## Module # 4

# Big Cat Conservation

Content:

## Cats of the World

There are 38 species of cat (Family: *Felidae*) known to be extant in the world, inhabiting every continent save Antarctica and Australia and ranging from Tierra del Fuego at the Southern tip of South America to the northern latitudes of Alaska, Canada, Scandinavia and Siberia. The world's cats are generally grouped according to size (primarily their weight) with over 50% (20 species) falling into the "small cat" category, 30% (11 species) considered "medium" and the remaining 7 species known as the "Big Cats" (see Table #1).

Not surprisingly the size of the cat tends to be proportional to the depth of knowledge about its life history and habits with many of the smaller species virtually unknown. In illustration not only has the Bornean Bay Cat (*Catopuma badia*) never been studied, a living example has never actually been seen by biologists! Everything that is known about this most mysterious species has been gleaned from five skins and two skulls lying nestled away in a European Natural History Museum (ISEC, 2002). That additional species await "discovery" is therefore a good bet. This is especially possible in some of the more remote pockets of the globe such as regions of Amazonia where the past decade has seen at least three new species of primate "discovered" by science.

The smallest of the small cats are the south African Black-footed Cat (*Felis nigripes*), the Rusty Spotted Cat (*Prionailurus rubiginosus*) of southern India and Sri Lanka and the Kodkod (*Oncifelis guigna*), a rare inhabitant of southwestern South America. These species have in common a relatively limited distribution to go along with their meager sizes. On the other end of the distribution spectrum is the Domestic Cat (*Felis catus*). Inhabiting all corners of the peopled planet they can be further divided into a vast number of sub-species. It is believed that this species arose from the domestication in Egypt of the Wild Cat (*Felis silvestris*) between 4,000 and 8,000 years ago (ISEC, 2002). These two species together with the jungle cat (*Felis chaus*) have been excavated, mummified from ancient Egyptian tomb structures giving an indication of the degree of reverence in which they have been historically held.

The small cats generally subsist on a mixed diet of creatures ranging from birds to lizards, small rodents to large insects. Medium sized cats on the other hand fill a slightly different niche which means expanding their diets to include such prey as rabbits and hares, larger ground birds, young antelope or cattle, monkeys and even some poisonous snakes. The Fishing Cat (*Prionailurus viverrinus*), as its name implies, relies mainly on aquatic creatures such as fish, frogs, snails and crustaceans. The Caracal (*Caracal caracal*) is such an expert at catching birds mid-flight that it was once trained for such a purpose in India and thus gave rise to the saying "to set a cat among the pigeons" (ISEC, 2002). The largest and arguably most beautiful of the medium size cats is the rare and ghostly Clouded leopard (*Neofelis nebulosa*). Extremely elusive, this partially arboreal cat has suffered greatly for the striking markings that adorn its coat, making it one of the most intensely hunted of the cats.

INSERT CHART –Table 1.

## The Big Cats

The seven species of Big Cats are some of the best-known and beloved members of the Animal Kingdom. Their physical capabilities together with striking markings and the human predilection for top carnivores has made them popular conservation and advertising pin-ups. Their biological requirements include relatively large habitat areas in which to hunt, socialize and rear young as well as a prey base sizeable enough to sustain them. This makes the Big Cats an ideal focus for species based conservation initiatives which are most successful when the protection of the subject species concurrently works to protect a host of other species the length and breadth of the food chain. The Big Seven themselves run the gamut from the mostly solitary leopard (*Panthera pardus*) to the communal living lion (*Panthera leo*); the swift and lean cheetah (*Acinonyx jubatus*) to the long and heavyset tiger (*Panthera tigris*); the jungle dwelling jaguar (*Panthera onca*) of the hot and humid New World tropics to the snow leopard (*Uncia uncia*) of the high mountains of Asia; and the durable *Puma concolor*, a cat so elusive yet mythical in status that it is varyingly known as the puma, cougar, catamount, panther and mountain lion depending on its local incarnation.

They are mostly nocturnal or crepuscular beings, hunting, socializing, feeding and patrolling territories in the nighttime hours. All possess keen senses of hearing and sharp eyes but tend to have much less acute olfactory senses.

The beauty and majesty of these felids has also contributed to their present precarious position with they're often spectacular skins long prized by hunters and collectors alike. The powerful teeth and sharp claws are also sought after and used as everything from charms to jewelry. The loss of habitat due to human encroachment has drastically reduced the worldwide extent of these species and their subsequent refusal to differentiate between wild prey and domestic livestock have increasingly put them at odds with ranchers and farmers throughout their range.

### Tiger (*Panthera tigris*) (CITES Appendix I)

The largest and perhaps most instantly recognizable of the Big Cats, the tiger is one of the world's most critically endangered species. Already at least three sub-species – the Bali, Caspian and Javan – have been rendered extinct, while the numbers of three other sub-species – the South China, Siberian and Sumatran – are scant, with estimated populations of 20-30, 300-400 and 400-500 respectively. While evidence is sparse concerning the Indo-Chinese sub-species, population estimates range from 1,200 to 1,800. It is only the Bengal tiger of Central and Southern India that appears temporarily secure in the wild with an estimated minimum of 3000 animals (ISEC, 2002).

Tigers are generally solitary animals with the most frequent social groupings being a mother and her cubs or a mating pair. They are nocturnal for the most part but may be active during the day as well, particularly in the colder, northern extents of their range. They require a steady supply of large prey and do not seem to be able to subsist on small prey for any extended period of time. Partially eaten carcasses are often covered over with leaves or other vegetation when the tiger is not eating, a precaution to ensure that scavengers do not easily locate them. Most tigers prefer to stay in the vicinity of their kill, even when they are not eating and frequently alternate between feeding and drinking at a nearby water source. Tigers are comfortable in water and can be found lounging in shaded pools in the heat of the day.

Threats & Conservation:

Initially it was the avid desire of hunters to acquire trophies in the form of skins from these distinctive animals that led to a sharp decline in the population. This was further fuelled by the animal's size and fierce reputation, which seemed to add a certain sense of inflated machismo to the hunt. As times and attitudes gradually changed, so did the origin of threats to the species. Human encroachment into tiger habitat, particularly in densely populated countries like India has eclipsed trophy hunting as the main cause of population decline. That some tigers, almost always individuals too old or injured to successfully hunt its natural prey, have become "man-eaters" has caused further detriment to its public image. Taken in context and considering the very close, forced association between man and tigers in certain parts of the latter's range, direct attacks on humans are infrequent indeed. More common however is the human-tiger conflict over domestic animals. With cattle, goats and sheep replacing natural prey species like deer, wild boar and wild goats, tigers have come to rely more and more upon these domestic breeds for their survival, thus triggering an intense rivalry with ranchers and farmers.

Unfortunately the hunting of tigers has never stopped, merely changing focus from trophies for the wall to a cornucopia of parts as ingredients for traditional East Asian medicines. The near mythological status of the tiger has meant that everything from its flesh to its bone, its hair to its penis has become imbued with perceived medicinal potency. From Siberia to Malaysia this grand felid is persecuted for the trade, which is perhaps the biggest threat to its continued survival.

A final, not insignificant cause of population decline is the exotic pet trade. Uninformed or simply careless individuals consider ownership of a big cat as a status symbol regardless of its predicament in the wild. Recent estimates in Italy suggest that at least 3000 tigers, lions and leopards are kept as personal pets (ISEC, 2002).

In response to the declining wild populations the American Association of Zoological Parks and Aquariums selected the Siberian tiger as their first target species for a Species Survival Plan (SSP). This ex-situ conservation method involves meticulous record-keeping in order to maintain bloodlines and genetic diversity as well as intense research into captive breeding. However these plans tend to overlook the concurrent preservation of natural habitat and the fear remains that even successful SSPs will not have a dramatic effect on wild populations. Most zoos are actually doing a disservice to the Big Cats (and other endangered species) by giving the false impression that they are plentiful and failing to educate visitors about their precarious situation. A case in point is the Siberian tiger, with a global captive population larger than that in the wild.

The relative success of the Bengal sub-species is due entirely to the dedicated conservation efforts of the Indian Wildlife Department initiated by the World Wildlife Fund and World Conservation Union's "Project Tiger". Instituted in 1971 with essential and unwavering support from then President Indira Gandhi this project brought the plight of the tiger into the international arena and raised funds for an ambitious conservation strategy. With numerous issues still plaguing the Southern Indian tiger population, their future is far from rosy, however with the will of the government firmly behind the project there is reason for hope.

**Lion (*Panthera leo*)**
**(CITES Appendix I – Indian population)**

No other Big Cat and possibly no other animal can compare to the lion in terms of its central role in folklore and myth around the world. Having once inhabited a massive range from southeastern Europe, throughout Africa and across the Middle East to northern India, they are now restricted to Sub-Saharan Africa with a 350 strong relic population in the Gir Forest in India's Gujarat Province. The largest and most stable population can be found in the vast East African savannah. Lions are generally associated with low, open or scrubby areas but an isolated population has lived in Kenya's Ngorongoro Crater at almost 5000m asl.

Unique among cats, lion's live in groups called prides, usually comprised of between 4 –12 related females, their collective offspring and 1-6 males. Some of the males may be related also. The size of the pride usually depends on the habitat quality in which it exists with larger prides occurring in the prey-rich Plains of Eastern Africa. In peripheral or low-quality habitats it is not unusual for lions to remain largely solitary. There are several benefits theorized favouring the choice of group living. These include an increased ability to maintain and protect territory, especially in open areas, increased hunting success due to co-operative stalking practices, the ability to tackle large prey such as adult buffalo which would be impossible for a single animal and a better chance of successfully raising young. Like elephant and many primate societies, a central aspect of pride living is the association of "aunts" that aid in the rearing of cubs. Most cubs in a pride are born during the same season, making the atmosphere of the pride akin to that of a nursery school. One of the greatest threats to cub survival is the takeover of the group by a new male or collection of males. Upon taking over a new group it has been observed that male lions often kill all of the existing young in the pride. It is believed that this is done in an attempt to eradicate all trace of the previous leader as well as to bring the lionesses into estrous more quickly so that the new male(s) can begin to have its own young and increase its fitness.

Male lions are easily distinguishable from females as a result of the long mane of thick, coarse hair that rings the neck, framing the massive head. It is possible that the mane is used as a display to signify health and vitality as well as to indicate the sex and age of the bearer. It is also useful for protecting the neck during encounters with other males. The size and thickness of the mane differs geographically with lions at the southern and northern extent of the range possessing larger manes than those mid-range. Asiatic lions (*Panthera leo persica*) have smaller and darker manes than their African cousins.

Threats & Conservation:

Over-hunting for sport has had a dramatic effect on lion populations both in Africa and Asia. Due to their conspicuous nature – as evidenced by its ear-splitting roar and swaggering walk - and quickly garnered (if inaccurate) reputation as the "King of the Jungle", lions became a favourite target for the armies of big game hunters that plagued the African savannah during colonial times. While very few lions have taken to hunting humans, one famous incident occurred in the Tsavo region of Kenya during the construction of a railway line during the heyday of British colonial expansion. A mysterious male lion began preying upon the railway workers, going so far as to drag the odd individual from his tent in the night. Not surprisingly this caused tremendous panic and further vilified the lion as an obstacle to progress in the region. It was later determined that it was not one lion, but a pair of old brothers that were responsible for the attacks. They are now forever immortalized in the Hollywood movie "The Ghost and the Darkness", the title of which purportedly came from the monikers given to the

lions during the time. Again this isolated tale betrays the generally peaceful attitude of lions toward man that has been far more characteristic of their relationship.
The prominent role that lions play in the political and religious spheres of human society further exemplifies the degree to which they have captured the imagination. From emblematic symbols of the Indian kings to the inspiration for ambitious constructions from the Sphinx of ancient Egypt to the famous Lion Gate of the Greek Mycenae period and the Lion paws of the 5th century Sigiriya rock fortress. On a more personal (and practical) level the Masai of Eastern Africa historically required their young warriors to kill a lion before they were considered men. This tradition no doubt stems from the fact that the Masai are pastoralists and as such consider the lion as a prime threat to the safety of their cattle.
Today, habitat depletion and increased cattle grazing are the prime threats being faced by lions across their range. Particularly fragile is the Gir Forest Sanctuary, the lone remaining enclave of the Asiatic lion. It is 1412 sq. km in size, however the section of the Sanctuary that is National Park and therefore more thoroughly protected, is a mere 258 sq. kms (ISEC, 2002). The intense population pressure on the parks boundaries must be carefully monitored for the future security of the lion population to be ensured.

**Jaguar (*Panthera onca*)**
**(CITES Appendix I)**

The jaguar (*Panthera onca*) is depicted as the New World version of the leopard, as it exhibits very similar physical markings with black spots and blotches on a yellowish background. In actual fact the spots are rosettes, which, in contrast to the leopard, completely enclose one or more dots in a field darker than the regular background colour. The jaguar is also heavier set than the leopard with a broader head and muzzle and thicker, shorter legs. Despite these differences it is believed that the two species evolved from a common ancestor in Eurasia with the present-day jaguar crossing into North America on the Bering land bridge. No longer extant in the northern part of its old range, the jaguar can be found from northern Mexico all the way south to northern Argentina at altitudes up to 3,500m (ISEC, 2002). Extremely rare sightings in the very southern United States are believed to be roaming migrants from the Mexican population.
Like the tiger (Panthera tigris) in Asia, the jaguar does not abide by the popular theory that cats dislike water. In fact jaguars are strongly associated with water, often thriving in riparian lowlands like the Amazon basin or in seasonally flooded grassland habitats like the Brazilian Pantanal or Venezuelan Llanos. They are considered to be excellent swimmers and strong climbers however most of their hunting is done on the ground. Catholic in taste, eighty-five (85) different species have been recorded in their diet (ISEC, 2002).
As the largest cat in the western hemisphere and strikingly patterned as well, it is not surprising that the jaguar is a dominant feature in numerous indigenous cultures throughout Central and South America. The Olmecs of Central Mexico revered these cats; building monuments in their honour while for the Mayans the jaguar symbolized the night sun of the underworld and therefore was the personification of fear, night terror and death. In stark contrast to this view is that of the Tucano Indians of Amazonia who consider the jaguar as the earthly incarnation of the sun, one of the most powerful symbols in their worldview.

Threats & Conservation:
Originally the threats to this large felid came from commercial exploitation for their skins, however now they are threatened more by the persistent twin ravages of habitat destruction and human encroachment. As jaguars live in typically dense forest, they're prey tend to be smaller and less concentrated requiring larger land areas per animal. This means that habitat fragmentation, an event occurring at alarming rates in Central America, can have dire consequences for this species.

**Cougar (*Puma concolor*)**
**(CITES Appendix I – Florida, Eastern and Costa Rican, Appendix II – others)**

The cougar (*Puma concolor*) is the big cat with the largest latitudinal range, extending from the northern reaches of British Columbia to the very southern tip of South America. This perhaps explains the diversity of names that are regionally used to describe this relatively plain-featured felid. From the widespread standards such as puma, mountain lion and panther to the more colourful and regionally restricted mountain devil, painter, red tiger, catamount and mountain screamer. There are six sub-species across this range, varying in coat colour from sandy brown to a deep, reddish tinge, all one coloured and exhibiting no other markings. The larger specimens are found in North America. Cougars inhabit a wide variety of habitat types ranging from swamps to deserts, moist deciduous forests to cold, dry coniferous forests and at altitudes up to 4,500m (ISEC, 2002). Like the other cats, the cougar has attained mythological significance throughout its range. This is perhaps best exemplified in the ancient Incan capital of Cuzco in Peru the design of which was inspired by the physical shape of the cougar.

They are hardy, adaptable cats that can survive by changing their prey base as circumstances dictate and are able to live in very close proximity to human settlement, often unbeknownst to the inhabitants.

Threats & Conservation:
This tight spatial relationship with people has led to much conflict between the species with cougars increasingly including domestic livestock in their diets as encroachment intensifies. A typical response to this kind of livestock predation has been for ranchers to put out poisoned carcasses for the raiding carnivore. However as cougars often refuse to eat anything not killed by them, this method has proven inefficient, often unintentionally penalizing other scavengers that do show up for the feast. Unfortunately ranchers, led by US government agencies have simply changed tactics and gone after cougars with guns, snares, traps and hunting dogs in an effort to safeguard their herds. This has fragmented cougar populations. A case in point is the Florida panther, sub-species of the cougar; it has been decimated by persistent persecution and the sharp reduction of its habitat to the point that only about 50 individuals exist in the wild. For a large carnivore this number is tragically small and not viable.

**Snow Leopard (*Unica uncia*)**
**(CITES Appendix I)**

Snow leopards (*Unica unica*) are the most mysterious of the Big Cats. With their ghostly grey coats and treacherous, inhospitable habitat they are relatively unstudied in the wild. Inhabiting vast, snow-swept territories they make themselves conspicuous only in a secondary manner by leaving scrapes, scent marks and fecal deposits at particular locations for others of their kind to interpret (Jackson & Ahlborn, 1988).
Unusual for the Big Cats, in the winter months snow leopards often supplement their carnivorous diet with plant matter, especially willow bark. Further separating them from other Big Cats (except the similarly restricted cheetah) is their inability to roar and their trait of eating while in a crouch position, both characteristics usually associated with the smaller cats. Their fur is exceedingly long – up to six cm's on the chest – as it is an essential for such harsh conditions. Other adaptations for the cold include a long, rounded tail of long hairs used to wrap around the body when sleeping for extra insulation and broad footpads covered with a cushion of hair. This hair increases the surface area of the feet and helps to distribute weight evenly over the snow. They also protect the pads from extreme cold. Snow leopards are extremely agile felids with the ability to leap as many as 15 m in a single bound, their long tails acting as an effective counterbalance. A favourite daytime hangout is apparently atop a huge nest – accessed by a straight vertical leap -built by a black vulture.

Threats & Conservation:
With prey few and far between in most parts of their Central Asian range, snow leopards have probably never been particularly common, however it is their very beauty that has been their biggest curse. The rapacious fur industry, charmed by the thick, plush fur wreaked havoc with snow leopard populations and it is estimated that only 4,000-7,000 remain in the wild (ISEC, 2002). The demand for snow leopard products for medicinal usage is also rampant. Compounding the decimation due to poaching, much of the snow leopard's traditional prey has been eradicated. This includes large ungulates hunted to extinction or replaced by domestic stock and pika and marmots poisoned in they're thousands by ranchers who see them as detrimental to their livelihood.
The International Snow Leopard Trust was founded in 1981 to deal with some of these issues, however in the remote regions where snow leopards are mostly found attempts at conservation are slow moving and difficult.

**Cheetah (*Acinonyx jubatus*)**
**(CITES Appendix I)**

Cheetahs (*Acinonyx jubatus*) are widely acclaimed as the fastest runners in the Animal Kingdom, able to attain speeds of over 90km/hr for short bursts! This incredible fleetness can only be utilized as a practical measure in open country, thus the very attribute allowing the cheetah to successfully hunt also works to restrict its potential range.
The cheetah shows many adaptations for fast running. Long legs and a flexible spine allow an extended stride length for speed, exposed claws grip the ground for traction and large nostrils permit increased efficiency when breathing during and after a spurt of activity. The heart and lungs of a cheetah are large relative to their size, as are their

air passageways and adrenal glands. Their feet, meanwhile are outfitted with hard, ridged pads which theory suggests are useful as anti-skid treads. The long tail acts as a counterbalance when changing direction swiftly during pursuit (ISEC, 2002).
The actual hunt involves sneaking through the long grasses of the plains to within 30 or so meters of the potential target followed by a short but intense sprint. It is the aim of the cheetah to swipe out with a forepaw and knock the fleeing antelope or young wildebeest off balance, hooking it with a specially enlarged front dew claw situated halfway between pad and elbow joint.
Unlike most cats, cheetahs apparently show no requirement for water and can attain sufficient moisture from the blood of their kills. They are mostly solitary animals but young, related males often stay together for years, hunting in tandem and maintaining territories amid the solitary males and females with cubs. Lions are a constant menace for the cheetah; frequently hunting out the latter's dens and consuming the cubs. With small canines, an inability to roar and a distinctly non-threatening physical presence the cheetah is easily scared away from its kill by everything from lions to hyenas to vultures. Once flushed from the kill it will not return even after the usurper has moved away.
Cheetahs have long had an association with humans. They were used as hunting companions throughout North Africa and the Middle East and due to the fact that they are relatively easily domesticated have been substituted for dogs in many instances.

Threats & Conservation:
Where once they inhabited open lands throughout Africa, the Middle East and into India and Russia, hunting, habitat destruction and the loss of prey species have seen them restricted to east and southern Africa with small, relic populations in Egypt and Iran.
This precarious situation does not appear to be a new phenomenon for the cheetah as genetic evidence suggests that a massive die-off has occurred at least once already, approximately 10,000 – 12,000 years ago. As a result the species are genetically identical exhibiting only 2% genetic variation where other cats have 10% or more (ISEC, 2002). This makes the cheetah unusually prone to devastation by disease.
Captive breeding of cheetahs are ongoing, with ideas of increasing the gene pool for release into the wild. However such measures are not as successful as conservation of the existing wild populations and their remaining habitats, allowing hopefully for natural regeneration of the species.

**Leopard (*Panthera pardus*)**
**(CITES Appendix I – Asian subspecies', Appendix II – African subspecies')**

With the ability to thrive not just in forests like the tiger or open savannah like the lion, the leopard (*Panthera pardus*) is the most successful big cat in terms of colonizing new and varied terrain. That these felids can subsist on a host of small prey species increases their impressive ability to lie in all manner of habitat. This is perhaps why these adaptable carnivores have spread virtually throughout Asia and roam over all of Africa except for the Sahara. With small populations in Israel and Central Asia the leopard today maintains a large if fragmented range. This is the only Big Cat inhabiting Sri Lanka.
This wide range in geographical extent corresponds to a variability of coat colour in different regions from grayish to brown but all united by the common theme of dark spots forming rosettes on a lighter yellowish background. All-black individuals – black panthers - are not uncommon, especially in thicker, moister forest regions.

Such melanistic forms of the jaguar are similarly found and, to add to the confusion, are also known as a black panthers.
Of all the Big Cats, leopards are most similar to cougars in terms of physique and the basic tenor of their lives. They are supple, bold creatures skilled at concealment but possessed of great drive and self-assurance. Solitary for the most part, they come together to mate and socialize, communicating with great dedication through a selection of non-audible methods such as scrape marking and scent spraying. They also possess a wide-ranging vocal repertoire used only as needed. Leopards are known to be good swimmers if necessary and are excellent climbers, carrying kills up to three times their own weight up into trees as a safeguard against scavengers.
Leopards are opportunistic in their dietary requirements, taking all manner of prey. Large prey such as deer, antelope, young buffalo and wild boar are at times heavily supplemented by smaller game such as rats, porcupines, rabbits and turtles. One population in the arid Kalahari region of southern Africa has been observed to include insects such as beetles as a major component of their seasonal diet (Baily, 1993).

Threats & Conservation:
This ability to inhabit a wide variety of terrain and adapt to changing circumstances has set leopards in good stead with the increasing forces of human encroachment. Unfortunately the ability to substitute cattle and dogs (a mainstay of the diet in many parts of India) for wilder prey, while salutary in terms of survival has not benefited the species in terms of its public perception. Leopard-human conflict over domestic livestock is increasing throughout its range and together with continued poaching for the Chinese medicinal market, the illegal fur trade and habitat loss is putting pressure on this hardy felid. Forest fragmentation within as well as between habitats are also resulting in possible 'bottlenecking' of leopards, which in turn will lead to increasingly fragile wild populations.

**A CASE STUDY:**
***Brief from a study by Kittle & Watson, 2001-02, Homerange, Demography & Behaviour of the Sri Lankan Leopard, Ruhuna (Yala) National Park Block I.***

**The Sri Lankan Leopard (*Panthera pardus kotiya*)**

The leopard that inhabits the island of Sri Lanka differs genetically from its mainland bretheren and thus has been designated as separate sub-species. Unique in the world it is the only leopard that has evolved as the top feline predator in its ecosystem as none of the lion, tiger or cheetah made the crossing from India. This historical situation may manifest itself in behavioural peculiarities with the Sri Lankan leopard living a less strictly nocturnal and less arboreal existence.

Leopards inhabit all manner of habitat types within Sri Lanka from the arid South East coastal scrub jungles throughout the entire dry zone's semi evergreen forests and extending up into the Central hills to montane forests at altitudes above 2000m. They also inhabit the island's few remaining pockets of rainforest. The morphology of the species changes according to its location with the highland populations appearing larger due to a thicker coat. The diet similarly changes with habitat type with spotted or axis deer (*Axis axis*), wild boar (*Sus scrofa*), sambhar (*Cervus unicolor*) and buffalo (*Bubalus bubalis*) being the preferred prey in the dry zone areas while it is thought that purple faced langur (*Trachypithecus vetulus monticola*) and sambhur

make up a larger percent of the diet in the montane areas (study in progress). In the arid Yala National Park, Block I leopards have been found to supplement their diet with everything from star tortoises to porcupines, rabbits to pangolins.

Land tenure:

The social structure of the arid zone Sri Lankan leopard is similar to that of other leopard populations in Africa and Asia with adult animals occupying home-ranges that in turn encompass smaller, more central and defended territories. The animals that live in established home ranges and are sexually active are known as residents and they continually demarcate their territorial boundaries as well as common travel routes using a variety of methods including scent spraying, scraping and vocalizations. These methods of communication are adapted to a social structure based on avoidance and the desire to be solitary. By leaving olfactory clues such as scent marks a resident animal is telling others that he/she is in the area. This important cue allows leopards to avoid both surprise and confrontation. A female can also communicate her stage in the all-important estrous cycle through these cues. As a single resident male's home-range will encompass and overlap the home-ranges of several females, these signals allow him to know when to attempt a mating with a particular female. Portions of a resident male's home-range will also overlap the home-range of at least one other resident male. By constantly leaving a trace of movement via scrapes and spray these males are able to avoid each other, usually utilizing a common patch of range at different times. The territory on the other hand is essentially the core area of a resident's home-range and is both more frequently visited and stringently protected.

The animals in a population that are not residents – with established home-ranges - are known as transients. While these animals may inhabit a particular area for a number of days or even weeks, they do not claim ownership to that area by marking, patrolling and mating. Most transients are young males as it is these that have to leave their natal area after approximately 2 years and search out an area of their own. Often young males make exploratory forays in a variety of directions from the natal area, coming back to that area after a period of time. This "homebase" situation allows the males to get to know the lay of the land and read the ownership claims scraped or sprayed into the terrain before striking out on their own once and for all. Females tend to remain within their natal home-range or in an area adjacent to it, inheriting a larger range upon the death of another female in the area (mother, sibling from a previous litter). Once a female bears her first set of young she can be considered a resident. Usually, resident males tolerate transient males as long as the later act their role by avoiding the resident animal. Of course it is possible for a transient individual to 'sneak' a mating but the chances of this happening are low since the resident of the area will be aware of the receptiveness of the females within his purview and thus monitor any newcomers closely.

Mating:

A female is at the prime point of her 45-day estrous cycle for approximately a week. During this period she will associate closely with the resident male, copulating frequently for short (~30 second) periods. The female will initiate the actual mating by repeated physical contact (rubbing herself against) the larger male. Once she has him aroused she will lie on her belly, the male mounting from behind, grasping the female's neck in his jaws. The act is accompanied by vocalizations. Repeated

copulation can occur after a few minutes. The association can vary from 2-7 days varying in intensity. Mating pairs have been known to hunt together.

Cub rearing:
Cubs stay with their mother for the first year and remain within her home-range, associating less and less frequently for approximately two years. Resident males are very tolerant of these cubs - perhaps because often the cubs are their own! Females usually give birth to 2-3 cubs after an 85-100 day gestation period. They prefer rocky caves as den sites as these afford better protection from potential predators. In Sri Lanka, with the absence of lions, tigers, hyenas etc. the list of potential predators is quite small with pythons (*Python mulurus*), jackals (*Canis aureus*) and crocodiles (*Crocodylus palustris*) the most potentially dangerous. The cubs are dark and lightly spotted at birth and remain a smoky grey colour for the first couple of months before their hair takes on the familiar yellow and black pattern. They are weaned at between 3-4 months while they rely on the mother's kills for another year or more, they immediately begin practicing hunting by stalking all manner of creatures from frogs to pond herons to land monitors (*Varanus cepedianus*).

Hunting & Feeding Ecology:
As adults, leopard's must make a kill at least once a week and ideally a couple of times a week. This requirement makes them opportunistic hunters, willing to take almost anything if the circumstances permit. In the arid zone of SE Sri Lanka only elephants and adult buffalo are safe from leopards. The success of the hunt almost always requires stealth and secrecy with the favoured method being to sneak as close as possible to the targeted prey using long grass or scrub as camouflage, and then dashing and leaping in an effort to clamp jaws around the neck. A leopard will consume its kill over a protracted period, depending on the size of the carcass. Usually an adult deer kill will last for three or four days with the leopard feeding a couple of times a day for 20-60 minutes. Dusk is a favourite time to return to a kill for a feed. Leopard's in many populations expend an enormous amount of energy hauling their kills up trees in an effort to prevent scavengers from stealing the meal. Sri Lankan leopards in the arid zone leave most of their kills on the ground, possibly due to the fact that only the wild boar, jackal and sloth bear (*Melursus ursinus*) can be considered the only potential scavengers of note. The wild boar is adept at rooting out older carcasses by their smell but does not appear to be a major threat to fresh carcasses – although obvious ones will certainly become a magnet. The sloth bear is capable of climbing trees itself so pulling the carcass up to avoid them is a waste of energy while jackals appear to avoid leopard kills. An alternate theory is that the prey base is so large in the Yala area that leopards consider it more fruitful to make another kill than drag an existing one up a tree! Of course some carcasses do find their way up into trees especially in areas with many wild boar or during the wetter months when the decay rate is high.

Status and Conservation

In Sri Lanka the current population of leopards roaming the island is unknown. What is known however is that the numbers of these elusive animals have decreased substantially over the last century. This was originally due to game hunting during colonial times and later through poaching for skins. The passage of the Fauna and Flora Protection Ordinance of 1938 put leopards under legal protection, however poaching both inside and outside protected areas continued unabated. Even today

poaching outside and within the country's national parks is far from a thing of the past with a minimum of 25 leopards killed around the Island since January 2001.

Leopard skins are still in demand on the black market, as are claws and teeth. While many of the details and statistics are unavailable for Sri Lanka, there is mounting evidence from India to indicate an extensive and established trade in leopard products in the region. A nationally publicized bust near New Delhi in India on January 28, 2000 seized some 70 leopard skins and 18,000 leopard claws in addition to a scattering of tiger products, indicating that there definitely is a colossal demand within the region. As each leopard has 18 claws (5 on each hind paw and 4 on each front) this works out to an astounding minimum of 1000 animals!! It is not expected that Sri Lanka is even home to that many leopards.

The skins and claws confiscated in India were partway on a well-worn trail that leads from the forests of Uttar Pradesh, Madhya Pradesh and Himachal Pradesh, through curing stations located in small towns, to larger centers like New Delhi where they are shipped abroad for final consumption. Where they end up seems to depend a fair amount on the particular products and their purported uses. The following is a rough breakdown of leopard products, their typical uses and destinations:

- Skins – The unrivalled beauty of a leopard's skin, evolved in such a way as to keep the animal out of sight from predators, has historically – and ironically - been the greatest contributing factor to its global depletion. Indigenous groups from Africa, Asia and the Middle East have utilized the spotted skin of a leopard as a designation of prestige, often worn by high-ranking members of the community or during ceremonial events. As mentioned this concept was taken to new, unsustainable levels in the late 1960s and 70s by the fashion industry before consumer demand encouraged the use of synthetic materials. Today the leopard skin is still sought after for its remarkable beauty and the demand seems to originate in the Middle East, where leopards no longer roam in anything other than highly threatened, isolated pockets. Increasingly it seems skins are not worn but hung on walls and cast on the floor as rugs.

- Bones – Not usually associated with leopard poaching, bones are now being used with increasing frequency as substitutes for the bones of much more rare (and more easily protected) tigers. These have long been used as vital ingredients to a number of Eastern, particularly Chinese and Korean homeopathic or traditional treatments for anything from rheumatism to hydrophobia. Hundreds of kilograms of leopard bones have been found in association with skins and claws in a number of illegal product seizures in India recently. This is the current biggest threat to wildcat populations in Asia with prices for a kilogram of bone being up to 10x that of skins.

- Claws – As with leopard skins, the demand for claws, as a fashion accessory appears to have originated with tribal groups such as many in the Himalayan region of India that use them as necklaces. These necklaces are seen as being able to repel evil sprits and provide luck and prosperity. Whether there is a burgeoning market for these claws is unknown.

- Teeth – The canine teeth of leopards have long been used as charms and can now be seen incorporated into modern jewelry, apparently giving it that masculine edge desired by many.

Of course not all poaching is carried out with the intention of procuring products for sale. High human population densities in the sub-continent mean that habitat destruction and encroachment are proceeding at alarming rates. This has put more and more people in direct conflict with wild animals in and around protected areas, not to mention forest tracts without the benefit of protection. India has long lived with this problem and while Sri Lanka does not yet find itself in a situation quite so acute, signs seem to indicate that that is the direction in which it is heading. Unlike the sloth bear and even the tiger, leopards are very reluctant to move out of their territories after they get encroached upon, even if that option is available.

As people move into leopard territory the habitat gets disturbed through the clearing of forest and planting of crops. Together with the hunting that accompanies human encroachment, these changes have immediate effects on the wildlife of the disturbed area. A decrease in forest cover and alteration in plant species proliferation means that animals will find it difficult to survive. The species directly affected are the browsers – deer, sambhar, wild buffalo – that no longer have access to the resources upon which they survived. The predator species will subsequently find themselves faced with a shortage of traditional prey. There are two ways to react to this change in circumstance: Leave the area or adapt to different prey. Unless the changes are drastic indeed the leopard will select the second method.

This means that the result of increased human presence in leopard habitat is increased leopard/human conflict. While it is exceedingly rare for leopards to actually attack humans – like most wild animals, they would much rather avoid the presence of people – they do begin to prey on domestic livestock such as cows and goats as well as the dogs that invariably accompany encroaching settlers. Like elephants invading a chena farmer's crop, a leopard killing one of his cows is not something to be taken lightly and the result of this kind of predation is often the retaliatory killing of the leopard. As leopards do not easily get scared from their kills, the easiest and least traceable method is to poison the carcass. Of course if the carcass were fresh then a well-placed bullet would be more productive as the flesh of the kill can still be utilized. With a dead leopard on his hands and a market for leopard products available the farmer takes what he can from the animal, especially now that he is minus one cow. Needless to say once an individual has started down that slippery slope by entering into the poaching racket, it may become more difficult to put on the brakes.

Indirect Poaching Effects:

An alarming number of other animals are routinely poached in Sri Lanka. This has many indirect yet extremely serious effects on leopard populations' countrywide. Many leopards are caught in traps laid for other animals, a case in point being the recent death of a healthy young male leopard in the Nuwara Eliya region that was caught in a wild boar trap. Almost ripped in half by the tightened wire this animal died an excruciating death. Ironically the leopard was probably hunting the wild boar that was initially determined to be such a pest to the estate area that the trap was warranted. Even more disturbing is the obscene level of poaching that occurs to supply meat to religious pilgrims coming to Buddhist temples and Hindu shrines. Working in Yala, one could accurately determine how close in the calendar one was to a religious festival or poya day by the number of gunshots heard in and around the park. The prime targets for these poachers are spotted deer, sambhar and wild boar, which for many have come to be associated with a visit to Kataragama Devala or the Sithulpahuwa site. Individuals openly selling this illegal game operate right outside the gates of the park on occasion and have a well-used network involving a number of

the hotels and guesthouses used by the pilgrims. It is not only these religious sites however that receive the bounty of the poaching party, for some of Colombo's elite are certainly not averse to sampling this meat, irrespective of its origin.

How this poaching affects the leopard population is straightforward: The more venison that is smuggled into the rest-houses of Tissa and Kataragama or dinner tables in Colombo, the fewer deer remain in the forest to support the leopards. With a high degree of poaching occurring on the peripheries of National Parks, often by the very same farmers that are encroaching on the boundaries, the livestock introduced to the area become more vulnerable to leopard predation. Thus the cycle goes.

Compounding the problem is the fact that the Wildlife Dept., while for the most part active in their pursuit of poachers, is simply not adequately equipped to deal with the scale of the issue. Carrying out a raid involves a number of steps, each vital to the overall success of the operation. Assuming these steps are successfully negotiated and the seller arrested, it is then up to the Wildlife Dept. rangers in charge to present the case in open court. This is a massive stumbling block to proceedings as many rangers admit that they are not trained for this type of legal work. Add to this lack of training the fact that many sellers are "connected" in one way or the other and the end result is often acquittal. Even if the poacher or seller is found guilty the resultant fines are not sufficient to stall, let alone halt those involved.

It is essential that protection and implementation of such legal protection be carried out throughout the habitat of this island leopard. We are only now beginning to understand the full extent (on going study by authors) of this cats range and the inherent problems that are present for each of the different populations. It is hoped that a species and habitat specific conservation strategy will help in maintaining the survival of this Top Cat of Sri Lanka.

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