances than adult cheetahs and are more often seen by prey during their approach.
 - They let their quarry escape during a chase more often because they hold back and don't press their pursuit.
 - They sometimes require more than one chase to bring prey down.
- * Adolescents in sib-groups attempt to capture larger prey more often than adolescents living alone, resulting in larger prey making up a greater proportion of their kills. Single females who have left sib-groups tend to concentrate more on smaller prey, such as hares and young antelope.
- * There is no evidence of cooperative hunting among adolescent cheetahs in the sense of sib-group members enjoying greater per capita foraging returns than solitary cheetahs. Larger prey items simply compensate for having to share food with siblings.
- * The period between independence and maturity, when hunting skills are honed, is shorter in cheetahs than in other members of the cat family relative to their body weight.

Hunting in Male Groups

- * There is no evidence that males in larger groups hunt more or less frequently or more or less successfully than males in smaller groups.
- * In the Serengeti, because larger male groups show a preference for large prey, these prey items make up a higher proportion of their kills and result in higher foraging returns per coalition member.
- * On average, a male can eat an estimated maximum of 12.5 kg of meat per meal, with 16.5 kg being the largest meal recorded in the Serengeti.
- * In the Serengeti, coalitions usually choose wildebeests while single males pick Thomson's gazelles.
- * Cheetahs rarely cooperate in chasing prey by cutting corners or switching lead positions when companions begin to tire. Thus, prey is no more likely to be caught when it is chased by more than one cheetah.
- * Occasionally males will collaborate by driving defending prey away while a companion is making a kill.
- * There is little evidence that group living in male cheetahs is a result of higher success in hunting or communal hunting. Rather it is a response to intraspecific competition with other male cheetahs over territory and mating rights. Greater food intake is a secondary consequence of group living.

G. Physiology

Speed

- * Every facet of the cheetah's anatomy has been honed to serve one purpose, the chase, and it represents the most efficient biomechanical design for speed in a quadruped.
- * The cheetah's body extends and recoils in rhythmic sequence when chasing its prey, its supple spine alternatively arching and stretching.
- * Small, streamlined head; long, straight, light limbs; powerful hind legs; large, deep chest and narrow waist; flexible shoulders and spine; long muscular tail; and semi-retractable claws all combine to make it the fastest mammalian sprinter on earth.
- * Cheetahs can attain speeds up to 110 to 120 km/h (approximately 70 to 75 mph) though average speed during a chase is more like 85 km/h. A human sprinter runs 100 metres at roughly 37 km/h.
- * Cheetahs can accelerate from 0 to 80 km/h (50 mph) in just 3 seconds.
- * Gazelles can reach speeds up to 90 km/h but have more stamina than cheetahs.

Stride

- * The key to the cheetah's ability to reach such high speeds is the distance covered in each stride (stride length) and the tempo at which they take a stride (stride rate):
 - A stride can be defined as the distance an animal covers once every foot has hit the ground once.
 - As the cheetah speeds up, the distance covered per stride increases but the time taken for a complete stride remains the same at a little under a third of a second (about three and a half strides per second).
 - At top speed, a stride can measure just under 10 metres (32 feet), allowing the cheetah to cover over 34 metres (112 feet) in 1 second.
 - The higher speed at which the limbs are moved provides enough energy to raise the body into the air and propel it forward out of contact with the ground.
 - For more than half of every stride, the cheetah is airborne and as speed increases, the floating phases increase in length, thus increasing the stride length.
- * An increased stride length results from:
 - Elongated legs: the femur and tibia, and the humerus and radius differ very little in length (as is true in greyhound dogs). Other felid species that depend on strength rather than speed have proportionally shorter lower limbs than upper.
 - The scapula is pushed in to give slightly more length to the front legs.
 - Longest and most flexible spine of any large cat; half the muscle mass on a cheetah is packed onto its spine, which allows it flex and extend.
 - Long, narrow, rectangular scapula as opposed to wide and fan-shaped scapula in other felids.
 - Hip bones that pivot in their sockets.
 - Two phases per cycle when body is floating above the ground: extending body fully as the fore limbs are protracted (extended) and flexing it as the hind limbs are brought forward (flexed).
 - Hind legs that push sequentially rather than together.
- * An increased stride rate results from:
 - Limb bones that are thinner and lighter than other cats. Bones of lower limbs and paws are slender and light.
 - Muscles that do most of work are bunched high on each leg, close to body, and light ligaments transfer muscular action down limb without need for heavy muscles on lower legs.
 - To ensure stability and strength at high speeds, fibrous ligaments tightly bind fine bones of the lower leg (fibula and tibia) in a rigid unit.
 - It's a compromise that restricts the amount of rotation of the lower limb, crucial for resisting stresses during the chase and allowing the cheetah to make sudden turns at high speed.
 - As a result, the paws aren't very good at anything other than running.
- * A cheetah's back is hyper-extended going into the extended phase of a stride, allowing the hind legs to push against the ground longer and the fore limbs to reach out further. This phase is longer than the flexed phase.
- * In the flexed phase of a stride, the back bows so deeply that the hind legs actually come forward ahead of where the fore limbs last landed; thus, extra ground is covered between strides.
- * A cheetah can change lead the instant before its forefoot strikes the ground, so it can turn immediately after zigzagging prey. Its long muscular tail acts as a counterbalancing rudder or stabiliser when making fast, sharp turns so it doesn't roll over or spin out.

Shoulders

- * The cheetah's shoulders or scapula are free to swing back and forth or rotate in broad, fluid arcs, increasing the length of the fore limbs and thus each stride.
- * Shoulder structure:
 - A small clavicle or collar bone is embedded between 2 muscles but has no bony attachment to the body.
 - Without attachment via the clavicle, shoulders and forelegs have no bony connection to the body.
 - Body is supported between 2 forelegs in a muscular sling that extends on each side from inside the scapula to the middle of the chest.
 - Support of body in muscular sling allows forelegs to swing freely in bigger arc and also acts as a shock absorber to cushion landing after leap
 - Cheetah's scapula is more elongated than any other cat species and the muscle attachment on the inner surface of the scapula is unusually deep and narrow to facilitate running (in the leopard, it is wide and shallow to facilitate climbing).
 - Cheetah's shoulder anatomy is a compromise: scapula is free to rotate, lengthening each stride, but a small clavicle provides support when cheetah drags prey down with forepaws.

Feet and Claws

- * A cheetah's feet show several modifications:
 - A cheetah's pads are less rounded than other cats and resemble a dog's; they are small and tough with edges that aid in gripping.
 - Digital pads and metacarpal pad are extremely hard and pointed at the front, possibly as an adaptation for sudden braking and sharp turning.
 - Palmar pads bear a pair of longitudinal ridges instead of the usual slight impressions, the functional equivalent of tyre treads, serving as anti-skid devices.
 - Pad accompanying large, curved dewclaw is hard and calloused, rather than soft in other cat species.
- * A cheetah's partially retractable claws differ from other cats:
 - Cheetahs retain the physical apparatus to retract their claws, with the same arrangement of muscles and ligaments that extends and withdraws claws in all cat species.
 - However, changes in lower limbs (see under Rate of Stride) to ensure stability at high speed, result in diminished action so retraction is only partial.
 - Cheetahs also lack the sheath of skin that protects and hides the claws of most cat species.
 - As a result, their long, straight claws are not significantly retracted in the rest position and are thus clearly visible on top of each digit.
 - Much blunting is caused by fully extending claws during chase for increased traction. Claws act like cleats on track shoes, providing more grip on the ground and aiding the cheetah's swift, sideways jinking movements as well as helping acceleration.

N.B. There are two other species of cats that cannot fully retract their claws - the Asian Fishing Cat and the Flat-headed cat.

Head and Teeth

- * The cheetah's high domed skull is designed to give its jaws a vise-like grip capable of maintaining a tight throttle-hold for 20 minutes or more. A steep angle to the face raises the top of the skull and eyes, helping clamping action of jaws.
- * A reduction in the size of the roots of the upper canines allows a larger nasal aperture for increased air intake during exertion and for panting through the nose while strangling its prey.
- * Canines are short, rounded and sharp, with little space between them and the rest of the teeth.
- * Canines don't need to be long as their function is to hold prey by the throat during strangulation. Except for small prey, cheetahs don't use their canines for severing the spinal cord at the nape of the neck like other cats in the typical felid neck bite.
- * More posterior teeth are large with expanded cusps to aid in crushing grasp on throat of prey.
- * Flat face and reduced muzzle length allow the large eyes to be positioned for maximum binocular vision.

Endurance

- * A cheetah's propulsion comes almost entirely from muscular force, mostly from its strongly muscled hind legs, restricting its stamina and causing it to tire quickly.
- * Cheetahs can only maintain top speed for between 300 to 500 m. Most chases average 300 m in length and last about 20 seconds (rarely more than 1 minute).
- * If a cheetah fails to catch its prey after 300 m, its breathing rate goes up to 150 per minute and it has to cool down for 30 minutes or more.
- * A cheetah's body has been measured at 40 C during a 400 m sprint. Cheetahs haven't evolved the evaporative heat release mechanisms of gazelles though panting is a means of cooling down.
- * Heavy, rapid breathing after a chase is indicative of enormous energy expenditure and oxygen debt. Breathing rate during a chase may increase ten-fold from what it was at rest.
- * Breathing rates for cheetahs have been recorded at:
 - 16 breaths per minute for a resting male.
 - 156 breaths per minute for a male after a chase.
 - 140 breaths per minute for a female after a chase.
 - 195 breaths per minute after field immobilization.
- * A cheetah's normal heart rate is 100 beats per minute. The average heart rate for a 25-year-old human is 60 to 70 beats per minute (120 max, 185 extreme).
- * Nasal passages, lungs, heart, liver, arteries, and adrenals are all enlarged:
 - Large, broad nostrils and sinus cavities allow more oxygen exchange and also allow cheetah to pant through their noses while strangling prey.
 - Large lungs move oxygen more quickly throughout the body.
 - Big heart increases respiratory rate, enabling blood to move from the lungs to the muscles rapidly.
 - Highly muscular arteries allow for maximum delivery of oxygen.

H. Habitat and Territory

Habitat

- * Cheetahs can be found in open plains, woodland, savanna, scrub-savanna and highlands up to 2,000, as well as arid regions extending to desert fringes. They avoid woodland with thick understorey and tall grass as well as dense forest.
- * Habitat is determined more by abundance of prey and lack of other big predators than by terrain and vegetation.
- * A balance of cover and visibility is important. Optimum cheetah habitat includes some cover in the form of bushes, medium-length grass, trees and broken ground, though they can survive on dry, open plains, such as parts of the Serengeti.
- * Cheetah have greater hunting success in wooded country than on open plains.
- * They also tend to be more successful in arid areas where there are few or no lions and hyenas. They formerly penetrated deep into the Sahara from areas north and south.

Home Ranges and Territory

- * The cheetah's social and ranging behaviour is unique among cats: solitary, nomadic females and generally social, sedentary males (some males are nomadic).
- * The cheetah's system of land tenure is not completely straightforward. In some areas, they are residential and in others, migratory, depending on location of prey (in the Serengeti, they concentrate seasonally in association with migratory movements of Thompson's gazelle, their primary prey).
- * Unlike most other large cats, females don't establish and defend territories, and male territories tend to be much smaller than larger female ranges:
 - Males generally defend small discontinuous territories (37 to 80 sq km) that overlap with ranges of several females (territories in Namibia are much larger due to larger female ranges).
 - Females are not territorial but roam over large home ranges (50 to 3,000 sq km) that overlap with those of other females whom they avoid. Though they don't defend their ranges, they sometimes mark by urinating or defecating on termite mounds.
- * Males in strategically sited territories, where females aggregate for purposes of feeding, are usually ensured of a good supply of potential mates. Male dispersion is influenced by female dispersion patterns, which are influenced by concentrations of prey and adequate cover.
- * Females pass through several male territories during circuit of their own ranges, but non-territorial females make it more difficult for males to locate them and males have to home in on 'hotspots' that attract females and use multiple tactics to secure matings.
- * Dispersion pattern of prey determines the size of female home ranges:
 - Where prey is migratory or nomadic (Serengeti or Kalahari), ranges tend to be large (from 300 to 1,500 sq km, with an average of 833 sq km in the Serengeti).
 - On Namibian farmlands, where prey can be sparse, females may range from 1,200 to almost 4,000 sq km.
 - Where prey is more sedentary and evenly dispersed (Kruger), ranges are much smaller (100 to 200 sq km).
 - In Nairobi NP, females with cubs use a smaller distinct range of only 58 sq km.
- * Dispersion of females generally determines the size of male territories:
 - In places like the Serengeti, and Kalahari, male coalitions establish small territories of less than 50 sq km in areas where females regularly visit.
 - In Kruger NP, male territories coincide with smaller female ranges and in Phinda, male territories are actually slightly larger than small female ranges: between 60 and 100 sq km.
 - In Namibia, male home ranges average around 2,000 sq km though territories that they defend are much smaller.
- * Females in the Serengeti:
 - Establish ranges large enough (up to 1,000 sq km) to encompass both wet and dry season ranges of their primary prey, Thompson's gazelle.
 - Some females only need 50 to 65 sq km where gazelle remain during both the wet and dry seasons.
 - Where gazelle are highly concentrated, female ranges overlap considerably.
 - Females follow gazelle from end to end of their ranges and often move into male territories.
 - It is the patchiness of prey, not low prey density that accounts for expanded female ranges.
 - When female cubs leave their mothers, they usually remain within the maternal home range but stay alone, avoiding each other (daughters tend to overlap more with their mothers' ranges than with each other). Up to 20 females have been counted using the same area.
 - When male offspring emigrate, they wander long distances while maturing and trying to establish territories of their own.
- * Males in the Serengeti:

- Establish small territories from 37 to 78 sq km with no overlap and sharp boundaries, which they defend. These small territories are centred in areas with prey and cover that attract females.
 - Males defend their territories but may range outside them, especially when following migrating herds of Thompson's gazelle or females, usually for 1 or 2 days, but sometimes up to several weeks.
- * Of all resident males in the Serengeti:
 - 41% live alone.
 - 40% live in pairs.
 - 19% live in larger groups.
 - * Ability to acquire residence on a territory is the principal benefit of coalition membership. Non-relatives often join forces with brothers when 2 or 3 years old to take over a territory or fend off a challenge from intruders.
 - * Coalitions have the competitive edge in fights, are better able to acquire territories, and are less likely to be ousted from territories than single males.
 - * In the Serengeti, only about 4% of single males ever hold territories.
 - * Single males normally acquire a territory only when a vacancy appears and are less likely to displace residents from territories than are coalitions.
 - * Body size and age are key factors that determine if a male will become territorial or not. Territorial males are never adolescent and young adult males are only able to hold a territory if they are unusually large for their age.
 - * Nomadic or 'floating' males travel continuously and extensively, always on the move and cautious to avoid contact with territorial holders who might kill them.
 - * Floaters range over much larger areas than territorial males. Their ranges in the Serengeti averages 777 sq km and they sometimes make excursions up to 20 km away before returning to their own ranges (possibly searching for mates).
 - * Non-territorial males may be as likely to encounter females as territorial ones, but single floaters are usually unable to compete with coalitions for mating rights.
 - * Nomadic males tend to be more alert, nervous and ill at ease than territorial males. Extensive ranging associated with the floating lifestyle often results in poor condition. Compared to resident males, they tend to:
 - Weigh less and have thinner vertebral musculature.
 - Have elevated cortisol levels, indicating physical or physiological stress, resulting in suppressed immune systems and greater susceptibility to disease.
 - Have higher white blood cell counts, suggesting higher levels of chronic bacterial or viral infection.
 - Suffer from a broader range of parasitic infections and allergic respiratory diseases.
 - Have coarser coats and suffer more often from mange and hair loss.
 - Suffer from ulcerated mouths, skin lesions and abscesses.
 - * Non-resident males have less chance of survival than residents, as they are more prone to injury or death from fighting as well as poor health. In the Serengeti, resident males live almost 2 times as long as floaters.
 - * Males patrolling their territories visit the same spots on a regular visit, sniffing and scent-marking. Marking doesn't deter intruders but it may intimidate them.
 - * Scent lets an intruder know that a territory is occupied and males will mark repeatedly over the scent-marks of other cheetahs. Marking locations vary from 30 to 50 m in dense cover and 50 to 100 m on the open plains to as much as 1.6 km apart in the southern Kalahari.
 - * Male cheetahs scent-mark in several ways:
 - Directing a jet or spray of urine mixed with glandular secretions against prominent objects, such as trees, rocks or termite mounds, while using their hind feet to scrape or tread at the same time.
 - When spraying, males use the tips of their tails to locate the marked object and direct the jet of urine behind them.
 - Sometimes urinating close to the ground in a half-squatting posture, followed by repeated raking of the hind feet over and around the urine.
 - Defecating near urine-marked objects or on top of prominent objects. Feces may be mixed with anal gland secretions to convey a range of messages to other cheetahs.
 - * Non-territorial males spend much less time scent-marking than territorial males, who may mark every hour.
 - * Competition over territories is an important cause of mortality. Males don't seek out opportunities to attack other males but rather encounter them during patrols of their territories.
 - * Occasionally males will kill another male cheetah, especially when coalitions attack a lone male or one coalition is out-numbered by another. Group size is the most important factor in the outcome of contests between male cheetahs.
 - * In small areas like Phinda Game Reserve, which can only accommodate 2 or 3 coalitions at a time, territories are defended vigorously and at least 4 males have been killed over the past 10 years.
 - * When male cheetahs fight, they usually flail at each other with a downward motion of one or both paws, cutting with the sharp dewclaw. They also bite each other (sometimes hundreds of times) and there is a record of one male suffocating another, just as he would a prey animal.

Activity and Movement

- * Cheetahs spend most of the day resting and are most active in the early morning and late afternoon. On hot days, a cheetah may spend up to 90% of its time resting in the shade.
- * The hunt is the primary mover in the daily activities of a female with cubs; when they are on the move, it is with the purpose of finding prey. Females with cubs spend a greater proportion of the day moving than lone females.
- * While moving and while resting, they are always alert, on the lookout for prey as well as other predators.
- * In the Serengeti, family groups were found to be active about 5 hours per day, covering 1.5 to 4.5 km.
- * Researchers in the Serengeti recorded the typical activity pattern for a female with cubs:
 - Begin stirring at dawn, sitting up, stretching and yawning.
 - If hungry, begin moving at a leisurely pace in search of prey.
 - If they don't make a kill by late morning, stop and rest during the heat of day.
 - In the late afternoon, become active again and continue moving until they make a kill or bed down for the night at sundown.
 - During the night, rarely move unless disturbed.
- * The great mobility of females means that they cross paths with other cheetahs quite often, and either avoid contact or tolerate the presence of others; separate families have been observed resting together for hours.
- * Male cheetahs have a slightly different activity pattern than females. They will often wander around their territory without searching for prey, on the lookout for intruders, scent-marking, and searching for estrous females. Males and sib-groups will often travel long distances during the night as well.
- * In the Serengeti, cheetah movement is affected by the activity of Thompson's gazelles, their main prey. When the gazelle are migrating, the cheetah tend to travel greater distances.
- * In Nairobi NP, males average 7 km per day and females with cubs about 3.7 km per day.
- * In the southern Kalahari, 2 males once travelled 252 km in 20 days or a daily distance of 12.6 km.
- * In Namibia, cheetahs often cover 30 km in 2 or 3 days and 9 marked males were once re-trapped over 200 km away.
- * During cold weather, cheetahs spend a lot of time sunning themselves to warm up in the morning; they usually start moving later on cold mornings than during warm weather.
- * During the heat of the day, cheetahs will rest in shady spots. In the Sahara, they use caves, rock overhangs and even underground burrows to escape the heat.
- * Cheetahs have the ability to be completely relaxed while at the same time totally alert and watchful. Even when resting in the middle of the day, they will sit up to look around as much as 10 times per hour.
- * By being inactive at night, cheetahs reduce the chances of encounters with lions, leopards and hyenas.

I. Distribution and Population

Distribution

- * Cheetahs have never had high population densities but were much more widespread than they are today. Up until the early 20th century, cheetahs ranged throughout Africa, the Middle East and Central Asia as far north as Kazakhstan and east into India.
- * The cheetah has disappeared almost totally from Asia except for a small population in Iran, due primarily to capture for private use and habitat loss.
- * They had a wide but sparse distribution throughout Africa from the Mediterranean to the Cape, except in true deserts and equatorial forests.
- * At the beginning of the twenty-first century, the range of the cheetah in Africa is only a remnant of what it once was.
- * In Namibia most cheetahs live outside protected areas: 95% are found on private land, mainly commercial and communal livestock farms and ranches.
- * In South Africa, cheetahs can be found in Kruger and Kgalagadi National Parks as well as in provincial and private parks and reserves. Free-roaming cheetahs can be found on farmland in the Northern Cape, North West and Limpopo Provinces.
- * In Natal they were exterminated by the 1930s, but stock from Namibia has been reintroduced to reserves. Most cheetahs found in South African reserves are of Namibian blood-line.
- * Until recently, the North African cheetah roamed over sparsely vegetated patches of the Sahara, living off gazelle and other natural prey species. During the last half of the 20th century, due to hunting of cheetahs and gazelles, and habitat destruction, the North African population has become highly fragmented and is on the brink of extinction.
- * As part of the IUCN's North Africa Biodiversity Programme, data on the status, distribution and ecology of the Northwest African cheetah was gathered with the following results:
 - In Egypt, the cheetah is now restricted to a small part of its former range in the northwestern part of the Qattara Depression in the Egyptian Western Desert.
 - In northwest Africa, cheetahs are known to persist in only 4 countries: Algeria, Niger, Benin and

Burkina Faso.

- Other northwest African countries where cheetahs may persist include Mali, Mauritania and Togo.
- Northwest African countries where cheetahs are presumed extinct include Morocco and Western Sahara, Senegal, Guinea, Guinea-Bissau, Sierra Leone, Cote d'Ivoire and Ghana.

African Wild Population

- * Around the time of Christ, it is conservatively estimated that there were around 500,000 cheetahs throughout the world.
 - * In 1900 there were approximately 100,000 cheetahs left in 44 countries throughout Africa and Asia.
 - * In the last 25 years, the population has declined by 50% and the human population has doubled.
 - * Today the total population is estimated at 7,500 mature breeding individuals. This number was last assessed by the IUCN in 2008.
 - * The majority of cheetahs are now found in Southern Africa, primarily Namibia, Botswana and South Africa, with viable populations also in Kenya and Tanzania.
 - * Namibia has the largest cheetah population left in the world at about 3,000. Due to persecution by farmers in the 1980s, its population was reduced by half to less than 2,500 but has now stabilized.
 - * Approximately 850 cheetahs reside in South Africa:
 - About 350 reside in parks and reserves.
 - About 500 free-roaming cheetahs on farmland.
 - * The official figure in Botswana is 1,800 but there could be anywhere between 1,000 to 3,000 cheetahs there.
 - * Survey done in 1993 and 1994 estimated between 575 and 1,000 in Tanzania, with about 250 in the Serengeti eco-system, the largest protected population in Africa. Numbers may currently be lower.
 - * Estimated between 500 and 1,000 in Kenya but probably closer to 500. New census numbers should be available from CCF Kenya soon.
- The total population of the Northwest African or 'Saharan' cheetah is suspected to be fewer than 250 mature individuals, with a continuing decline, and no subpopulation larger than 50 mature individuals. This number was last assessed by the IUCN in 2008.
- * Other African countries:
 - A 1990 survey in Zimbabwe estimated 500 to 1,000, with 80% on farmland. This number has probably been drastically reduced during the turmoil of the last few years.
 - Malawi had about 30 cheetahs in a 1989 survey.
 - Uganda had from 50 to 300 cheetahs, all in the northeastern part of the country, in a 1990 survey.

Asian Wild Population

- * Cheetahs once roamed over much of the Middle East and Central Asia as far north as Kazakhstan and east into India.
- * The Asiatic cheetah, a subspecies of the African cheetah, was given the name *Acinonyx jubatus venaticus*, which is a Latin name meaning 'belonging to hunting.' This name applied to cheetahs north of the Sahara Desert eastward to Palestine, Arabia, Syria, Iraq, Iran, Afghanistan, Pakistan and India.
- * The last Indian cheetahs were shot in 1947, and though unsubstantiated sightings continued until the 1960s, the cheetah was declared extinct in India in 1952.
- * Over the past 50 years, there has been interest in reintroducing cheetahs to India but nothing has been done due to inaction on the part of the Indian government.
- * In what was once the Soviet Union, cheetahs used to be found in western Georgia, Turkmenistan, Uzbekistan and Kazakhstan regions up until the 1970s.
- * During the first half of the 20th century, cheetahs were seen in Syria, Iraq and Kuwait. The last reliable sighting of a cheetah in Israel was in 1959.
- * There were an estimated 400 cheetahs throughout the desert areas of central and eastern Iran before WWII but by the 1950s, the number had dropped dramatically due to over-hunting of the cheetah's main prey, gazelle.
- * By the late 1970s, the population was estimated to be 200 to 300 but the revolution of 1978 brought about widespread poaching of both cheetahs and gazelle.
- * With the reduction in gazelle numbers and increased human persecution, cheetahs were forced from their former ranges into mountainous habitat, where they turned to hunting wild sheep and goats.
- * Today 70 to 100 cheetahs are found in 7 reserves in the deserts and shrub steppes of central and eastern Iran; each reserve contains anywhere from 6 to 20 individuals.
- * The latest population figures come from a combination of field surveys, tracking, direct observations, interviews with local people and over 12,000 nights of camera trapping inside all 7 reserves during the past 10 years.
- * Iranian cheetah hunt wild sheep and goats, gazelle, hares and occasionally livestock.
- * The Iranian cheetah has a longer, silkier coat than the African cheetah, a variation probably caused by their different environments.
- * Today the main threat is habitat disturbance and degradation, including desertification, caused by spreading agriculture, industries, mining and human settlements.

- * Extensive livestock overgrazing has drastically reduced prey, leaving the cheetahs with little to eat. Nomadic herders are allowed to use the reserves for winter grazing for their livestock and their livestock guarding dogs are so effective that they chase off both cheetahs and their prey.
- * Other threats include people driving through the reserves and chasing cheetahs in cars and on motorcycles, reserves being used as smuggling routes for drug traffic in Afghanistan, and hunting pressures on both cheetahs and their prey (almost one million hunting licenses are issued annually, with an annual quota of 300 bullets provided by the State). In the past, protection has been inadequate due to too few reserve guards.
- * The Iranian government has given priority to the survival of the Asiatic cheetah and with technical and financial support from international organizations, formed the Conservation of the Asiatic Cheetah Project in 2001.
- * The Iranian Cheetah Society (ICS), a non-profit NGO was also established in 2001 and collaborates with the Iranian government to save the last of the Asiatic cheetahs through:
 - Research of the ecology of the cheetah and other big carnivores in its habitat.
 - Raising public awareness through education in the local communities.
 - Reducing human-predator conflict.
 - Habitat rehabilitation.
 - Direct action to improve enforcement of laws and regulations.
- * Some immediate options for saving the Iranian cheetahs have included buying off people who have grazing rights in the reserves and not allowing herders to bring dogs into the reserves, as well as breeding and releasing relevant prey species.

Captive Population

- * Between 1829 and 1994, over 1,567 cheetahs were imported from the wild and exhibited at more than 373 facilities.
- * The earliest record of a cheetah held in a zoological collection was 1829, at the Zoological Society of London, but this cheetah lived for less than a year.
- * The next recorded exhibitions of cheetah were at Antwerp in 1851, at the Berlin Zoological Gardens in 1852, in Frankfurt in 1860, and in Hamburg in 1863. The first North American exhibition was in the Central Park Zoo in New York City in 1871.
- * Despite centuries of association between humans and cheetahs, there is no record of cheetahs being bred successfully in captivity until the 20th century except for one litter of 3 cubs born in 1613 during Mughal rule in India. The next successful birth and rearing of cheetahs in captivity did not occur until 1956, at the Philadelphia Zoo in the USA. The first captive-born cubs to be reared by their mother were born in a Roman zoo in 1967.
- * According to CCF, there are about 1,400 cheetahs held in 165 facilities in about 65 countries throughout the world.
- * There are about 524 cheetahs in captivity in South Africa.
- * The captive cheetah population is not yet self-sustaining and is aided by the importation of wild-caught animals. The North American population is stabilizing, with death rates decreasing and birth rates increasing. This is primarily due to management under the Species Survival Plan.
- * 99% of captive cheetahs are from Namibian stock, but there has been a steady increase in the number of subspecific hybrids produced (mating between East African and Southern African subspecies), which made up 13% of the 1994 population.
- * The size of the captive breeding population needs to be increased, but should not affect the remaining free-ranging cheetah population. New bloodlines should be obtained from captive-born animals.

Breeding in Captivity

- * Failure to mate or conceive is the most critical factor slowing captive population growth and improved husbandry is the key factor in offspring survival (Caro).
- * Though captive males in North America and South Africa exhibit a high percentage of sperm abnormalities and a low sperm count, many males are still able to sire offspring; females appear reproductively sound.
- * The Ann van Dyk Cheetah Centre, in Pretoria, South Africa is one of the most successful breeding facilities in the world:
 - The Ann van Dyk Cheetah Centre began breeding in 1975 with 23 cubs from 6 females.
 - The first king cheetah was born in 1981.
 - Over 750 cubs have been bred with a survival rate of 75%.
 - Much of this success is attributed to large enclosures and the large number of cheetahs held, which may facilitate the necessary social factors involved in natural breeding.
 - A core of 80 to 100 animals is kept at the centre.
 - Cubs go to zoos and other breeding facilities as well as South African game reserves with adequate space and low numbers of other predators.
 - The Ann van Dyk Cheetah Centre has translocated over 140 free-roaming cheetahs from farmland where they are persecuted to reserves.

- * CCF recommends that the more prolific breeders should be replaced with the unrepresented lineages and there should be coordinated transfers or artificial reproductive strategies set in place to facilitate this. Crossing individuals from east Africa with those from southern Africa is also recommended.
- * Factors in promoting successful breeding in different cheetah facilities include:
 - Keeping animals in large enclosures and in natural surroundings.
 - Providing elevated areas from which to survey the terrain.
 - Keeping males and females out of sight of each other.
 - Keeping potential prey species in sight.
 - Moving females between facilities or within a facility.
 - Competition between males may also increase a female's receptivity.

Health and Longevity in Captive Population

- * Mortality rate of cheetah cubs born in captivity is between 30 and 40%:
 - 33.9% of 1,046 cubs born between 1978 and 1988 failed to reach 6 months of age (Caro).
 - Neonatal mortality stems from poor husbandry and maternal neglect, with cannibalism, congenital defects, disease and stillbirths playing a lesser role.
 - Cheetah mortality in animals over 6 months is attributed to kidney and/or liver disease (21%), gastrointestinal disorders (9%) and feline infectious peritonitis (FIP)(6%). In 1994, 60% of the captive population was sero-positive for FIP.
- * Smaller litters in captivity may be the result of physiological stress due to captive conditions or poor nutrition.
- * Adult mortality plays a smaller part in influencing the captive population size. Between 1978 and 1988 (Marker-Kraus, 1990):
 - 38% of animals lived beyond 5 years of age.
 - 17% lived over 10 years.
 - 3% reached 15 years.
- * Health issues discussed at the Global Cheetah Conservation Action Workshop in September 2001 include:
 - Herpes has been identified in a North American population.
 - Gastritis and renal diseases appear to be common health risks in captive populations.
 - The Helicobacter bacteria is still associated with the occurrence of gastritis.
 - Common treatment of gastritis includes use of antibiotics and antacids.
 - Rabies shots not recommended for cheetahs due to their link to development of gastritis.

Conserving the Captive Population

- * Zoos and other captive facilities make significant contributions to cheetah conservation:
 - They act as genetic reservoirs, insurance against extinction in the wild.
 - Captive cheetahs provide opportunities for research that wouldn't be possible in the wild.
 - Captive cheetahs can be used to educate and inspire as well as raise funds toward conservation in the wild.
- * During the 1980s, several cheetah conservation initiatives were established:
 - Development of regional studbooks in North America, Japan and Great Britain.
 - Development of an international studbook in 1988.
 - Inclusion of the species as a target animal of:
 - SSP - Species Survival Plan
 - EEP - European Endangered Species Program
 - AMSP - Australian Species Management Program

A cheetah SSP Research Master Plan involving implementing a multidisciplinary research programme to provide a biological explanation for poor captive breeding.

- * The international Cheetah Studbook registers all cheetah in the world held in both zoological gardens and private facilities, and provides information about existing animals, thus creating the pre-conditions for selecting breeding animals.
- * Each registered animal has a studbook card.
- * A Species Survival Plan (SSP) for cheetahs has been formulated across the globe in order to ensure the propagation of the species.
- * Zoos and wildlife parks keep records of all their cheetahs, using this information to coordinate breeding plans among various animal institutions.

J. History of Cheetahs and Humans

- * Cheetahs have a long relationship with man, going back thousands of years. It's likely that early man joined other scavengers in robbing cheetahs of their kills.
- * Although humans have been depicting animals for at least 50,000 years, cheetahs were absent until recently. Since the cheetah was neither an animal to be hunted nor an animal to be feared by humans, it

- was not a major subject of interest to prehistoric inhabitants.
- * The earliest known depiction of a cheetah is a life-sized rock engraving from Niger's Air Mountains from about 7,000 years ago.
 - * Cheetahs have been kept in captivity for about 5,000 years and have the longest history of hunting with humans, with the exception of the dog.
 - * The oldest record of a captive cheetah is depicted on a decorated silver vase from a Scythian burial mound at Maikop in the Caucasus Range. The vase, showing cheetahs wearing collars and chasing antelope, dates back to approximately the middle of the third millennium BC.
 - * Ancient Egyptians first tamed cheetahs as early as 1650 BC. Depictions of cheetahs on tombs of royalty show them wearing collars and being led on leashes. Though pharaohs kept them as pets, there is no clear evidence that they used them for hunting.
 - * The origin of hunting with cheetahs is often reported as early as 4,500 to 5,000 years ago among the ancient Egyptians or the earlier Sumerians in what is now Iraq but unequivocal evidence is still lacking.
 - * It isn't until the time of Christ that records show that hunting with cheetahs existed in North Africa, the Middle East, Central Asia and possibly into China.
 - * The sport of hunting with cheetahs reached its zenith in India, where the most detailed accounts of the practice were produced.
 - * Regardless of where coursing with cheetahs began, the sport had become an established practice in Hindu royal courts and with Muslim kings and courts of North India by the 12th century.
 - * Under the great Mughal dynasty of the 16th and 17th centuries, coursing with cheetahs was practiced on an unprecedented scale and peaked during the reign of Akbar the Great (1556-1605).
 - * During his lifetime, Akbar acquired about 9,000 cheetahs and at one time, had 1,000 cheetahs in his stables. He kept detailed records about his cheetahs and the sport of coursing.
 - * Akbar's son Jahangir (1605-1658) also hunted with cheetahs. In the space of 12 days, he and his son hunting with cheetahs captured 426 antelope.
 - * Though Akbar tried to breed cheetahs in captivity, there is only one record of cheetahs breeding successfully when a litter of three cubs was born in 1613, during Jahangir's reign.
 - * Nearly full-grown cheetahs that already had hunting skills were captured from the wild by trapping in pits or snaring around their favourite 'play' trees.
 - * Training cheetahs involved taming them by creating a strong bond with their handlers. After a cheetah was tamed, it was taught to course mainly blackbuck, a plains antelope that was the primary prey of the wild Indian cheetah.
 - * Cheetahs were transported to the hunt on a litter carried by two bearers, on horseback, in carts pulled by bullocks or in the 20th century, by motorcar.
 - * When restraining hoods were removed, the cats chased and captured prey with the keeper intervening for collection and rewarding the cheetah with a bowl of blood or some internal organs.
 - * Indian princes continued coursing with cheetahs into the early 20th century, but due to the dwindling Asian population, about 200 cheetahs were imported from Africa between 1918 and 1945.
 - * The sport of coursing with cheetahs disappeared with the Indian states and their princes at independence.
 - * Though practised on a much smaller scale than in India, hunting with cheetahs also occurred in Russia and Europe. The sport was practised by Russian nobility during the Middle Ages and taken up by nobles in France and Italy around the 10th century. It flourished in Europe between the 13th and 16th centuries but had vanished from western Europe by the 18th century.
 - * Though coursing with cheetahs was rare in England, there is a record of a cheetah being presented to King George III and used for hunting. The king and his aristocracy were disappointed when the cheetah failed to kill a red deer, prey (100 to 120 kg) much too big for the cat. Instead, the deer turned on the cheetah and tossed it into the air, and it refused to hunt again.

K. Evolution

- * Cheetahs made a sudden appearance in the fossil records around the globe at almost the same time, about 3.5 to 4 million years ago in the Pliocene, so it is difficult to determine exactly where they first arose.
- * It appears that the cheetah split from other large cats several million years ago in a lineage that includes the puma and jaguarundi, a small South American cat. Cheetahs, pumas and jaguarundis are closely related with anatomical similarities, corroborated by recent molecular analysis.
- * In prehistoric times, the cheetah's distribution was more extensive; several species of cheetah-like cats were widely distributed throughout Africa, Asia, Europe and North America up to only 10,000 years ago.
- * The opening up of habitat during the Pliocene favoured a cursorial (running) lifestyle, which cheetahs have exploited to the maximum.
- * The oldest known fossil records of the modern cheetah, *Acinonyx jubatus*, are from East Africa about 3.5 million years ago, with slightly later records in southern Africa and Asia.
- * A very large cheetah, *Acinonyx pardinensis*, lived in Europe during the Pliocene and Pleistocene, from about 3.2 million to 500,000 years ago.
- * *A. pardinensis* was the size of a small modern-day lion and weighed up to 105 kg, but had the same limb proportions as a modern-day cheetah.
- * Because of its larger mass, *A. pardinensis* wasn't as fast as today's cheetah, but was still able to swiftly pursue its prey across the grassy steppes of Eurasia.
- * At the same time as the European cheetah, a genus of sprinting cheetah-like cats called *Miracinonyx* arose in North America.
- * The earliest species *Miracinonyx inexpectatus*, weighing up to 95 kg, was only slightly smaller than the European *A. pardinensis*, while the later form *Miracinonyx trumani* was smaller and resembled the modern cheetah, *A. jubatus*. *M. Trumani* survived up to 10,000 to 20,000 years ago.
- * Both American cheetah-like species exhibited the same small, domed skull and slim, elongated bones of the existing species today, but differed in a number of skeletal features, including retention of fully retractile claws.
- * *M. expectatus* had intermediate body proportions between a puma and a cheetah, but was more versatile, running faster than a puma and better equipped for climbing than a cheetah.
- * A fossilized skull of a new species of primitive cheetah, *Acinonyx kurteni*, was recently found in China.
- * The skull, between 2.16 and 2.55 million years old, is about the same size as living cheetahs but has a very wide braincase, enlarged frontal sinuses and primitive teeth.
- * The discovery of this skull may cast doubt on the theory that cheetahs evolved in North America and spread into Eurasia and Africa.
- * On the other hand, it is possible that the modern cheetah, *A. jubatus*, first evolved in Africa from an earlier species on the cheetah-puma lineage that had arisen elsewhere and colonised Africa, spreading into Eurasia.
- * Other cheetah species could have been evolving elsewhere in the world (North America and Eurasia) at the same time, possibly from the same distant ancestor of the African (modern) cheetah.
- * There are still large gaps of knowledge of cheetah evolution because few fossils have been found.
- * The cheetah appears to have suffered a series of severe population reductions or "bottlenecks" in its history, with the most significant probably occurring during the late Pleistocene, about 10,000 to 12,000 years ago. Drastic changes in the earth's climate resulted in a major extinction of vertebrates worldwide (75% of all mammals in North America and Europe died).
- * Over a few thousand years, all the cheetahs in North America and Europe, and most of those in Asia and Africa died. Cheetahs may have migrated to more suitable environments as ice covered a large part of the northern hemisphere and sea levels fell.
- * The cheetah survived the mass extinction of the Pleistocene Epoch, but its numbers were greatly reduced. Brothers were left to reproduce with sisters and parents with siblings, which led to inbreeding. Today's population are direct descendents of the survivors, the only cheetah species that survived.
- * The cheetah was first described scientifically by J.C.D. von Schreber in 1775 as *Felis jubata* from a specimen collected at the Cape of Good Hope.

L. Conservation Issues

Current Status and Threats

- * Though the cheetah faces many problems, the primary reason for its decline is shrinking range due to habitat loss all over Africa and the resulting loss of ungulate herds the cheetah depends on.
- * Drastic increases in human populations and proliferation of domestic animals has led to loss of habitat and prey, and conflict with man. Cheetahs need large expanses of land to survive and its favoured habitat, open semi-arid areas, is being used more and more for grazing livestock.

- * Increased livestock in arid areas compete with wildlife for limited grazing, further reducing prey available for cheetah to hunt.
- * The cheetah, being very sensitive to human disruption in its surroundings, has a more difficult time adapting to the presence of man than other cats.
- * Many people fear large predators and carnivores and respond by eliminating them. People incorrectly view the cheetah as a wanton killer of livestock and wild game, while in reality, the amount of damage to domestic stock is exaggerated and usually caused by a few problem animals and inadequate farming practices.
- * Ranchers and farmers often see cheetah as pests or vermin:
 - In Namibia, due to indiscriminate trapping and shooting by farmers, there was a drastic decline in the number of cheetahs in the 1980s when the population was halved in a 10-year period, leaving an estimated population less than 2,500 animals.
 - In the Sahel, cheetahs are reported to prey on young camels and goats in the Aïr and Termit regions of Niger, and are hunted as livestock killers.
- * Inevitably, stock losses to predators are greater where the natural prey base has been eliminated or reduced: on a 200 sq km ranch in Kenya, where about 9,500 head of livestock graze alongside a still largely intact wild ungulate population, depredation by cheetahs is minimal, accounting for only 11 sheep a year.
- * Past capture of wild cheetahs for private use has led to the near extinction of the Asian population. Cheetahs don't breed well in captivity and removal of individuals reduces genetic diversity in the wild.
- * Though the cheetah's skin was never in demand like the leopard's, during the 1960s, 1,500 cheetah skins entered the U.S. every year to be made into coats, shoes and handbags. In 1972, one furrier in New York City was found with nearly 2,000 cheetah pelts.
- * Trophy hunting and live export of cheetahs is still allowed in Namibia (150), Botswana (5) and Zimbabwe (50). Only single males should be shot, but often coalition males or females are taken. Luke Hunter believes that hunting doesn't really help conserve the species since very few farmers benefit from the profits and those who do, continue to shoot cheetahs on their land.
- * Because it is low in the predator hierarchy, the cheetah faces competition from other predators and does not do well in parks and reserves with large lion and hyena populations. As a result, most cheetahs live outside protected area.
- * Interspecific competition with other large predators takes the form of direct predation on cubs, occasional killing of adults, especially in thick bush, and loss of kills.
- * After lions, leopards are the second biggest killer of adult cheetahs; both have been known to stalk and kill cheetahs for food if prey is scarce. Spotted hyenas occasionally kill adult cheetahs but are the main *kleptoparasite* of cheetah kills across Africa.
- * However, other predators' effect on cheetahs' food intake on the Serengeti plains may be less severe than previously assumed; predation on cubs limits reproduction and is a far more important factor in keeping populations at low density over much of the cheetah's range (Caro).
- * Being a daytime hunter, the cheetah is an easier target than other predators for harassment by tourists. In many parks and reserves, tourist vehicles routinely disrupt cheetah hunts.

Conservation Measures

- * Cheetahs are protected under several major treaties and laws:
 - CITES Appendix I: prohibition of trade in live animals or products, except for restricted quotas for hunting trophies. Appendix I includes species that are most threatened.
 - IUCN Red List: Vulnerable in sub-Saharan Africa and Critically Endangered in Northwest Africa and Iran (facing high risk of extinction in the wild in the medium-term future).
 - UNEP (UN Environment Programme) Convention: Appendix I
 - U.S. Endangered Species List: Endangered.
 - Limited trophy hunting is allowed in Namibia and Zimbabwe.
 - Namibia no longer permits any live or dead exports of cheetahs, and it is illegal to breed cheetahs in captivity.
- * Different cheetah populations require very different conservation strategies.
- * To conserve the cheetah, it will take a combination of protected areas and the more extensive areas surrounding them: cheetahs within protected areas can only survive where these sanctuaries are welcomed by surrounding communities.
- * Many reserves suffer from being conservation islands, too small to avoid inbreeding and the consequences of a major disease outbreak or natural disaster.
- * Despite shortcomings, protected areas provide a safeguard against extinction, guaranteeing that a core population of cheetahs will be conserved—the numbers may be small, but the species will persist.
- * To address the isolation of the parks, conservationists are using meta-population management to treat physically isolated populations of cheetahs as they interacted before humans intervened and carved wilderness into fragments.
- * Translocating cheetahs between different reserves to enhance the genetic diversity in different populations,

or into areas occupied before man intervened, works relatively well because they are surprisingly tolerant of relocation and make good candidates for reintroduction programmes.

- * Growing tourism in South Africa is the driving force behind most of the reintroductions of cheetah to farmland turned into new game reserves.
- * However, meta-population strategies require considerable resources and expertise, and benefit relatively few cheetahs.
- * Throughout its range in Africa, the cheetah is found in greater numbers outside protected areas than within them, and protection measures must look at the extensive areas surrounding the limited system of parks and reserves.
- * In East Africa pastoral tribes, such as the Masai and Samburu, rarely go out of their way to kill cheetahs as lions and hyenas present a far greater threat to their livestock. Though their model of coexistence doesn't always work, it is being emulated in Namibia and South Africa in the combination of a dog (Turkish Anatolian) with a herder to reduce livestock losses to cheetahs.

M. Genetic issues

- * Genetic variation, by providing sufficient genetic options for natural selection to operate in response to environmental change, is thought to be essential to long-term survival of a species. However, the cheetah's wide ecological and geographic distribution suggest a wide tolerance for varying ecological conditions over time despite its morphological specializations (Caro).
- * Cheetahs show a very high level of genetic homogeneity, meaning there is a great similarity and little diversity in the genetic makeup of different populations.
- * Through blood tests, skin grafts, and DNA research, it has been discovered that cheetahs, both in the wild and in captivity, are so inbred that genetically they are as closely related as twins.
- * In most species, related individuals share about 80% of the same genes; cheetahs share 99%.
- * The most popular explanation for the present low levels of genetic diversity in the cheetah is a population bottleneck that occurred 10,000 to 12,000 years ago, with the present-day cheetahs direct descendants of the small population that survived.
- * Other theories that explain the genetic uniformity in present-day cheetahs are:
 - The cheetah population became fragmented during the last ice age as climatic fluctuations caused the advance and retreat of ecosystems such as forests and savannas. As populations became separated by forests, they became more inbred, resulting in a loss of genetic variation.
 - The cheetah has evolved to an optimum for its niche and has shed its genetic diversity. This theory is not widely accepted as the cheetah still has plenty of bad genes and competes badly with rival predators, and several different *Acinonyx* species existed over the last few million years, all signs that the cheetah hasn't reached an optimum in evolution.
- * As cheetah populations become more fragmented across Africa, lack of genetic diversity in isolated groups has led to inbreeding and further weakened the cheetah's ability to adapt to a changing environment.
- * Lack of a sizeable and diverse gene pool in a declining population has resulted in:
 - Sperm abnormalities.
 - Decreased production of young.
 - Higher infant mortality rates.
 - Weakened immune systems.
 - Susceptibility to diseases, notably FIP, feline infectious peritonitis.
- * Morphological abnormalities found in Namibian cheetahs include:
 - Distinct kink in tail (19% of population).
 - Focal palatine erosion.
 - Crowded lower incisors.
- * Wild male cheetahs in the Serengeti and in Namibia have exhibited low numbers of sperm per ejaculate and a percentage of sperm abnormalities similar to that of captive animals in North America and South Africa. One study showed that 71% of sperm from both wild and captive males was abnormal.
- * Genetic poverty also means that cheetahs are unable to adjust to sudden changes in the environment, such as disease epidemics that could wipe out an entire population.
- * Parasites and diseases, such as anthrax, feline enteritis and *Babesia canis* (tick fever), are known to affect cheetahs.
- * Cheetahs are highly susceptible to FIP. As a consequence of genetic uniformity, the genes that code for defence in a cheetah's immune system are similar among all cheetahs in a population. When the virus adapts to one animal's immune system, it is able to beat the immune systems of all other animals in that population. This is especially evident in captive populations.
- * Though no epidemics have been reported from wild populations yet, cheetahs in some parks have been reported to suffer a relatively high incidence of mange.
- * Luke Hunter believes that the cheetah isn't suffering major consequences of inbreeding:

- Wild cheetahs are prodigious breeders and congenital problems are rare in the wild.
 - Wild cheetahs are not as plagued by disease as captive cheetahs, due in part to their living at low densities with fewer interactions; in fact, their immune response isn't as impoverished as expected.
 - Recent genetic analyses suggest that the cheetah may not be as homogenous as previously thought. Classification of the cheetah's current five subspecies needs revising, but recent analysis shows a significant difference between cats from Namibia and northern Somalia.
- * Vulnerability to disease increases in captive situations due to closer contact of animals and concentration in one area.
 - * It is possible that lack of activity in captive cheetahs can lead to liver disease; the cheetah's liver is specialized for mobilizing energy for the chase.
 - * Because cheetahs incur significant liver damage during the first week following capture, and can suffer progressive renal damage over time, trapped animals not destined for life in captivity should be released as rapidly as possible.
 - * Success with in vitro fertilization using cheetah sperm is relatively low compared to other felid species.
 - * Scientists are working on ways to enhance breeding through artificial insemination and in vitro fertilisation. Eggs and sperm are being collected from wild Namibian cheetahs as a means of enhancing genetic diversity of captive populations.
 - * To ensure genetic diversity in captivity, zoos and breeding facilities must ensure that only unrelated cheetahs mate, and must facilitate the movement and exchange of breeding animals throughout the world.

N. Cheetah Conservation Fund (CCF)

Cheetahs and Farmers in Namibia

- * In Namibia, cheetahs and leopards are the only large predators still found on commercial livestock farmlands, where they come into conflict with farmers who view them as pests that threaten their livelihood.
- * Namibia has the largest, and one of the few remaining sustainable populations of free-ranging cheetahs (± 2500-4000 cheetahs).
- * 95% of Namibia's cheetahs live on commercial and communal farmlands.
- * Namibia's cheetahs live on commercial and communal farmlands due to increased water availability, which attracts wild prey, and to the absence of other large predators, such as lions and hyenas. In eradicating lions and hyenas, farmers have opened up a niche for cheetah. The inclusion of watering holes on commercial farmlands, as well as game fences decreases the amount of migration of wild prey species, resulting in a denser population of cheetah and degraded soils.
- * Approximately 70% of the total cheetah prey species live wild on these commercial farmlands. Therefore, the cheetah's survival depends on a total ecological system of farmland management, prey species management, and habitat stability.
- * Farmers perceive cheetahs as a threat to their livestock and to wild game, but research indicates that cheetah take fewer livestock than is thought. Cheetahs prefer wild game, and will generally only turn to killing goats, sheep and calves when the natural prey population declines or they are unable to capture wild prey for other reasons (orphaned cubs, etc.).
- * During the 1980s, Namibia was hit by a bad drought and the cheetah's natural prey base died back. In addition, many farmers killed wild prey to reduce grazing and water pressures on their own livestock. With this reduction in their natural prey base, some cheetahs were forced to take livestock to survive.
- * When farmers employ effective livestock management practices or own farms with abundant game, they suffer minimal or no livestock losses to cheetah. Unfortunately, many farmers have done little in using non-lethal predator control methods (60% or more use no form of livestock protection).
- * In Namibia, cheetahs are a protected species, but farmers and ranchers are permitted to trap and shoot animals suspected of being a threat to livestock, a condition that is easy to exploit. Many cheetah are labelled as "problem" animals when in reality, they pose no threat to livestock.
- * Namibian law stipulates that cheetahs cannot be exported unless they are to be released; they can't be exported to breeding facilities or zoos and it is illegal to breed cheetah in captivity in Namibia.
- * Some farmers trap cubs to 'tame' and use as tourist attractions, but don't allow free-ranging cheetahs on their property.
- * Farmers switching their land use to wild game tend to have more negative attitudes toward cheetah than livestock farmers due to their costly investment in exotic game species such as blesbok and black-faced impala.
- * Indiscriminate capture and removal of cheetah by farmers often doesn't target problem animals and disrupts the local population, leading to further problems:
 - When a non-problem cheetah is captured, one or more cheetahs may take its place and a "problem" animal may replace the cheetah removed.
 - If a coalition member is trapped, those remaining may turn to livestock because of the reduction in numbers in their coalition.
 - When a female with immature cubs is removed, her cubs may be unable to catch wild prey and turn

to livestock to survive.

- * Threats to wild cheetahs as identified by CCF include:
 - Loss of habitat and limited geographical range.
 - Decrease in prey base.
 - Persecution by farmers due to exaggerated claim of livestock loss.
 - Increase in game farming of exotic species.
 - Lack of enforced legal protection.
 - Public ignorance of cheetah behaviour.
 - Effect of increased tourism in protected areas.
 - Poaching and trophy hunting.
 - Competition from other predators.
 - Lack of genetic diversity.
 - Lack of self-sustaining captive population.

About CCF

- * CCF, a non-profit, non-governmental organization, was established in Namibia in 1990 by Laurie Marker and Daniel Kraus to support cheetah conservation research and education as well as habitat protection with an ecosystem approach.
- * Based on an 18,000-acre farm in Namibia, CCF works with local farmers and school children, the Namibian ministry and many other organizations.
- * Its mission is to "secure habitat for the long-term survival of free-ranging cheetah and their ecosystems through multi-disciplined and integrated programmes of conservation, research and education" by:
 - Developing and managing long-term conservation management plans that benefit both cheetahs and farmers.
 - Monitoring movement of cheetahs on farmlands.
 - Promoting better livestock management techniques that use non-lethal predator control, such as better corralling, use of electric fencing, placing donkeys and guard dogs with calving herds, and maintaining wildlife on farms so cheetah have an adequate prey base.
 - Supporting multiple use of farmlands (i.e., livestock farming, ecotourism).
 - Building awareness among farmers and the general public about the role of the cheetah in Namibia through conservation education programmes.
 - Collaborating with other research institutions and conservation organizations to ensure the survival of the cheetah.
 - Conducting long-term scientific research in cheetah genetics, biology and survival.
- * CCF's focus is to work with livestock farming communities in order to develop ways to reduce conflict. This is achieved by devising a conservation plan that secures habitat for the cheetah while accommodating farmers' land-use needs.
- * CCF has developed programmes in Namibia that are being adapted for use in other African countries, such as Kenya, Botswana and Zimbabwe.
- * CCF develops, tests and promotes:
 - Non-lethal predator control practices (Turkish Anatolian Shepherd, see below).
 - Relocation of problem cheetahs.
 - Ecotourism.
- * CCF initiates scientific research programmes in such areas as:
 - Cheetah population biology.
 - Cheetah ecology.
 - Cheetah health and reproduction.
 - Human impacts on cheetah.
- * CCF runs both Namibian and international education programmes that raise awareness of the cheetah's endangered status (95% of farmers initially interviewed by CCF knew nothing of the problems facing cheetahs or the importance of the Namibian population to the survival of the species).

Turkish Anatolian Shepherd Livestock Guarding Dog Programme

- * In 1994, CCF established the Livestock Guarding Dog (LGD) research programme in association with the LGD Association from Hampshire College in Mass, USA.
- * The Livestock Guarding Dog programme is one of several non-lethal predator management strategies that CCF has developed and implemented. Besides saving cheetah from indiscriminate removal from farmlands, the programme also fosters goodwill between CCF and the farmers.
- * The Livestock Guarding Dog programme is an extension of a livestock management practice previously in use in Namibia where some farmers were using breeds of smaller dogs to protect their livestock. The Anatolian Shepherd is better suited for the role of livestock protector.
- * The goal of CCF's programme is to raise young Anatolians with the herd so that they bond with the livestock

- instead of humans and thus assume the role of protector. All dogs are donated to farmers.
- * Besides breeding the dogs, the programme also involves selection and training of recipient farmers and follow-up to make sure the dogs are doing well (well cared for and well trained).
 - * Puppies are weaned at 7 or 8 weeks and placed with their herds in order to successfully bond with the livestock. The Anatolian Shepherd lives with the herd, eating, sleeping and travelling with the livestock. Human interactions are kept to a minimum to avoid bonding with people.
 - * Anatolians must defend their herds against leopards, cheetahs, caracals, jackals, baboons, and even humans.
 - * Anatolians have excellent senses of hearing, sight and smell, and are very sensitive to changes in normal herd behaviour.
 - * They are not trained to chase or attack, but rather bark and posture to scare the predator away. Occasionally, a dog is forced to physically defend its herd, but normally its barking is enough to scare a predator away and to alert humans to the threat.
 - * Cheetah are not normally aggressive and are quick to retreat from a barking dog, especially one the size of an Anatolian.
 - * The original 10 Anatolians for the programme were imported from the U.S. Between 1994 and 2007, approximately 260 dogs were placed on Namibian farms.
 - * The dogs used in CCF's livestock guarding dog program are all bred on CCF's farm in Namibia and CCF maintains a registry to track the breeding histories of each dog and to document placement and work of the dogs.
 - * The Livestock Guarding Dog programme costs over \$40,000 per year to breed and care for the dogs and to educate farmers in training workshops (costs increase yearly as the number of dogs increases).
 - * Farmers must invest enough time for initial training of dogs or they may develop aggressive behaviour toward livestock or wander off if the bonding to the herd isn't strong enough.
 - * Sometimes dogs are placed with a second farmer if the first owner doesn't work out and they will bond with a second herd. The bonding instinct is so strong that herds cannot be split up in the presence of the dog or it may try to follow the section of the herd that has been removed.
 - * See section 7 for more detailed information on the Turkish Anatolian Shepherd.

Glossary

Acinonyx jubatus. Genus *Acinonyx* derives from the Greek words *akantha*, a thorn, and *onux*, a claw, referring to the unsheathed claws of the cheetah. Species name *Jubatus* derives from Latin for having a crest or mane

Anoestrus. Not showing estrous. The interval of sexual inactivity in a female mammal between two periods of estrous or heat.

Babesia canis. Tick fever; known to affect cheetahs.

Binocular vision. The visual field within view of both eyes; the frontally placed eyes of cats and primates have most overlap and best depth perception.

Brisket. The part of the chest between and behind the forelegs in four-footed animals.

Canine teeth. The tooth that lies between the incisors and premolars in the upper and lower jaws of many mammals. Often large and pointed (especially in carnivores) and specialized for piercing and seizing prey as well as fighting.

Carnassial teeth. The blade-like cutting teeth in carnivores. The last upper premolar and first lower molar on each side of the mouth that meet with a shearing action like scissors, effectively cutting meat and sinew.

Cheek teeth. The row of premolars and molars used for chewing food.

Chirping. Bird-like chirp that sounds like a yelp or dog's yip at high intensity and carries for 2 km. Used by adult female to call cubs or adults greeting each other.

Churring. High-pitched, staccato growling sound that doesn't carry as far as a chirp or yelp. Also called stutter-calling.

CITES. Convention on International Trade in Endangered Species; an international treaty that monitors trade in wild species.

Clavicle. Collarbone; either of two slender bones of the pectoral girdle that connect the sternum and scapula.

Coalition. Alliance or union of male cheetahs, often brothers, which lasts for life or until the death of a coalition member. Cheetah coalitions hunt and defend territory together.

Coursing. The sport of pursuing game with dogs or cheetahs that follow by sight rather than by scent.

Cusp. A prominence or small elevation on the surface of cheek-tooth (premolars or molars).

Dewclaw. A vestigial digit or claw that fails to contact the ground or is said to reach only the dewy surface of the ground; the inside or first digit in carnivores.

Digital pads. Pads of digits or "toes".

Displacement activity. A behaviour that is displaced from its normal context; considered a sign of indecision or frustration, as when two conflicting drives block one another (i.e., approach vs. withdraw, fight vs. flight).

Diurnal. Referring to species that are primarily day-active.

Estrous. The regularly recurring period of sexual excitement, receptivity and fertility of female mammals other than humans; behaviour associated with ovulation and also called 'heat'.

FIP. Feline Infectious Peritonitis, viral infection that cheetahs are susceptible to.

Flehmen. The grimace associated with urine-testing, which is developed to varying degrees in nearly all ungulates and in some carnivores.

Gastritis. Inflammation of the stomach, especially its mucous membrane. A major cause of illness in captive cheetahs, there is no known cure and the underlying cause of the disease is still being debated.

Gestation. The period of development between conception and birth.

Induced ovulation. Ovulation, the process of shedding mature ova or eggs from the ovaries, induced by copulation.

Infanticide. Killing of unrelated offspring by males.

Interspecific Competition. Competition between different species over territory and food. Interspecific competition between cheetahs and other large predators includes killing of adults and cubs, stealing kills, and chasing cheetahs away from prey-rich areas.

IUCN. International Union for the Conservation of Nature, an organization which brings together states, government agencies and non-government organizations; also known as The World Conservation Union.

Kleptoparasitism. Theft of kills by other predators.

Mantle. A smoky or bluish-grey mane or ruff of hair up to 8 cm long running down the neck and back of a cheetah cub; mantle begins falling out at about 3 months of age.

Metacarpal pad. Pad on the metacarpus, the bones of a forelimb between wrist and fingers; on a cat, on the inside of the forelimb slightly above the dewclaw.

Neonate. New born or in its first 28 days.

Nomadic. The wandering habit, meaning species that have no clearly defined residence most of the time; distinct from migratory species.

Palmar pad. Pad of forefoot of an animal; corresponds to the palm of the hand in humans.

Polyoestrus. Having several estrous cycles annually or during the breeding season.

Savanna. Vegetation characteristic of tropical regions with extended wet and dry seasons. Dominated by grasses and scattered trees.

Scapula. Either of two flat triangular bones each forming the back part of the shoulder; also called shoulder blade.

Scent-marking. An animal's excretion, in felids deposited from anal scent glands, to mark territories, communicate the sexual status of an individual, or both.

Scrapes. Marked areas on the ground produced by a felid scratching the earth, conifer needles or leaves, and then urinating or defecating on the resulting pile of dirt or leaves.

Sib-group. Temporary unit formed by litter of young adult cheetahs after separating from their mother. By 2 years of age, all females have left group, leaving only male siblings, who usually form a life-long coalition.

Species. Populations of closely related and similar organisms which are capable of interbreeding freely with one another and cannot or normally do not interbreed with members of other species.

Subspecies. Populations that have been isolated from other populations of the same species long enough to develop genetic differences sufficiently distinctive to be considered a different race.

Territorial. Animals that defend a particular area against (usually same-sex) rivals of their own species.

Territory. The geographical area an individual animal lives in and defends so that it does not overlap other such territories held by members of the same species.

Ventral. The underside or abdominal side of an animal; opposite of dorsal.

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Cheetah Conservation Fund (CCF)	www.cheetah.org
Cheetah Outreach	www.cheetah.co.za
The Ann van Dyk Cheetah Centre	www.dewildt.org
Iranian Cheetah Society (ICS)	www.iraniancheetah.org
World Conservation Union (IUCN)	www.iucn.org