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Abstract: The resource guide will help provide teachers with ideas for integrating cheetah conservation education into the school curriculum and enable teachers to cover material required in the syllabus in an innovative and pleasurable way. The guide has been divided into five sections. The *Introduction* provides teachers with a general overview of the problems predators are facing, specifically cheetahs; *Cheetah Facts* with information sheets for use in teaching about the species and as reference materials for activities; *Cheetah Challenges* with suggested activities related to the subject are listed. *Project Topics on the Cheetah* include interdisciplinary topics on the cheetah and *Conservation Activities* presents individual and classroom projects designed to encourage student participation in cheetah conservation.

CHEETAHS:

A PREDATOR'S ROLE IN THE ECOSYSTEM

TEACHER'S RESOURCE GUIDE

STUDENTS AND TEACHERS
WORKING TOGETHER
TO SAVE AN ENDANGERED SPECIES

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"Nations of the World
have tolerance for the cheetah."
Rogate School

If you would like to receive additional copies of the teacher's educational packet or would like the Cheetah Conservation Fund to give an assembly presentation at your school, please write or call us at:

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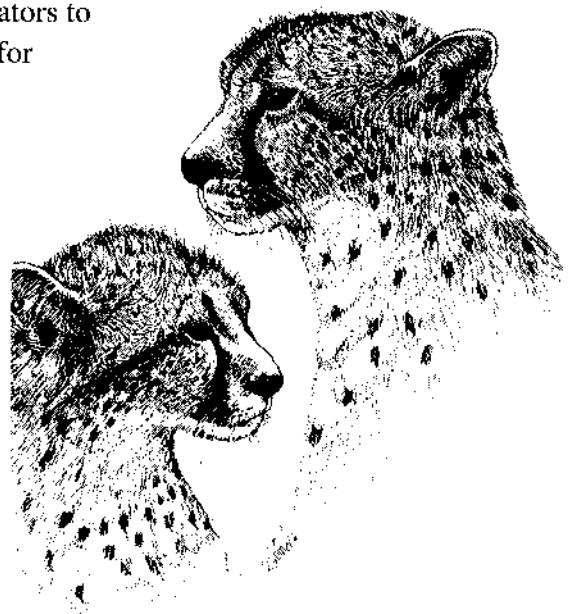
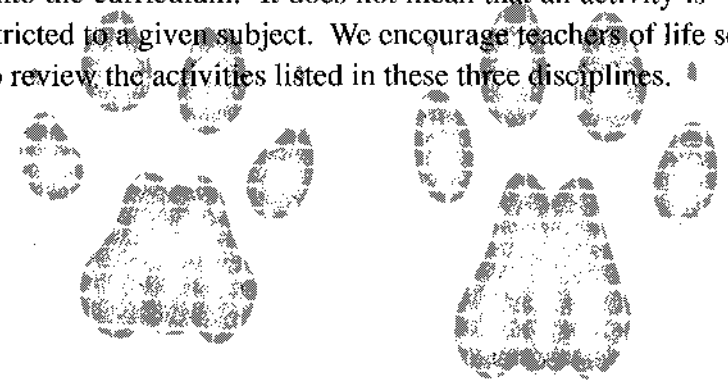
HOW TO USE THIS PACKET

Animals interest people of all ages, and some of the most fascinating species on earth are predators. This packet will help provide teachers with ideas for integrating cheetah conservation education into the school curriculum and enable teachers to cover material required in the syllabus in an innovative and pleasurable way. The packet contains suggestions that will help you generate your own ideas specific to the age and abilities of your students. Activities are designed for grades 1–12; teachers may determine what activities are appropriate for their classes based on the students' abilities to complete the exercises. We hope that you will utilise or be able to adapt this information to your course work.

The packet has been divided into five sections. The INTRODUCTION provides teachers with a general overview of the problems facing predators, specifically cheetahs. CHEETAH FACTS provides teachers and students with informational sheets for use in teaching about the species and as reference materials for activities. These fact sheets may be copied for students or used as background information for teaching. We do encourage educators to provide copies of the fact sheet entitled *Cheetah* for each of their students.

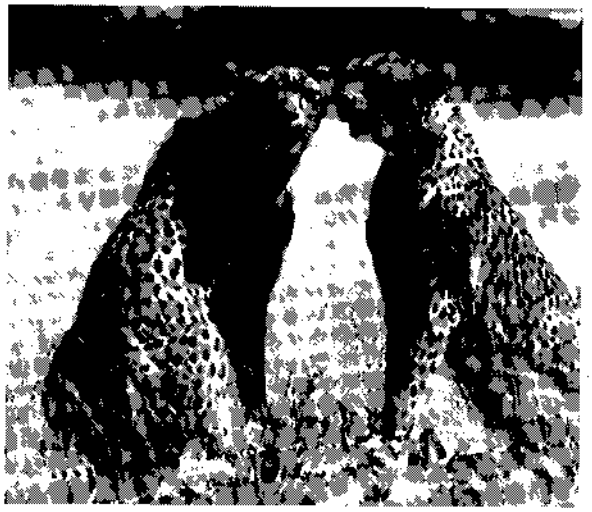


CHEETAH CHALLENGES provides teachers with suggested activities related to the subject areas listed. Work sheets and teacher answer keys are located at the end of each activity. Page numbering in each section is to aid in updating the packet. Teaching objectives, background information, and suggested fact sheets for use with the activities are listed at the beginning of each subject for easy reference. Many of the activities within subject areas are interdisciplinary. The designation of activities within a subject is meant to assist teachers with integrating the material into the curriculum. It does not mean that an activity is solely restricted to a given subject. We encourage teachers of life science, social studies, and English to review the activities listed in these three disciplines.



INTRODUCTION

Many people fear predators, especially big cats such as the lion, cheetah, and leopard. We are often taught to fear carnivores without understanding their unique behaviours, special adaptations, and essential roles in the maintenance of healthy ecosystems. Our attitudes and misconceptions about these species have led to their endangerment because many people deal with their fear by eliminating predators.



Endangered species exist in low-population numbers and need intensive long-term management in order to survive. Attitudes toward predators must be changed if we hope to save endangered species such as the cheetah. By learning the reasons why species are endangered, students learn how clean and healthy ecosystems are crucial and what will occur if we continue to pollute the environment and destroy habitats. Through environmental education, we can all work together to change the attitudes and behaviours that have led to the endangerment of predator species and help save them from extinction. Individuals can make a difference!

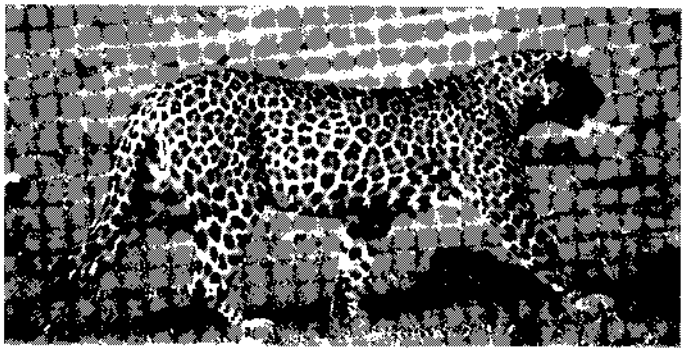
To appreciate predators, we must first understand their roles in wildlife communities. Because predators must kill other animals in order to survive, many myths about them have evolved over the centuries in many cultures. The plight of cheetahs symbolizes the problems that many predators face throughout the world. Cheetahs are endangered because of:

1. Loss of habitat and prey to commercial farming and land development;
2. Persecution by farmers as vermin or livestock-killing "problem" animals; and
3. Poaching or the illegal taking of an animal.

If we are to conserve healthy wildlife populations in the 21st century, we must understand the ways of animals and recognize their importance to our survival. Wild species maintain healthy ecosystems; provide us with food, shelter, and clothing; benefit us economically; and improve the qualities of our lives by their existence.

Humans are predators and carnivores. We compete with wild animals for natural resources. Because of growing human populations and over-consumption of the earth's resources, the world is losing wild places and species as the demand for food, minerals, lumber, and other resources increases. Two hundred years ago there were fewer than one billion people on earth. Today, about five billion people live on the planet, and there may be over six billion of us by the year 2000.

Leopard



Extinction is a natural process, and for hundreds of millions of years, plants and animals have become extinct. But, the current rate of extinction is something new. By the year 2000, the total number of species lost each year may be 40,000. This rate of extinction is far greater today than at any other time in the last 65 million years. The five most common causes of extinction created through human involvement are:

1. Destruction of habitat for development and to obtain lumber, minerals, oil, and other products;
2. Introduction of exotic species into new habitats;
3. Pollution;
4. Overuse of animals and plants through collecting, hunting, or poaching; and
5. Use of animal and plant products for religious beliefs.

The cheetah's survival depends on people and their ability to manage the wild population and protect its habitat.

When people destroy habitat by constructing buildings or grazing livestock, for example, they prevent nearly all animal populations from surviving there, both in the present as well as in the future. Animals compete poorly with humans for space. Humans change the environment rapidly, and animals cannot always adjust to these changes or adapt quickly enough in response. Large predators, like the cheetah, need large areas in which to roam; they usually are not found

close together in great numbers. Loss of habitat and a limited geographical range (a small area in which to live) threaten the cheetah's survival. Low survivorship (few cheetahs live long or do not become adults) also affects cheetahs and makes them more vulnerable to human competition. High cub mortality, up to 90% in the wild, makes it difficult for the cheetah to recover when its population size decreases. Helping predator species survive in spite of competition from people is one aspect of wildlife conservation. Loss of habitat and prey base, competition with large predators and agricultural interests, and poaching are taking a heavy toll on wild cheetah populations throughout Africa. Today, there are less than 12,500 of these endangered cats remaining in Africa and Asia.[1] The vast majority of cheetahs live in small, isolated groups outside protected game reserves where they are often in conflict with humans and livestock, and most populations continue to decline. The largest wild population of cheetahs is found

1 Cheetahs are found in 26 countries in Africa and in Iran. The majority of these countries have only small isolated numbers of cheetahs, which are not considered viable populations. The large populations are found only in Namibia/Botswana, Zimbabwe, and Tanzania/Kenya.

2 According to the Convention on International Trade in Endangered Species (CITES), between 1980 and 1991, 6,782 free-ranging cheetahs were removed by farmers from this population. This number represents a minimum, as many removals from farmlands are not reported.

in Namibia; however, in the 1980s their numbers were reduced by half to less than 2,500.[2] Lack of genetic variation, reproductive abnormalities, high infant mortality, and a greater susceptibility to disease place the species at further risk of extinction. Genetic variation allows species to adapt better to environmental and ecological changes and to fight off diseases.

While cheetahs were once found all over Africa, they are now endangered in most of their former ranges. Cheetahs do not pose a threat to human life. People have carried on the campaign against cheetahs because they believe cheetahs wantonly kill livestock as well as other animals, such as small or young antelopes, causing excessive economic loss. In reality, the amount of damage to domestic stock is exaggerated and is usually caused by a limited number of livestock-preying cats, or "problem" animals, and inadequate livestock practices. Despite these problems, cheetah have a chance for survival on the vast farmlands of southern Africa.

Humans share this Earth with up to 33 million animals, plants, and other life forms. The diversity of life on our planet is amazing. All species — plants, mammals, insects, invertebrates — depend on one another. People depend on many different plants and animals for food and medicines. Cheetahs are only one of the 33 million species living on the planet. Does it really matter if the cheetah becomes extinct? It is tempting to think that the loss of only one species will not affect us. But we must remember that all things are connected and explore how important cheetahs are in their ecosystem. When we lose even one species, our world becomes a poorer place to live. The cheetah deserves a place on this Earth. The cat has been revered by humans for almost 5,000 years. If it is lost to future generations it would leave a large hole not only in nature but also in the very psyche of the human mind, which so naturally feels and knows the uniqueness of this creature. Namibia, with its varied ecosystems and diversity of life, poses the greatest hope for the cheetah's future.

Youth education and understanding are paramount to helping the sleek hunter of Africa win its race for survival. The ultimate success of the Cheetah Conservation Fund's education programme depends on you — the teacher — who will take cheetah conservation to your students. In doing so you become part of an international effort to save this endangered species, and together we can work to conserve our world's rich biological diversity. By participating in environmental education, you become someone who cares for our land, its wildlife, and the future your students will inherit. The Cheetah Conservation Fund (CCF) appreciates your initiative in using this packet. We hope it will help you motivate students to think critically about individual and communal efforts to conserve wildlife, and to act constructively to improve our world's environment.

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± 12,500 CHEETAHS REMAIN IN AFRICA.

At top speed the cheetah can run 27 meters in 1 second.

Cheetahs are predators & carnivores.

NAMIBIA - THE CHEETAH CAPITAL OF THE WORLD.

"Never kill the Cat that Cries"

From 0 to 80 km in 3 seconds.

There are over 3,000 spots on an adult cheetah's coat.

2,500 cheetahs live in Namibia.

DID YOU KNOW THE CHEETAH IS THE WORLD'S FASTEST LAND ANIMAL?

CHEETAH FACTS

The cheetah can cover 7 metres in 1 stride.

At top speed a cheetah can run 110 km/h!

The Cheetah is the world's oldest big cat.

Cheetahs do not pose a threat to human life.

95% OF NAMIBIA'S CHEETAHS LIVE ON COMMERCIAL LIVESTOCK FARMS.

To help save the cheetah, learn more about it & share what you have learned with others.

CHEETAHS ARE AN ENDANGERED SPECIES.

CHEETAH

(Acinonyx jubatus)

Status	Protected species in Namibia. Endangered under the United States Endangered Species Act. Listed on CITES Appendix I.*
Description	The cheetah has a slender, long-legged body with blunt semi-retractable claws. Its coat is tan with small, round, black spots, and the fur is coarse and short. The cheetah has a small head with high-set eyes. Black "tear marks," which run from the corner of the eyes down the sides of the nose to its mouth, keep the sun out of its eyes and aid in hunting.
Size	Adult body length 112–135 cm; tail length 66–84 cm; shoulder height 73+ cm; weight 34–54 kg. The male is slightly larger than the female.
Specialisations	The cheetah's flexible spine, oversized liver, enlarged heart, wide nostrils, increased lung capacity, and thin muscular body make this cat the swiftest hunter of Africa. Covering 7–8 meters in a stride, with only one foot touching the ground at a time, the cheetah can reach a speed of 110 km/h in seconds. At two points in the stride, no feet touch the ground.
Habitat	Cheetahs thrive in areas with vast expanses of land where prey is abundant. In Namibia, cheetahs have been found in a variety of habitats, including grasslands, savannahs, dense vegetation, and mountainous terrain. Ninety-five percent of Namibia's cheetahs live on commercial farms.
Range	Once found throughout Asia and Africa, the species is now only scattered in Iran and various countries in sub-Saharan Africa. Home ranges in Namibia for males can be up to 1500 square km^2 and for females, 1200–1500 square km^2.
Behaviour	Cheetahs have a unique, well-structured social order. Females live alone except when they are raising cubs. The female raises the cubs on her own. The first 18 months of a cub's life are important — cubs learn many lessons because survival depends on knowing how to hunt wild prey species and avoiding other predators such as leopards, lions, hyenas, and baboons. At 18 months, the mother leaves the cubs, who then form a sibling group, which will stay together for another 6 months. At about 2 years, the female siblings leave the group, and the young males remain together for life. Males live alone or in coalitions made up of brothers from the same litter. Some coalitions maintain territories in order to find females with which to mate. Territories are often located in areas where there is a rich supply of wild game and/or water. Fierce fights between male coalitions, resulting in serious injury or death, can occur when defending territories. Cheetahs hunt in the late morning and early evening. They capture their prey by stalking — until the prey is within 10–30 meters — before chasing. The prey is suffocated when a cheetah bites the underside of the throat. Chases last about 20 seconds, and rarely longer than 1 minute. About half of the chases are successful. In Namibia, cheetahs use playtrees (trees with sloping trunks and large horizontal limbs, usually camelthorns) to observe their surroundings and mark the area. Cheetahs make chirping sounds and hiss or spit when angered or threatened. They purr very loudly when content. **Cheetahs do not pose a threat to human life.**

*CITES is an international treaty that monitors trade in wild species. Appendix I indicates that the species is threatened by trade and is in danger of extinction.

Reproduction	Sexual maturity occurs at 20–23 months. The gestation period is about 95 days, and the average litter size is 4–5 cubs. Cubs are smoky-grey in colour with long hair, called a mantle, running along their backs; they are up to 30 cm long and weigh 250–300 g at birth. The mantle has several purposes: it is thought to help camouflage the cub in the dead grass, hiding it from predators, and to work as a mimicry defense, causing the cub to resemble a honey badger (ratel).
Population	Only ±12,500 cheetahs remain in 25 African countries, and ±200 cats survive in Iran. Namibia has the world's largest number of cheetahs, yet only 2,500 remain in the wild.
Life expectancy	Studies have not been conducted in the wild on longevity; 8–12 years is average in captivity. Cub mortality is high for the species in both the wild and captivity. On average 30 percent of all cubs born in captivity die within one month of birth, and in Tanzania's Serengeti National Park, about 90 percent die before reaching 3 months of age.
Diet	Small antelope, young of large antelope, warthog, hare, and game birds.
Natural History	Cheetahs have been kept in captivity for some 5,000 years. However, they breed poorly, and the captive population has been maintained through wild collection. Cheetah suffer from a lack of genetic diversity making them more susceptible to disease and decreasing reproduction. The many parks and reserves of Africa offer protection for only a small number of cheetahs. In these parks, lion and hyena numbers increase, and the cheetahs cannot compete with these large predators, which kill cheetah cubs and steal their prey. Evolution has favoured speed and not strength for this species.
Survival Threats	Decline in prey, loss of habitat, poaching, and indiscriminate trapping and shooting as a livestock predator threaten the survival of the cheetah throughout its range.
Legal Protection	As a protected species in Namibia, people are allowed to remove cheetahs only if they pose a threat to livestock or human life. Unfortunately, some farmers will capture cheetahs indiscriminately (the "problem" animals may not be singled out), often removing or killing those that have not taken any livestock. Limited international trade in live animals and skins is permitted from Namibia, Zimbabwe, and Botswana. Illegal trade in other parts of Africa and indiscriminate capture and removal in southern Africa continue to threaten the survival of this species.
Conservation	To help this sleek hunter of the African wild win its race against extinction, we must: (1) help protect its habitat and insure a place for it on Namibian farmlands, (2) aid in the conservation of the wild prey base, (3) halt the indiscriminate capture and removal of the cheetah, (4) improve livestock management, and (5) educate everyone about the need to conserve biological diversity and the predators' unique role in healthy ecosystems.
Captivity	CHEETAHS ARE WILD ANIMALS. Capture of wild cheetahs threatens the survival of the species in two ways. Firstly, the removal of individuals reduces the species' genetic diversity in the wild. And secondly, cheetahs do not breed well in captivity. The Asian cheetah is nearly extinct because of its capture for private use. Special dietary requirements, spacial needs, and unpredictable behaviour make this animal a poor pet. Wild instincts remain intact even with tamed and captive raised animals.

GO FOR THE GOLD

If Frankie Fredericks and the cheetah were to run the 100 meter sprint in the 1996 Olympics, who would win?

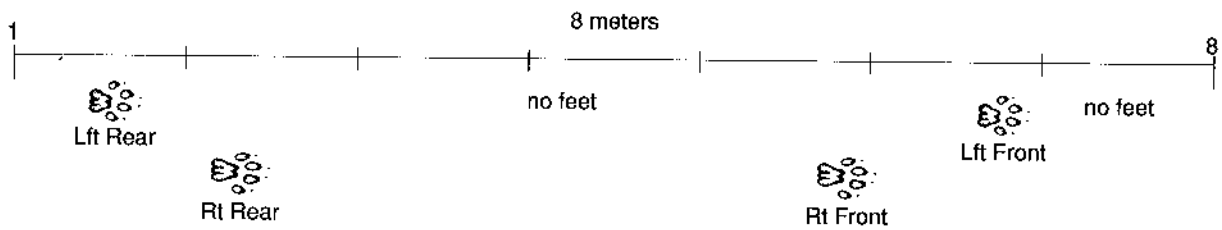
The cheetah is the fastest land mammal on earth and can easily outrun the world's fastest human sprinter. It can reach speeds of up to 110 km/h in seconds; however, it can only maintain this speed for 400–500 meters before it must stop and rest up to 30 minutes. Otherwise its body would overheat just like the engine of a car. While its speed is impressive, the cheetah's ability to accelerate is overwhelming. The cheetah can go from a complete standstill — or 0 km/h — to nearly 80 km/h in three seconds. It can actually out perform a sports car — a Ferrari needs four seconds to reach that speed!!

But how does the cheetah achieve this amazing speed?

The key to the cheetah's success is its increased stride length and stride frequency. A stride is one cycle of sequential footsteps, and the stride distance is measured between where one foot leaves the ground and the place where it touches the ground again. At top speed, the cheetah covers 7–8 meters in a single stride, and completes four strides per second.

The unique body structure — long legs, flexible spine, semi-retractable claws, long tail — allows the cheetah to achieve this incredible speed. Its slender, long, light body creates less wind resistance when it runs. The cheetah's shoulder blades are not attached to its collar bone, allowing the shoulders to move freely and help increase the length of the stride. Its flexible spine allows for more extension and flexing during running. This helps the cheetah increase its stride length because its front and rear legs stretch farther apart when its body is fully extended, and its hips and shoulders move closer together when its feet are crossing. The cheetah's hip bones pivot during its stride for greater length. The tail helps the cheetah make sharp turns when running by stabilising its body and acting as a rudder. And its claws, which are semi-retractable, grip the ground for traction during chases.

Even the cheetah's heart, lungs, and liver have evolved for speed. Enlarged nostrils and sinuses increase the amount of air exchanged. The cheetah has large lungs to move oxygen into its system quickly and a big heart that increases its respiratory rate, enabling the blood to move from the lungs to the muscles rapidly so the cheetah does not get tired while running. During a chase, the cheetah's breath rate goes from 60 to 150 breaths per minute.



The Cheetah's Stride at Top Speed

A PLACE FOR PREDATORS

Imagine a cheetah sprinting after a steenbok, a bird of prey diving out of the sky after a mouse, an ant colony feeding on a beetle. All of these animals catch, kill, and eat other animals — they are predators. There are different degrees of predation. Some animals, such as the cheetah, leopard, and lion, are strict predators, called carnivores, and eat only meat. Other animals, such as the jackal, catch prey when they can, but also eat fruits, nuts, and other plants. Animals can be both predators and prey. The cheetah hunts small antelope, the young of large antelope, hare, warthogs, and game birds; however, the cheetah, especially its young, can also become a prey species to other predators, such as the hyena, lion, leopard, and baboon.

Predators are an important part of a healthy ecosystem. Predators cull vulnerable prey, such as the old, injured, sick, or very young, leaving more food for the survival and prosperity of healthy prey animals. Also, by controlling the size of prey populations, predators help slow down the spread of disease. Predators will catch healthy prey when they can, but this too helps in natural selection and the establishment of healthier prey populations as the fittest animals are left to survive and reproduce.

If carnivores were removed from an ecosystem, what would happen?

1. Antelope herds would grow and grow.
2. Only bad weather, such as a drought, or disease, such as rabies, would slow down the herd growth.
3. Large antelope herds would overgraze their food source, and as the food disappeared, the whole herd would begin to starve.

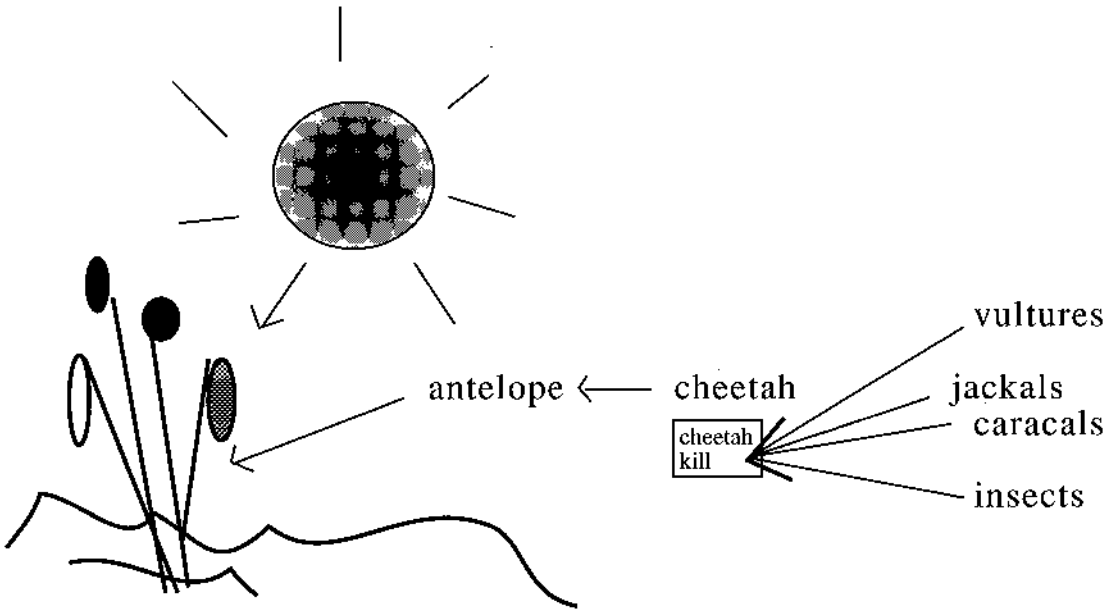
Lion at kill

Ecosystems where Cheetahs or other predators are not present

Cheetahs and other predators help limit the growth of prey populations and prevent overgrazing of ranges. While hunters can sometimes replace predators in the control of antelope populations, they generally do not remove the injured, sick, or older animals. Predators play an important role in maintaining healthy prey populations.

Ecosystem where Cheetahs are present

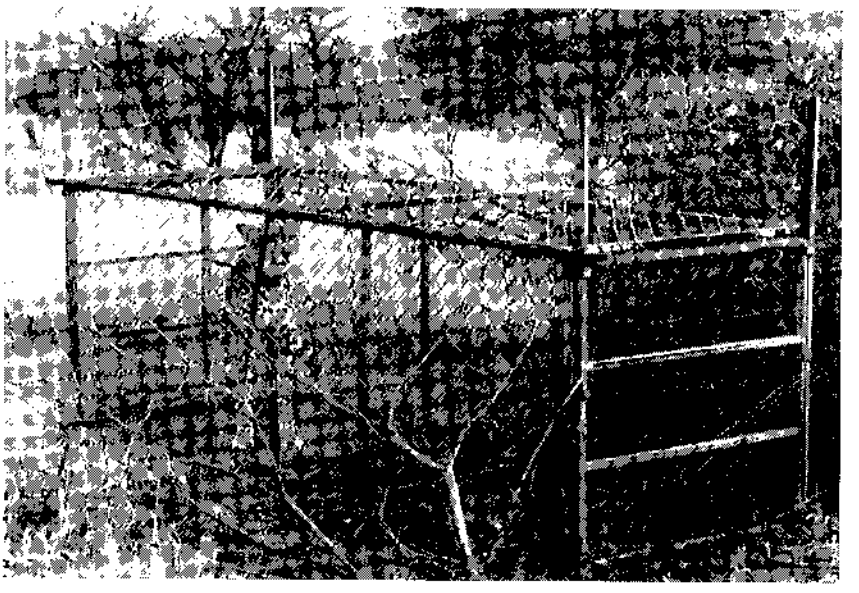
The cheetah is a valuable member of its community. In addition to its role as a predator, cheetahs feed other animals, such as vultures, jackals, beetles, and other scavengers. After a cheetah kills an animal it usually begins eating at the hind quarters, which provide the greatest amount of meat. Because the cheetah is not an aggressive carnivore, larger predators, as well as jackals and vultures, can scare the cheetah off its kill. By leaving the remains of a carcass, the cheetah feeds other animals in the ecosystem.



CHEETAHS AND FARMERS

Cheetahs are considered "top predators" - relatively large animals that are strictly meat eaters and are usually not preyed on by other animals. Cheetahs need a lot of room in which to find food and mates and to raise their young. In Namibia, a male cheetah's range can be up to 1,500 km^2 and a female's 1,200–1,500 km^2. Because they need so much space, many predators are having trouble surviving as land is converted for human use.

With the development of commercial farms in Namibia, most of the large predators were eradicated. Today, of the large carnivores, only cheetahs and leopards are found on the commercial livestock farmlands, and some farmers are still waging a war against these species because of their fear and misconceptions. Ninety-five percent of Namibia's cheetahs live on commercial farmlands. The species' adaptation to farmland is due to the absence of other large predators[1] and the increased water availability, which attracts wild prey populations. However, the cheetah's attraction to livestock and agricultural land poses a direct threat to the species' survival. Local declines in the Namibian cheetah population continue as farmers indiscriminately capture and remove cheetahs as vermin or "livestock killing" animals.



Loss of livestock and wild game to cheetahs is an emotional issue. Farmers perceive cheetahs as having an excessive economic impact on their livestock and wild game; however, research indicates that fewer livestock are taken by cheetahs than is thought. Farmers who employ effective livestock management practices and/or own farms with abundant wild game suffer minimal or no livestock loss to cheetahs. Unfortunately, a majority of Namibian farmers have done little to reduce their predator problems in a nonlethal manner.

Cheetahs prefer wild game to livestock, but if cheetahs are unable to find or catch wild game they may take livestock. When the cheetah's natural prey populations decline, due to loss of habitat and/or increased livestock on lands, it may turn to catching goats, sheep, and calves. Livestock are easier prey than are wild animals because the domestic animals are much slower and not as capable to escape a predator's attack.

Indiscriminate capture by farmers may force some cheetahs to prey on domesticated animals because the cheetahs' ability to capture wild prey has been reduced. For example, juvenile cheetahs are poor hunters,

1 Cheetahs do not do well in protected reserves because of increased competition with larger predators, like lions and hyenas, which steal their prey and kill young cubs.

During the Renaissance (the time period from the 14th through the 16th centuries), every Italian family of nobility and many French nobles kept cheetahs for hunting. Russian princes in the 11th and 12th centuries also hunted with cheetahs. The crusaders observed cheetahs being used to hunt gazelles in Syria and Palestine during this time. Marco Polo, the famous Italian explorer, brought back accounts of the hundreds of cheetahs kept by Kublai Khan, the Founder of the Mongol dynasty in China, during the 13th century. Akbar, a Mongolian ruler of the 16th century, was said to have owned 9,000 cheetahs during his 49-year reign. He kept detailed records of his collection, which showed the birth of only one litter. Unfortunately, cheetahs do not reproduce well in captivity, and cubs suffer high mortality — none of Akbar's cubs lived. It was not until 1956 that the first cheetahs were born and raised in captivity. Because of the continuous wild capture of the Asian species of cheetah for royalty and their failure to breed in captivity, the Asiatic cheetah numbers were sharply reduced, and cheetahs had to be exported from Africa to supply hunting cheetahs at Court. In India, the cheetah was considered a prerequisite for royalty — in 1952 it was declared extinct. The Asian cheetah, which was distributed widely throughout the continent in 11 countries is now nearly extinct. Today, only 200 cheetahs are found in Asia, in the country of Iran.

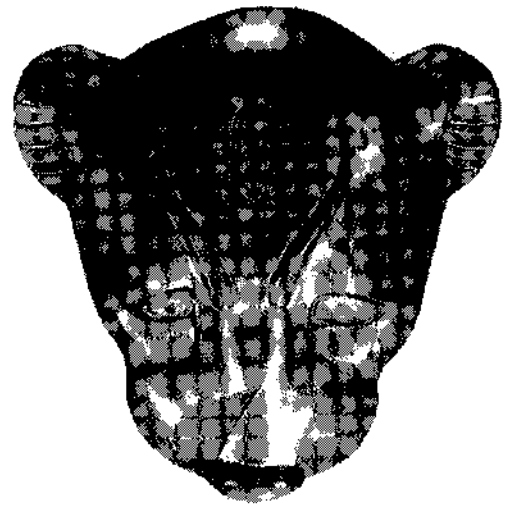
The number of cheetahs has decreased from 100,000 at the turn of the century to $\pm$12,500 today. The cheetah has suffered from inbreeding, high infant mortality, loss of habitat, a reduction in its prey base, conflicts with livestock farming, and a reduced ability to survive in parks and reserves due to the presence of larger predators. Yet, despite all these problems, the cheetah is the oldest of the big cats and has survived the longest. If we can provide habitat and a rich prey base for cheetahs on the livestock farmlands of southern Africa, the cheetah's race will be one of survival, not extinction.

CHEETAH HISTORY: A RACE FOR SURVIVAL

Cheetahs have existed on earth for at least three-and-a-half to four million years — long before any of the other big cats that are alive today. About 20,000 years ago, cheetahs were common throughout Africa, Asia, Europe, and North America. Through the dating of fossil remains, it appears that the cheetah originated in the United States of America in the present-day states of Nevada, Texas, and Wyoming. Approximately 10,000 years ago, at the end of a time called the Pleistocene Epoch, also known as the Great Ice Age (a geographical time period from approximately 2 million to 10,000 years ago), the world's environment underwent drastic changes in climate. Over a few thousand years, 75 percent of the mammal species in America, Europe, and Asia vanished. When the mammals began to die, so did all the cheetahs in North America and Europe and most of those in Asia and Africa. 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 the founding of the next generation, and inbreeding took place. This occurrence — a severe reduction in population — is called a "bottleneck." Every cheetah alive today appears to be so inbred that genetically they are as closely related as twins (two offsprings, or individuals, born at the same birth).

Cheetahs have been kept in captivity since 3,000 BC when the Sumerians, people who lived in present-day Iraq, began taming cheetahs for pets. In Egypt, during the time of the Pharaohs, the cheetah was considered a goddess named "Mafdet." Pharaohs kept cheetahs as close companions as a symbolic protection by Mafdet. Symbols of the cheetah are found on ritual and magic knives, statues, and in paintings on royal tombs. The ancient Egyptians believed that the cheetah would carry the pharaoh's soul to the afterworld. The cheetah was admired for its speed, hunting ability, and beauty, and honoured as a symbol of royalty and prestige.

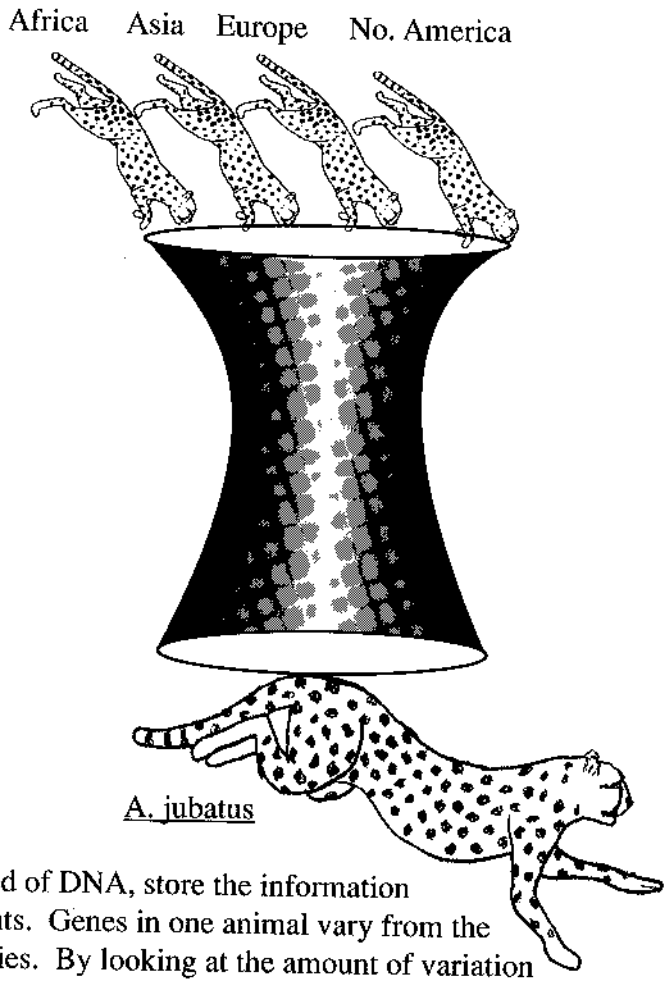


As early as the fifth century, cheetahs were used by Italian nobles to hunt for sport. Adult cheetahs were caught in the wild and tamed within a few months of capture. With their heads covered by a hood so they could not see the prey, cheetahs were led to the hunting area on a leash, in a cart, or on the back of a horse, sitting on a pillow behind the rider. The cheetah was taken near the prey, and the hood was removed. It then sprinted after the prey. After catching it, the trainer rewarded the cheetah with a piece of meat. Cheetahs were commonly known as "hunting leopards." People often confuse the cheetah and leopard, and consider them the same species. The use of this term may account for some of the confusion between the differences in the two cats — the cheetah and leopard are two distinct species.

A SINGULAR SPECIES:
WHY DOES THE CHEETAH LACK GENETIC DIVERSITY?

The cheetah, Acinonyx jubatus, is the sole member of its genus. Twenty thousand years ago cheetahs roamed throughout the savannahs and plains of four continents: Africa, Asia, Europe, and North America.

About 10,000 years ago — because of drastic changes in the world's climate — all but one species of cheetah, jubatus, became extinct. With the drastic reduction in their numbers, close relatives were forced to breed, and the cheetah became genetically inbred, meaning all cheetahs are closely related. Inbreeding occurs when members of the same family or close relatives breed only among themselves. For example, when you look around your classroom you see different hair colours, eye colours, and heights. If you took blood from everybody in the room and looked at the proteins in the blood, you will see that the proteins also vary between each student just like hair colour. When you look at the proteins in the blood of cheetahs, they are very similar; it looks as if they are identical twins of one another, meaning they are all closely related.



A. jubatus

The study of biological inheritance is called "genetic research." Genes, which are composed of DNA, store the information that an individual inherits from his or her parents. Genes in one animal vary from the same genes in another animal of the same species. By looking at the amount of variation existing in genes, scientists, called "geneticists," can begin to understand the relationships of animals within a population and how that population may be affected by infectious diseases. Also, by comparing the amount of variation between different species, geneticists can help us understand the evolutionary process.

When geneticists looked at the amount of variation within genes of the cheetah, they found that cheetahs exhibit much lower levels of variation than other mammals. In most species, related individuals share about 80 percent of the same genes. With cheetahs, this figure rises to approximately 99 percent. The genetic inbreeding in cheetahs has led to low survivorship (a large number of animals dying), poor sperm quality, and greater susceptibility to disease. Inbred animals suffer from a lack of genetic diversity. This means cheetahs lack the ability to adjust to sudden changes in the environment, such as disease epidemics, and have an unusually high susceptibility to certain viruses. For example, if a virus gets into a healthy population of leopards, not every animal dies; just some do, because leopards are genetically diverse. But if every animal is genetically the same, like the cheetah, and one animal gets infected, all of them may get infected and die off. Because of their lack of genetic diversity, a deadly virus could wipe out all the world's wild cheetahs instead of just the susceptible animals. It depends on a species' genetic differences.

CHEETAHS AND FARMERS

Cheetahs are considered "top predators" — relatively large animals that are strictly meat eaters and are usually not preyed on by other animals. Cheetahs need a lot of room in which to find food and mates and to raise their young. In Namibia, a male cheetah's range can be up to 1,500 km^2 and a female's 1,200 1,500 km^2. Because they need so much space, many predators are having trouble surviving as land is converted for human use.

With the development of commercial farms in Namibia, most of the large predators were eradicated. Today, of the large carnivores, only cheetahs and leopards are found on the commercial livestock farmlands, and some farmers are still waging a war against these species because of their fear and misconceptions. Ninety-five percent of Namibia's cheetahs live on commercial farmlands. The species' adaptation to farmland is due to the absence of other large predators[1] and the increased water availability, which attracts wild prey populations. However, the cheetah's attraction to livestock and agricultural land poses a direct threat to the species' survival. Local declines in the Namibian cheetah population continue as farmers indiscriminately capture and remove cheetahs as vermin or "livestock killing" animals.

Loss of livestock and wild game to cheetahs is an emotional issue. Farmers perceive cheetahs as having an excessive economic impact on their livestock and wild game; however, research indicates that fewer livestock are taken by cheetahs than is thought. Farmers who employ effective livestock management practices and/or own farms with abundant wild game suffer minimal or no livestock loss to cheetahs. Unfortunately, a majority of Namibian farmers have done little to reduce their predator problems in a nonlethal manner.

Cheetahs prefer wild game to livestock, but if cheetahs are unable to find or catch wild game they may take livestock. When the cheetah's natural prey populations decline, due to loss of habitat and/or increased livestock on lands, it may turn to catching goats, sheep, and calves. Livestock are easier prey than are wild animals because the domestic animals are much slower and not as capable to escape a predator's attack.

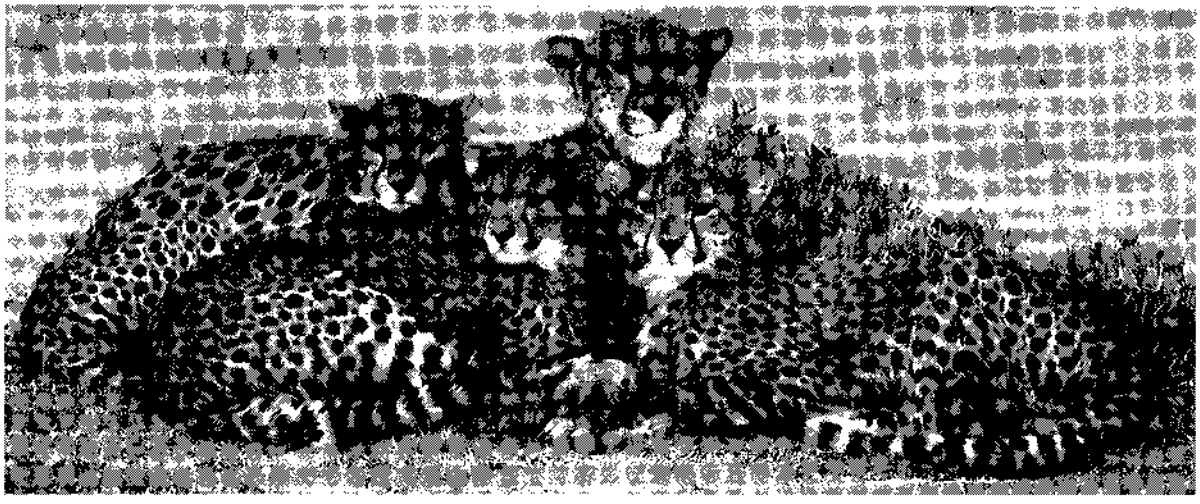
Indiscriminate capture by farmers may force some cheetahs to prey on domesticated animals because the cheetahs' ability to capture wild prey has been reduced. For example, juvenile cheetahs are poor hunters,

1 Cheetahs do not do well in protected reserves because of increased competition with larger predators, like lions and hyenas, which steal their prey and kill young cubs.

and they rely on their mother to teach them to capture wild game. If they are separated from their mother (when farmers indiscriminately capture cheetahs, a mother may be separated from the juveniles), the young cheetahs may not be able to hunt wild prey and could turn to livestock as a food source.

Cheetahs are territorial animals. Male cheetahs will fight, sometimes to the death, to protect their territories. If a farmer has a cheetah on his/her property that does not kill livestock, it is better to keep the animal on the farmland. By removing cheetahs, farmers create vacuums in an area causing other cheetahs to fight for possession of the territory. Where previously only one cheetah had lived, two or three may now come to fill its place. Furthermore, a "problem" animal may replace the one that was trapped.

Social groupings among male cheetahs are also important to hunting behaviour. Male cheetahs from the same litter live in coalitions for their whole life, which increases breeding and hunting success. If any are live-trapped and removed from the coalition, those remaining may begin to hunt livestock because of the reduction in their coalition number.



WILDLIFE MANAGEMENT ON COMMERCIAL LIVESTOCK FARMLANDS: The Legal and Environmental Frameworks

LEGAL FRAMEWORK

International

The cheetah is protected internationally by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, pronounced Sigh-tees). The cheetah is listed on Appendix I of CITES, which declares that the cheetah is an internationally protected, endangered species, and the Treaty prohibits trade in live or dead animals.

Currently, limited trade is allowed in wild cheetahs from Namibia, Zimbabwe, and Botswana under an exemption in the CITES Treaty. The current level of exploitation under Appendix I is strictly monitored, which guarantees that live animals are exported only to zoological institutions participating in internationally recognized efforts to propagate the species in captivity, and that skins and trophies are imported as personal items not to be sold in the country of import.

Namibia

1967 The Department of Nature Conservation and Tourism (SWA) Ordinance declares four species of game (kudu, springbok, oryx or gemsbok, and warthog) property of South West African farmers.

1975 SWA Nature Conservation Ordinance classifies the cheetah as a "protected animal," but permits shooting of animals for protection of life and property. In increasingly difficult economic times — particularly in drought cycles — the allowance to shoot cheetahs has been abused; farmers continue to indiscriminately capture and shoot cheetahs, often removing or killing those animals that have not taken any livestock.

1980 From 1980 to 1991, Namibian farmers report removing for export or killing 6,829 cheetahs from Namibian farmlands. This number represents a minimum, as many farmers do not report the capture and removal of cats.

1990 The Namibian Constitution provides for the sustainable utilisation of wildlife and protection of the environment, and invites the private sector to cooperate.

1992 CITES allows for a limited trade in cheetahs from Namibia, Botswana, and Zimbabwe under a special exception in the Treaty.

ENVIRONMENTAL FRAMEWORK

1. There are approximately 7,000 commercial farms in Namibia, which cover 49 percent of the country. Fifty-one percent of these farms raise cattle and 49 percent are small stock farms. Up to 70 percent of the country's wildlife game species live on these farms, and 95 percent of Namibia's cheetahs are found there also. Wildlife, including cheetahs, is a communal resource because it migrates across farm boundaries.

2. Farming in Namibia has been subject to cyclical events:

   1960s Vegetation and animal populations (both wild and domestic) grew as a result of farm expansions providing improved water resources.

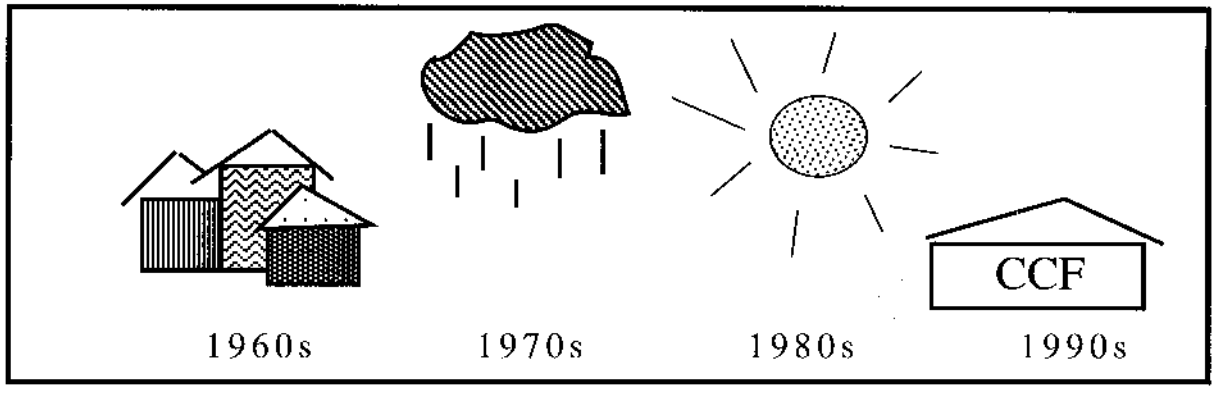
   1970s Good rains provided good grazing, which allowed for higher livestock numbers and greater wildlife populations, including cheetahs.

   In the late 1970s, a rabies epidemic in the kudu population greatly reduced the ungulate's numbers thereby decreasing the cheetah's prey base.

   1980s Drought led to the reduction of wildlife numbers because of natural death, starvation, and the organised culling to save grazing lands for livestock. Wild game populations on Namibian farmlands decreased 50–60 percent in 2 years. The reduction in prey available to cheetahs led to the species killing livestock for food; and, therefore, farmers began perceiving the species as a "problem animal" or livestock killer. The cheetah was seen as a competitor for human use of the land.

   Livestock numbers were kept too high for grazing conditions, resulting in overgrazing and bush encroachment as well as environmental and ecological changes.

   1991 The Cheetah Conservation Fund (CCF) establishes its international base in Namibia to help in the long-term conservation of the species by working with farmers to reduce human/predator conflicts. CCF involves farmers and workers directly in its conservation research and educational programmes. Through the proper management of livestock and wild game, farmers have been able to substantially reduce their losses to predators. Farms with abundant wildlife populations suffer fewer losses of livestock to cheetahs because the species prefers wild game. Very few cheetahs actually kill livestock, and losses are not as high as people believe.



Private lands offer the greatest chance for the cheetah's survival in Namibia and other countries in Africa. Cheetahs do not do well in national parks or reserves where they have to compete with stronger and larger predators. It is possible for humans, livestock, and cheetahs to coexist on farms. Cheetahs do not pose a threat to human life, and proper nonlethal livestock management techniques can be employed to reduce loss to specific cheetahs that do prey on livestock animals.

VOCABULARY LIST

ADAPTATION — changes in a structure, behaviour, body form or function, which help an animal or plant exist or survive in its environment. For example, the cheetah's claws do not fully retract so that they have better traction while running. The cheetah is the only cat species whose claws do not fully retract.

BIOLOGICAL DIVERSITY (BIODIVERSITY) — the full variety of life on earth and all the processes and interactions that sustain it.

BOTTLENECK — a severe population reduction, possibly resulting in inbreeding of the remaining animals.

BUSH ENCROACHMENT — thick scrub growth that takes over areas of land, making them unsuitable for farming or grazing; caused by poor land-use practices.

CAMOUFLAGE — the colour or patterns of an animal's coat, its smell, or a noise that help it blend into or hide in the natural surroundings from predators or prey.

CAPTIVE ANIMAL — any wild animal that lives inside a zoo or animal park or is kept as a pet.

CARNIVORE — a meat-eating animal.

CARRYING CAPACITY — a wildlife management term for amount of living matter that can be supported by an area. It is usually expressed as a number indicating the population of any organism a designated area can support. The carrying capacity of an area can vary throughout the year and from year to year depending on conditions within the species habitat, such as food sources or climate.

CHEETAH — a long-legged, swift-running, slender, spotted African wild cat.

CHEETAH CONSERVATION FUND (CCF) — a registered Namibian Trust established in 1990 to conduct conservation research and education programmes on the cheetah throughout its range. CCF strives to: (1) identify important components of farmland ecosystems that are necessary to sustain healthy cheetah populations; (2) develop conservation management plans that are beneficial to both the cheetah and farmers thereby ensuring the species' survival on livestock farms; and (3) promote farm management practices that reduce livestock losses from predators.

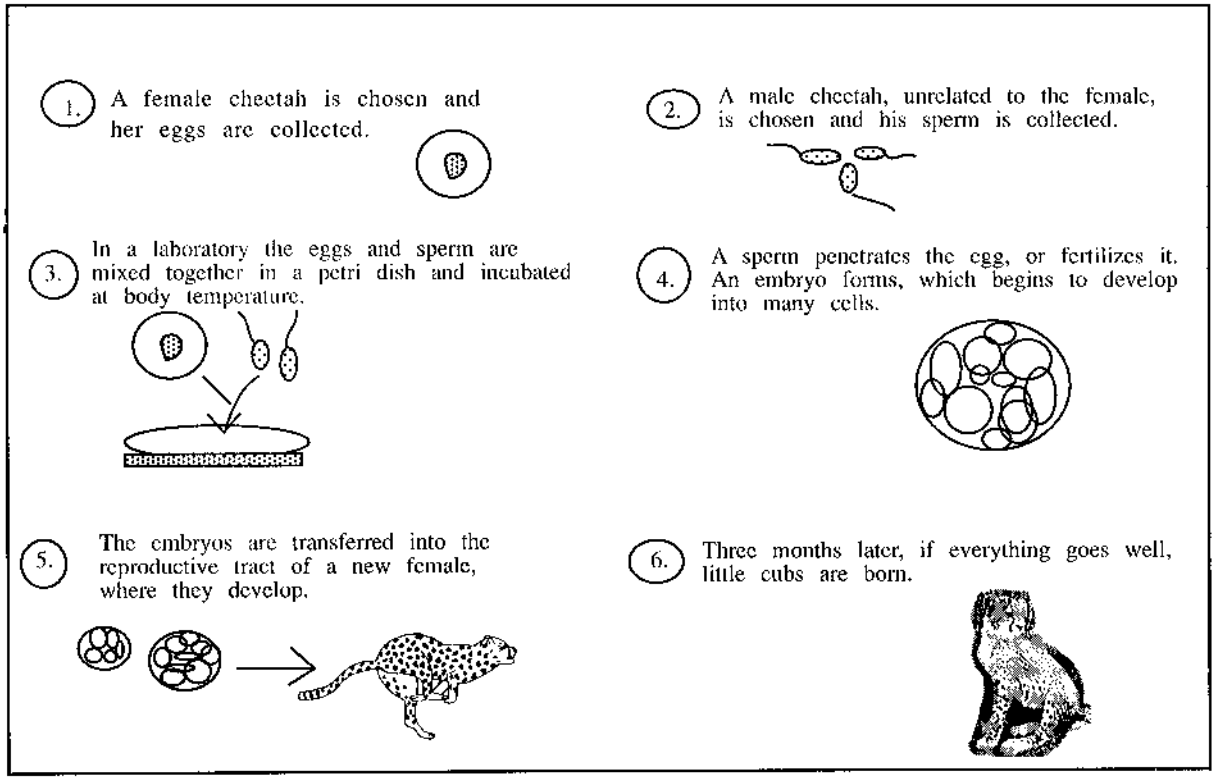
CITES — Convention on International Trade in Endangered Species of Wild Fauna and Flora. A treaty that monitors international trade in animals and plants. Over 115 countries have signed the Treaty. Namibia is a member nation, or "party," to CITES.

CONSERVATION — the act of protecting and preserving the environment and wild species.

Evolution eliminates traits in organisms that are least suited for survival. Some of the decline in the cheetah's genetic diversity is accounted for by its specialisation through natural selection. The decrease in genetic diversity resulting from natural selection has benefited the species' survival as it has made the cheetah better adapted to its environment. However, the effects of this occurrence are small when compared to the effects of the inbreeding that occurred 10,000 years ago from the population bottleneck.

To increase genetic diversity in captivity, zoos take great care to make sure that only unrelated animals mate. Scientists are working on ways to enhance breeding through artificial insemination and in vitro fertilization (IVF). Because of genetic inbreeding, male cheetahs have poor sperm quality. Abnormal sperm cannot swim properly, reducing the chance of fertilising eggs and producing offspring. Artificial insemination (A-I) is a laboratory technique wherein scientists place sperm in the reproductive tract of a female. This means the sperm have less distance to swim before reaching the eggs. Mating between male and female animals does not take place. Artificial insemination has produced cheetah cubs in the United States. Using these technologies, A-I and IVF, semen and eggs can be collected from wild Namibian Cheetahs for use in captive breeding programs. Because Namibia has the largest population of cheetahs, the genes represented in this population are important to captive cheetah survival worldwide.

HOW IN VITRO FERTILISATION WORKS



CONSERVE — to make use of natural resources wisely and well, so as not to overuse them.

CONSUMPTIVE USE — any use of a plant or animal that involves an activity resulting in the loss of an individual organism. Examples include hunting, fishing, and trapping as well as indirect impacts such as habitat loss.

DEPLETABLE RESOURCE — a natural resource, such as rainforests and soil, that takes thousands of years to be renewed.

DEPREDATION — in relation to wildlife damage, the act of destroying people's crops or domesticated animals.

DIURNAL — animal that is active during the day.

DNA — Deoxyribonucleic Acid. A chemical found in the chromosomes of every cell. DNA is organized into genes, which form the genetic code. An individual receives half of his or her DNA from the mother through her egg and half from the father's sperm.

ECOLOGY — the study of all the relationships between animals, plants, and the environment.

ECOSYSTEM — a system of plants, animals, and other organisms together with the nonliving components of their environment.

ENDANGERED SPECIES — a group of animals or plants in immediate danger of disappearing (becoming extinct) from the earth due to changes in their environment, loss of habitat, commercial trade and/or inability to adapt. Protective measures must be taken immediately or the species will become extinct. The cheetah is an endangered species.

ENVIRONMENT — all the physical, chemical, and biological factors that affect or make up an organism's surroundings.

EXTINCT — no longer found on the earth, no longer living, gone forever.

FELIDAE — the scientific name for the family of animals that includes all cats.

FOOD CHAIN — the relationship between species where one species relies upon another for its food. Herbivores are at the bottom of the chain and are preyed upon by larger animals called predators.

GAME ANIMAL — legal designation for animals that may be hunted under regulation.

GENE — a unit of DNA responsible for determining a specific heritable trait (for example, brown hair). Mammalian DNA contains about 100,000 genes.

GENETIC DIVERSITY — the variety of genes in an organism or in a population.

GEOGRAPHICAL RANGE (also called RANGE) — the area where an individual species of plant or animal population lives.

HABITAT — the place where a species lives, the environment where a plant or animal naturally occurs.

HABITAT DESTRUCTION — changing an animal's natural habitat so that it can no longer survive there.

HERBIVORE — an animal that eats only plants.

HOME RANGE — the area where an animal roams during its normal activities; different than an animal's territory.

INBREEDING — Occurs when close relatives (father and daughter, or brothers and sisters) mate. After several generations of inbreeding, animals may exhibit poor reproductive traits, ill health, and short life spans.

INTERSPECIFIC COMPETITION — competition between two different species for habitat, food, and other resources shared in common.

LIFE CYCLE — the continuous sequence of changes undergone by an organism from one primary form to the development of the same form again.

LITTER — all the offspring of an animal produced at one birth.

MAMMAL — an animal that has hair on its body and is warm-blooded; most species bear live young instead of laying eggs. The young get milk from their mother's body until they are old enough to eat other food on their own.

NOCTURNAL — an animal that is active at night.

NONCONSUMPTIVE USE — any use that does not directly kill an individual plant or animal, such as hiking or photographing.

NONGAME — all wildlife species that are not commonly hunted, killed, or consumed.

ORGANISM — any life form, plant or animal, made of mutually dependent parts that maintain vital biological processes.

OVERGRAZE — grazing too much or allowing too many animals to graze on one area, thus damaging the soil and the future growth of plants and animals.

OVERSTOCK — putting too many animals in an area; exceeding the area's carrying capacity.

POACHING — the illegal catching or killing of animals, or the illegal collecting of plants.

POPULATION — the total number of individuals of a species that share the same geographic area.

PREDATION — The act of hunting and killing other animals for food.

PREDATOR — an animal that hunts and kills other animals for food.

PREY — an animal caught by another for food; food for a predator.

RARE — a species not currently in danger of extinction, but of concern because of its low numbers.

RESERVE — an area of land set aside to conserve and protect animals and plants.

SAVANNAH — grassland with scattered trees or groups of trees.

SEMI-RETRACTABLE CLAWS — claws that can only be partially drawn back or into sheaths.

SPECIES — a group of animals or plants of the same kind that reproduce young like themselves. All organisms of the same kind. The leopard and cheetah are two different species of cats.

STEWARDSHIP — the concept of responsible caretaking of the environment; based on the premise that we do not own resources, but are managers of resources and are responsible to future generations for their condition.

SUSTAINABLE USE — the use of a plant, animal, or other life form in a way and at a rate that does not lead to the long-term decline of biological diversity, therefore maintaining the specie's potential to meet the needs of present and future generations.

TERRITORY — the area of land in which an animal lives and defends as its home. Animals may have fierce fights over territorial land.

THREATENED SPECIES — a species decreasing in numbers and range. Such animals and plants face serious problems and may become endangered if we do not help.

VULNERABLE SPECIES — a species that is limited in numbers or area but is not yet threatened or endangered.

WARM-BLOODED — animal whose body temperature remains relatively constant. Animal derives the heat energy it needs from the food it eats.

WILDLIFE — the natural fauna and flora of an area. Animals that are not tamed or domesticated.

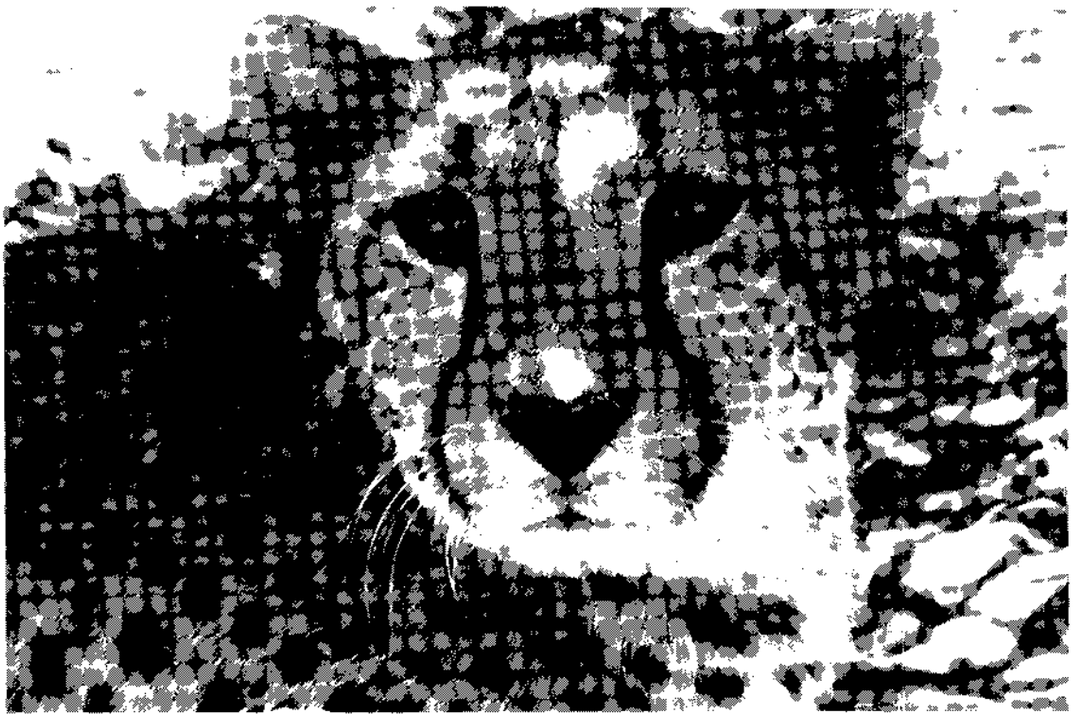
WILDLIFE CONSERVATION — the wise use of our world's natural resources, including minerals, plants, and animals, to prevent destruction of these resources and species extinction.

WILDLIFE MANAGEMENT — the application of scientific knowledge and technical skills to protect, conserve, limit, enhance, or extend the value of wildlife and its habitat.

WILDLIFE MANAGER — person who manages wildlife habitat and/or other human activities that impact wildlife.

CHAPTER 1

LIFE SCIENCES



LIFE SCIENCE

Of the many ways of measuring a land's wealth, one of the surest signs of ecological richness and diversity is an abundance of predator species. Because each species sits at the top of a different food chain, belonging to different cycles of organic matter, we can be certain of the existence of a larger animal community for every predator. This is in turn sustained by vegetation. The existence of carnivores carries the implications of a larger ecological community and of millions of years of evolutionary struggle.

Jonathan Kingdom,
East African Mammals, Vol. IIIa

OBJECTIVES

1. To understand processes of life and basic ecological principles and concepts.
2. To learn more about the cheetah, its social behaviours, habitats, and adaptations for speed.
3. To investigate how predators are adapted to their habitats and the environment.
4. To observe how the cheetah is related to other animals in its ecosystem.
5. To consider how human activity changes the natural environment.
6. To consider the role humans play in the endangerment of species and to discuss how it is possible for humans and cheetahs to live together.

FACT SHEETS

Activities in this section focus on habitat needs, animal adaptations and behaviours, predators' roles in ecosystems, and human management of resources. A brief summary of each subject area provides background information for teachers and suggests where the information can be integrated into the course syllabus. Activities are categorised within each subject area. All of the fact sheets in CHEETAH FACTS should be used with the life science activities. Fact sheets recommended for use with the activities are listed at the beginning of each section.

TEACHER'S BACKGROUND

The future of Namibia's environment and that of the world's is in our hands. Wild species do not know national boundaries, and environmental problems cross them. We are all part of the world environment and are responsible for its management. Rainforest destruction in the faraway continent of South America affects us. We can change the Namib Desert, Skeleton Coast, Caprivi, and the north-central agricultural lands for better or worse. The directions we take and choices we make depend upon our land ethic and values as individuals and as a society. A strong background in life science education is key to responsible decision-making concerning the care of our natural resources.

Our ability to think critically about resource problems and development issues, and to make responsible decisions concerning the use of wild animals and plants, influences how we take care of these precious natural resources and manage them for future generations. Development of these skills will encourage students to question how we change our natural world and the impact of these changes, and to consider their implications. Furthermore, it will teach learners to think creatively about solutions to current problems. By learning more about the natural world, its flora and fauna, and our role in the balance of nature, we learn to share the environment with other species — to coexist. Understanding the importance of life's diversity not only teaches us respect for the environment but also helps us understand the importance of individual differences in our societies, a critical link to our appreciation of the world's cultures and their ideas. All life on earth is connected.

ACTIVITY SHEET 1 HABITATS ARE HOMES

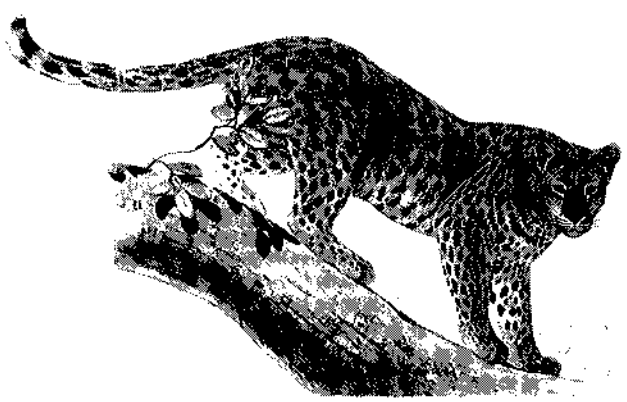
Fact Sheets: *Cheetah, A Place for Predators,* and *Cheetahs and Farmers.*

An animal's habitat is its home, and each animal is specially adapted to live in certain habitats. A habitat includes all a species needs to survive: food, water, shelter and living space, even climate. All the plants and animals in a habitat depend on one another, and this is called a "community".

A major problem for many species is habitat loss. When an animal's habitat is changed or destroyed it has nowhere to live. Habitat changes affect some species more than others. For example, the leopard can adapt better to changes than cheetahs can because the leopard can live in many different types of habitat while the cheetah has specialised requirements. The loss of an animal's habitat can cause its extinction, especially if the species has specific needs or a limited geographical range.

Lions, leopards, cheetahs, and caracals (or rooikats) are some cat species found in Namibia. These cats live in unique and different habitats even though they may be found in the same place. The lion is social — it lives in large prides of up to 30 members, inhabits grasslands, is active at night, and catches large prey such as zebras. The leopard is a secretive and muscular cat that is very adaptable. It characteristically hides its kills in trees and can be active during the day or night. The leopard likes rocky terrain and thick bush where it is able to hide, and it can live close to humans and cities. The cheetah is a slender, fast-running cat that preys on small antelope, the young of large antelope, game birds, and other small prey. It is active during the day and lives mostly on farmlands where there is less competition from other large predators. The caracal is the smallest of the cats listed and lives in an arid environment with thick bush. It is active at night and hunts mostly smaller animals such as rodents and birds. The caracal will hunt small antelope also.

Caracal



Leopard

Activities:

1. Have the students draw pictures or make collages of their home and one of the habitats of the Namibian cats mentioned above. A home is bigger than a house, it includes where they live and the things they need to survive such as food, water, and fuel sources.

Discuss the differences between their habitat and the cat's habitat. What needs do all mammal species have in common?

(Answer: We all need food, clean water, clean air, shelter, and energy.)

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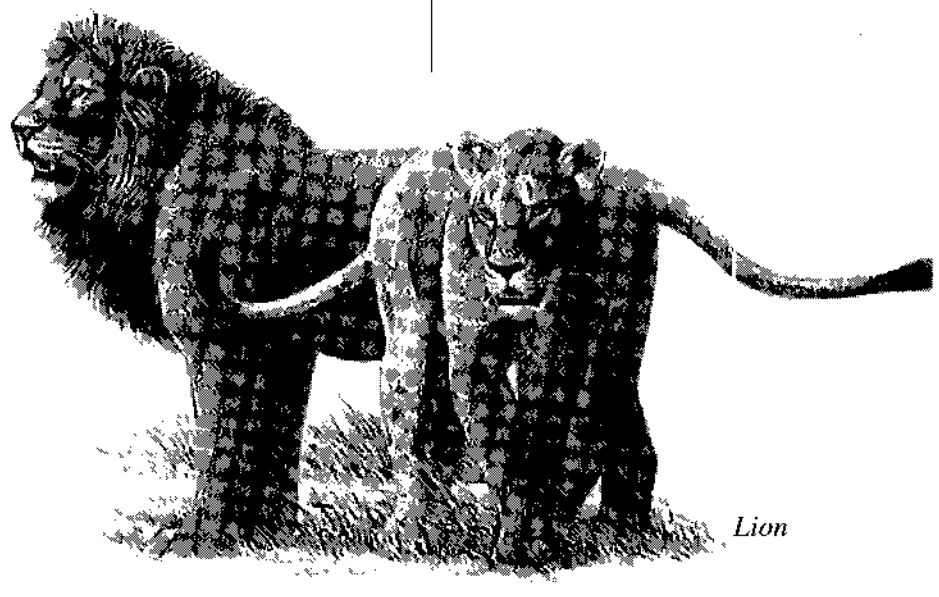
2. On small cards write the names of different habitats where Namibian cats live. Assign to each student a cat species and a list of habitats where they live. Make at least as many habitat cards as there are students. Place the cards face down on the floor and have students find a card with their habitat on it. Gradually take away the cards thereby reducing habitats. When a student can no longer find her or his habitat type, the species is extinct. Which cat became extinct first?

Discuss with students how species with fewer habitats are more likely to be affected by habitat loss than those adapted to many different types. What are some of the causes of habitat loss?

(Possible answers: development of cities, cutting of trees for products such as firewood or for lumber, conversion of land for agriculture, damming of rivers, mining for minerals, fire, overgrazing, and bush encroachment).



Lion

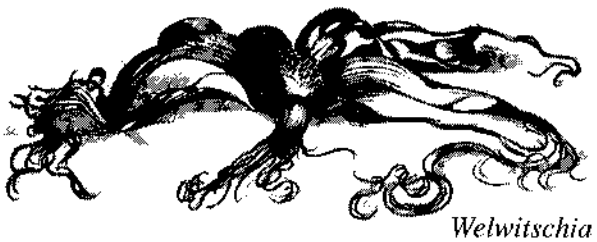
ACTIVITY SHEET 2 ANIMALS ARE ADAPTABLE

Fact Sheets: *Cheetah, Go for the Gold, and A Singular Species.*

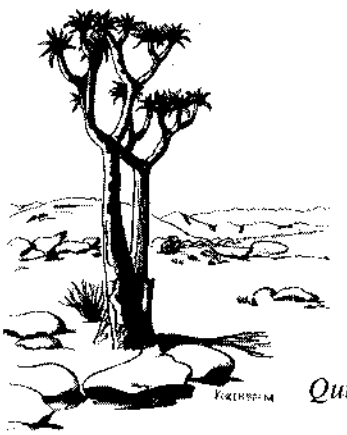
Animals come in all different shapes, sizes, and colours. These differences make each species or individual member of a species specially adapted for success in a different ecological niche, or place.

Imagine all of the biological riches found within Namibia :

The swift cheetahs of Etosha National Park and the north-central farms, the ancient *welwitschias* of the Namib Desert, the majestic desert elephants of the Skeleton Coast, the black-cheeked lovebird of the eastern Caprivi, the brown hyena of the southern coast, the quivertrees of Keetmanshoop, and the crocodiles of the mighty Kunene are just a few of the many unique species of Namibia. The life forms on our planet, and in Namibia, come in a wealth of shapes, sizes, and colours, all of which can give us clues about the animal — its home, food sources, and specialisations.

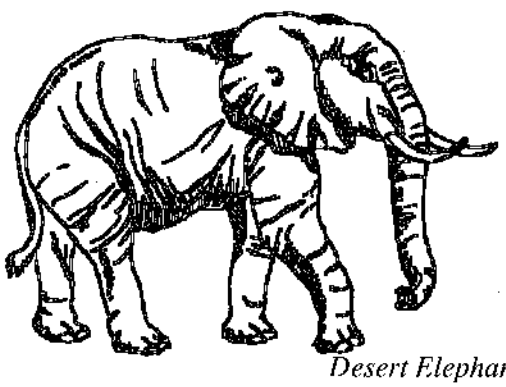


Welwitschia



Quiver Tree

Brown Hyena



Desert Elephant

ACTIVITIES:

1. To help students understand the great diversity of life forms found in nature, generate a list of species with the colours and shapes listed below. Ask students to come up with as many species as possible. Some examples are listed. Do they think there is great diversity of life on our planet? How many species do we share the Earth with? **(Answer: over 33 million)**

   black (penguins, black wildebeest)
   grey (little banded goshawk, elephant)
   green (grasshoppers, variety of plants)
   spotted (leopard, giraffe, adder)
   striped (tiger, zebra, porcupine)
   solid color (lion, rhino)
   wings (birds)
   fur (mammals)
   gills (fish)
   short tail (hyena, wild dog)
   long tail (cheetah, whydah)
   short legs (warthog)
   long legs (antelope)
   no legs (mambas, whales)

2. Build-a-Cheetah with your students. Instructions for the activity follow this section.

3. Have students complete work sheets "Built for Speed," "Cheetah Adaptations," "I Ain't Misbehaving," and "Cat Adaptability."

4. After completing "Cat Adaptability," discuss with your class the physical and behavioural differences between lions, leopards, cheetahs, and caracals and how they affect the habitat requirements of the different cats. Have the class generate a list of the similarities and differences between the cats. (**Some possible similarities:** Namibian species, carnivores, can live in the same ecosystems. **Some possible differences:** sizes, prey species, hunting techniques, habitats utilised.)

5. After completing the work sheets, you may want to ask your students to build a predator — write down where it would live, what it would eat, and its sex. Then decide on its adaptations and write them down. Would it run fast like the cheetah or be stocky like a leopard? Ask students to draw a picture of their predator and name it; describe its lifestyle and behaviours; and list its adaptations, the reasons for them, and their advantages.

ACTIVITY SHEET 3 BUILD A CHEETAH

Explore with your students the special body parts and adaptations cheetahs have that allow them to run so fast. Using the supplies listed below, discuss with students the various adaptations of the cheetah. Next to each of the supplies listed is the body part and adaptation it represents. Go through items one by one and explain why each is an important piece to include in the cheetah. You may want to put up a picture of a cheetah to help students visualise each part. Review the fact sheet *Go For the Gold.*

Supplies	Body Part	Adaptation
Paper airplane	Long thin body	Aerodynamic build
Running shoe, cleat	Semi-retractable claws	Traction for running
Long, medium, and short sticks	Legs	Long legs for running fast
Piece of wire	Flexible spine	Increased stride length
Long piece of string	Tail	Maintains balance
Paper heart	Heart	Strong heart for increased respiration while running
Binoculars or glasses	Eyes	Binocular vision to see 5 km
Black marker pen	Tear marks on eyes	Help focus on prey and reduce glare from sun
Baby bottle	Mammary glands	Used to feed young

Start with the paper airplane. Throw it into the air and watch it fly. The cheetah has a long thin body to create less resistance to wind while running, just as a paper airplane flies easily through the air. Now crumple the paper and throw it; it will not fly like the airplane. Animals that move quickly through the air like birds or through the water like fish are streamlined, or aerodynamic. Cheetahs are aerodynamically designed, which enables them to run so fast.

Now build a cheetah from the bottom up.

1. Running shoe or cleat — the feet of a cheetah are not like other cats' feet, but are more like a dog's. Cheetahs have semi-retractable claws to help the cheetah's feet grip the ground when it runs and turns. You can compare this to playing football. We use cleats, not dress shoes, to run.

2. Sticks — ask students what size of stick they would use for the cheetah's legs. A cheetah can cover 7 to 8 meters in a single stride; long legs increase the cheetah's stride length. A cheetah with short legs would not be able to cover such a distance.

3. Wire — the cheetah's backbone is much more flexible than ours, which helps increase the cheetah's stride by letting the cheetah move its legs further apart and closer together while running. Demonstrate how the wire can easily bend like a cheetah's backbone when it runs.

4. String — the cheetah's tail acts like a rudder helping the cheetah turn while running. The cheetah uses its tail like we use the handle bars on a bicycle to steer.

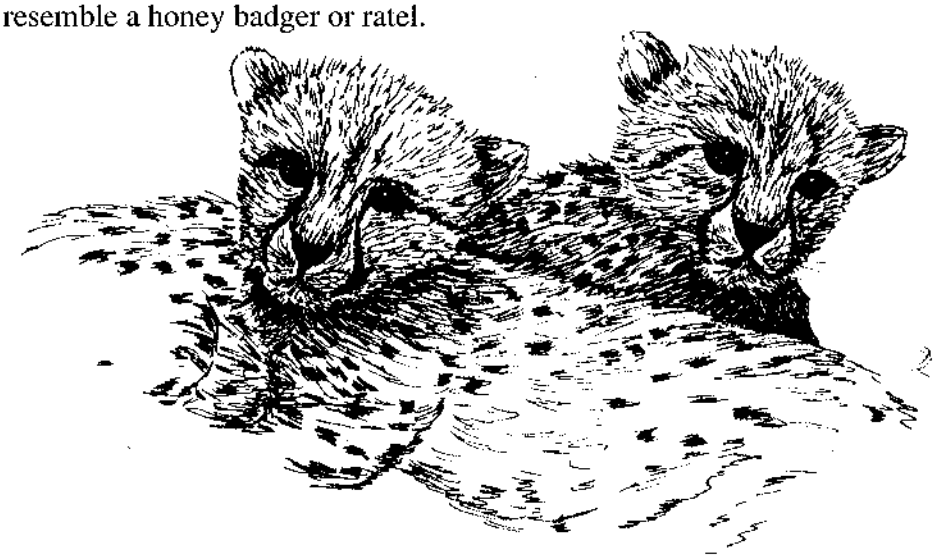
5. Heart — ask students to place their hand over their heart and feel it beat. Do they think their heart beats faster after running? Ask them if they breath heavily, or pant, after running fast. The cheetah's heart is enlarged to help it run fast. While running, the cheetah's breath rate increases from 60 beats per minute to 150. After sprinting, a cheetah must rest in order to catch its breath and slow down its heart beat, just as we must after running.

6. Binoculars or glasses — cheetahs have excellent vision, they can see clearly up to 5 km away. We would need to use binoculars in order to see so far.

7. Black marker pen — the black tear marks on a cheetah's face help it to focus on its prey. This is similar to how we use a scope on a rifle. The tear marks also help to reduce the sun's glare, just like sunglasses help us to see better during a bright, sunny day.

8. Baby bottle — cheetahs are mammals, which means that they are warm-blooded and feed their babies milk, just like humans. Cheetahs are very good mothers and take care of their cubs until they are 18 months old, teaching them the skills they will need as adults to survive in the wild.

There is one more thing a cheetah needs, what is it? A cheetah needs a spotted coat to help it hide, or camouflage, itself in the bush. Cheetah cubs' coats are smoky-grey in colour with long woolly hair, called a mantle, running along their backs. The mantle helps camouflage the cub in the dead grass, hiding it from predators, and works as a mimicry defense, causing the cub to resemble a honey badger or ratel.



ACTIVITY SHEET 4 BUILT FOR SPEED

Instructions: Research the special adaptive features listed below using the fact sheets *Cheetah* and *Go for the Gold*. What are the adaptations and functions of these structures? Fill in the blanks to show the relationships between structure, adaptation, and function.

STRUCTURE	ADAPTATION	FUNCTION
Tail		
Body		
Feet and Claws		
Spine		
Coat and Markings		
Head and Eyes		
Heart		
Nostrils and Lungs		

STRUCTURE	ADAPTATION	FUNCTION
Tail	long and narrow	balance and steering
Body	slender, long-legged and streamline	less wind resistance and longer stride
Feet & Claws	semi-retractable claws	better traction for acceleration and faster movement
Spine	flexible	increases strides for greater speed
Coat and Markings	(1) tan coat with small black spots; (2) black tear marks	(1) camouflages cat in long grasses; (2) helps keep sun out of eyes like sunglasses; (3) helps it to focus on its prey
Head and Eyes	small head and high-set eyes	less wind resistance and maximum binocular vision for hunting
Heart	enlarged	(1) increases respiratory rate; (2) enables blood to move from the lungs to muscles rapidly
Nostrils and Lungs	large nostrils and increased lung capacity	increases the amount of air exchanged and moves oxygen quickly

ACTIVITY SHEET 5 CHEETAH ADAPTATIONS

Instructions: Answer the questions below about cheetah adaptations using the fact sheets *Cheetah, Go for the Gold*, and *A Singular Species*.

1. What are some adaptations that help the cheetah run so fast?

2. What markings help keep the sun out of their eyes?

3. What do cheetahs use to help them steer?

4. What helps the cheetah camouflage itself?

5. What features of a cheetah are similar to those of a dog?

6. What type of animals do they hunt?

7. How does a cheetah hunt? How often is it successful in capturing its prey?

8. Most cheetahs live outside national parks on commercial farmlands. Explain why this may occur.

9. Why do cheetahs breed poorly in captivity? Why do they suffer high mortality both in the wild and in captivity?

10. What are the results of genetic inbreeding?

11. What types of habitats do cheetahs live in?

ANSWER KEY CHEETAH ADAPTATIONS

1. **What are some adaptations that help the cheetah run so fast?**
   a. slender, long-legged body
   b. small head with high-set eyes
   c. flexible spine
   d. long tail to help it steer and maintain balance
   e. large nostrils and increased lung capacity
   f. semi-retractable claws for gripping the ground during sprint
   g. jutting forehead and black tear marks to protect eyes

2. **What markings help keep the sun out of their eyes?** Black tear marks.

3. **What do cheetahs use to help them steer?** A long tail helps cheetahs maintain their balance while running at top speeds and when making sharp turns. Their claws help the cheetah grip the ground as they run.

4. **What helps the cheetah camouflage itself?** The cheetah's tan coat with black spots conceals the animal in the dry grass and thick bush. The cub's smoky-grey colour and mantle make it look like a honey badger, or ratel.

5. **What features of a cheetah are similar to those of a dog?** Its claws are semi-retractable, resembling a dog's claws which are nonretractable. It has long slender legs similar to a dog's. The cheetah's jaws are similar to that of a dog's; they do not have strong jaws like other cats and therefore rely on strangulation to kill prey.

6. **What type of animals do they hunt?** Fast-moving prey such as springbok, impala, steenbok, gazelle, and the young of antelopes such as hartebeest and kudu. They also hunt warthog, hare, and game birds such as guineafowl and bustards.

7. **How does a cheetah hunt? How often is it successful in capturing its prey?** Cheetahs capture their prey by stalking until it is within 10–30 meters and then, with a burst of speed, chase the prey. Using its dew claw, the cheetah trips the prey from behind and suffocates it by biting the underside of the throat. Chases last about 20 seconds and rarely longer than 1 minute. About half of the chases are successful.

8. **Most cheetahs live outside national parks on commercial farmlands. Explain why this may occur.** Protected areas are intended to be safe havens for wild animals; places where they can roam and live naturally. Cheetahs do poorly in these areas because of increased competition with lions, hyenas, and leopards. These predators are opportunists and steal up to half of what the cheetah kills. Cheetah cubs are also vulnerable to attack by these animals because females frequently have to leave their young to hunt and are unable to defend cubs against these larger species. Furthermore, the abundance of wild game on farmlands and the absence of other large predators makes these lands ideal habitat for the cheetah.

9. **Why do cheetahs breed poorly in captivity? Why do they suffer high mortality both in the wild and in captivity?** Scientists do not have a complete understanding of why cheetahs do not breed well in captivity. Research has shown that the problem is a combination of a lack of genetic variation, which has led to poor reproductive quality, and a lack of understanding about cheetah behaviours. Cheetah cubs suffer high mortality in captivity because they are not physically strong and are vulnerable to disease due to poor genetic make-up. In the wild, cheetah cubs also suffer the same problems, but they also experience high mortality because of predation by larger predators.

10. **What are the results of genetic inbreeding?** The genetic inbreeding in cheetahs has led to low survivorship (a large number of animals dying), poor sperm quality, and greater susceptibility to disease. Inbred animals suffer from a lack of genetic diversity. This means cheetahs lack the ability to adjust to sudden changes in the environment, such as disease epidemics, and have an unusually high susceptibility to certain viruses.

11. **What types of habitats do cheetahs live in?** Vast expanses of land where prey is abundant. In Namibia, cheetahs have been found in a variety of habitats, including grasslands, savannahs, dense vegetation, and mountainous terrain. Ninety-five percent of Namibia's cheetahs live on commercial farms.

ACTIVITY SHEET 6 AIN'T MISBEHAVIN'

Instructions: Answer the questions below about cheetah behaviours using the fact sheets *Cheetah* and *A Singular Species*.

1. Are female cheetahs solitary animals?

2. When do you see female cheetahs with other cheetahs?

3. Male cheetahs from the same litter form lifetime bonds and live in groups called what?

4. In Etosha National Park, you might see two male cheetahs or two different coalitions fighting and maybe even killing one another. Why?

5. Do male cheetahs raise cubs?

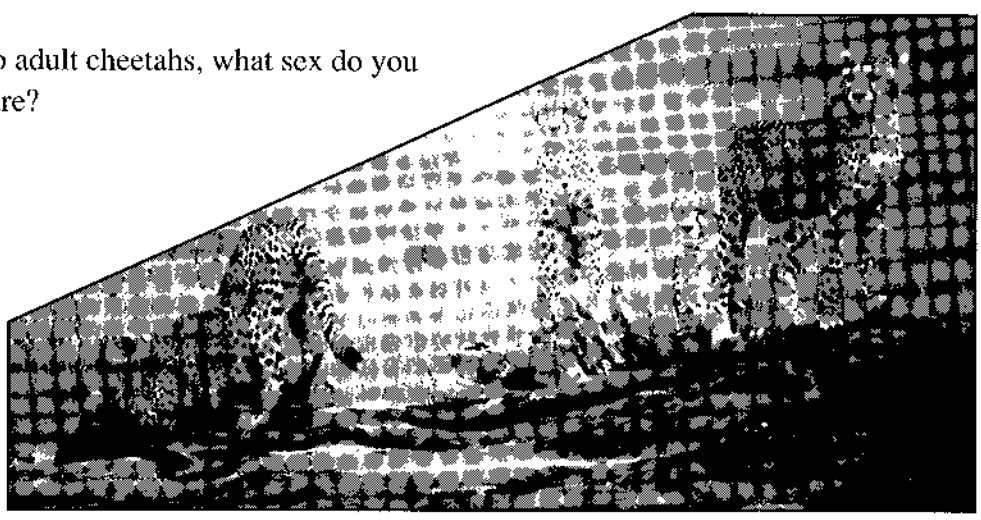
6. How long do cheetah cubs stay with their mother?

   How long do the young cheetahs live together after leaving their mother?

   Why do the family members separate?

7. You are visiting the farm "Okaruikosonduno" (the Cheetah Conservation Fund's base) and you see a group of five animals. What are the possible relationships of the group members?

8. You see two adult cheetahs, what sex do you think they are?



1. **Are female cheetahs solitary animals?** Yes. In Namibia cheetahs may be more social than elsewhere, and female cheetahs from the previous litter may stay with their mother through her next litter.

2. **When do you see female cheetahs with other cheetahs?** Female cheetahs are seen with others when mating or raising cubs.

3. **Male cheetahs from the same litter form lifetime bonds and live in groups called what?** Coalitions

4. **In Etosha National Park, you might see two male cheetahs or two different coalitions fighting, and maybe even killing one another. Why?** Males live alone or in coalitions made up of brothers from the same litter. Some coalitions maintain territories in order to find females with which to mate. Territories are often located in areas where there is a rich supply of wild game and/or water. Fierce fights between male coalitions, resulting in serious injury or death, can occur when defending territories.

5. **Do male cheetahs raise cubs?** No. Female cheetahs raise the cubs on their own.

6. **How long do cheetah cubs stay with their mother?** 18 months

   How long do the young cheetahs live together after leaving their mother? Male cheetahs born in the same litter stay together for life. Sibling groups composed of females and males stay together approximately 6 months after leaving their mother. Female cheetahs are chased away from the group at their first estrus, or heat.

   Why do the family members separate? Family members separate in order to breed and raise their own families.

7. **You are visiting the farm "Okaruikosonduno" (the Cheetah Conservation Fund's base), and you see a group of five animals. What are the possible relationships of the group members?**
   a. A coalition of five males
   b. A mother cheetah with four juveniles
   c. A sibling group
   d. A female cheetah with a coalition of four males

8. **You see two adult cheetahs, what sex do you think they are?**
   a. Two male cheetahs living in a coalition
   b. A male and female cheetah together for breeding
   c. Two female siblings or male and female siblings

ACTIVITY SHEET 7 **CAT ADAPTABILITY**

Instructions: Compare the types of hunting styles, prey species, body size, appearance, and habitats of various cat species. Review fact sheet *Cheetah*.

	CHEETAH	LEOPARD	LION	ROOIKAT/ CARACAL	TIGER
Hunting Style					
Prey Species					
Body Size					

CAT ADAPTABILITY (CONTINUED)

	CHEETAH	LEOPARD	LION	ROOIKAT/ CARACAL	TIGER
Appearance					
Habitat					

Name the two species that are not considered dangerous to humans.

What species of cat is not found in Africa?

Which species is the smallest?

Which cat is the smallest of the big cats?

ANSWER KEY

CAT ADAPTABILITY

	CHEETAH	LEOPARD	LION	ROOIKAT/ CARACAL	TIGER
Hunting Style	Chases prey; kills prey by strangulation hold.	Stalks; kills prey weighing several times its own weight.	Stalks; at kill, males eat first followed by femals and then juveniles.	Hunts mainly at night; runs down prey or pounces on it; can catch birds in flight.	Stalks and then ponces on prey from behind; solitary animal but may come together to share a kill.
Prey Species	Small antelope, hares, warthog, and game birds.	Baboon, monkey, antelope and warthog.	Wildebeest, zebra, Cape buffalo, all antelopes, giraffe and warthog.	Rodents, small antelope, hare, rabbit and birds.	Deer, wild pigs, guar, water buffalo.
Body Size	36-63 kgs 76+ cm high	50+ kgs 70 cm high	150 kgs 107+ cm high	13+ kgs 40 cm high	200 kgs 91 cm

	CHEETAH	LEOPARD	LION	ROOIKAT/ CARACAL	TIGER
Appearance	Tan coat with round black spots and black tear marks running from the corner of its eyes down the side of the nose to the corners of the mouth.	Tawny coat with black spots forming rosettes on back.	Tan coat with white on abdomen and inner side of legs; males have a long mane.	Reddish-brown to yellow-grey coat with white on abdomen, long ear tufts and long legs.	Largest of all cats, orange coat with black stripes -- only cat with stripes.
Habitat	Open savannah, thick bush and mountainous areas.	Almost anywhere that is rich in prey and has thick bush for cover.	Grassland and savannahs.	Dry woodlands, savannah, acacia scrub, arid hill steppe, dry mountain area.	Variety of habitats such as forest and mangrove swamps; require cover and access to water.

Name the two species that are not considered dangerous to humans. *Cheetah and rooikat / caracal*

What species of cat is not found in Africa? *Tiger*

Which species is the smallest? *Rooikat / Caracal*

Which cat is the smallest of the big cats? *Cheetah*

ACTIVITY SHEET 8 A PREDATOR'S PLACE

Fact Sheets: *A Place for Predators* and *Cheetah and Farmers.*

Predators are an important part of a healthy ecosystem. Predators cull vulnerable prey, such as the old, injured, sick, or very young, leaving more food for the healthy prey animals to survive and prosper. Also, by controlling the size of prey populations, predators help slow down the spread of disease. Predators will catch healthy prey when they can, but this, too, helps in natural selection and the establishment of healthier prey populations by allowing the strongest to survive and breed.

The cheetah is a valuable member of its community. Cheetahs feed other animals such as vultures, jackals, beetles, and other scavengers. After a cheetah kills an animal it usually begins eating at the hind quarters, which provide the greatest amount of meat. Because the cheetah is not an aggressive carnivore, larger predators, as well as jackals and vultures, can scare the cheetah off its kill. By leaving the remains of the carcass, the cheetah feeds other animals in the ecosystem.

Predation is the act of hunting and killing an animal for food. Predators must work hard for the food they eat, and some species are more successful than others when hunting. Cheetahs are successful hunters only 50 percent of the time. This means for every animal they have caught at least one other has escaped. Mothers are even less successful. Cheetahs also lose a large percentage of their prey to other predators such as lions, hyenas, vultures, and large groups of jackals, which steal the cheetah's food while it is recovering from its sprint. Cheetahs are unable to defend their kills from such animals.

Activities:

1. Have students write an essay on the following topic. Humans, animals, insects, and plants are all part of the living earth. How does the cheetah help feed the earth? Consider the cheetah's role as predator and prey species: how does its feeding behaviour provide food for other animals such as scavengers? **(Review *A Place for Predators* and *Cheetah and Farmers.*)**

2. Complete Work Sheet #1 "What Will I Eat for Dinner Tonight?" Teachers may want to make a spinner out of the pie chart for use in the classroom. Cut out the chart and spinner, and attach the spinner to the chart using a paper fastener. The arrow should be attached in the middle of the chart and be able to spin freely. Have each student spin the arrow and record the result. How many of the students were successful hunters? What percentage of the class was unsuccessful?

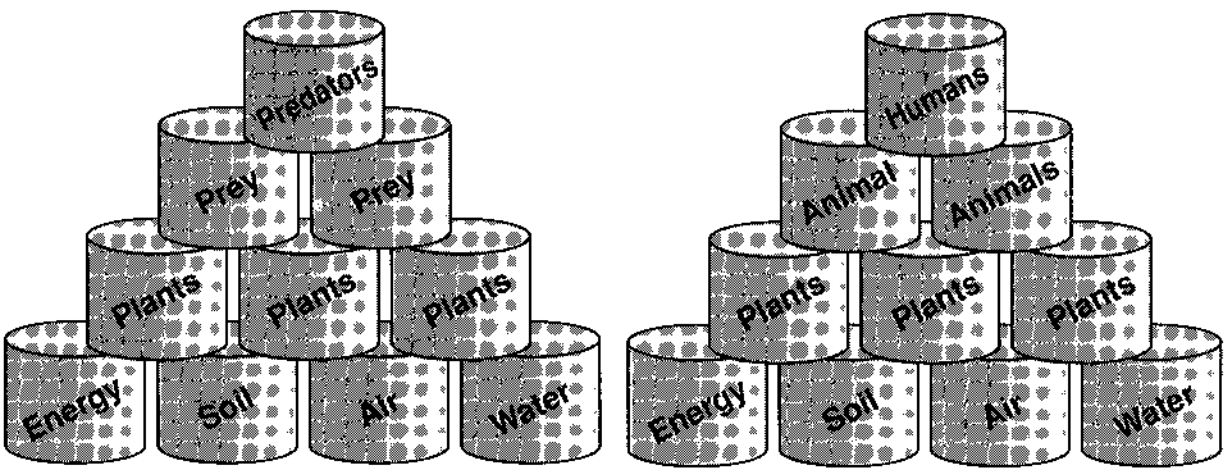
3. Draw a picture of an ecosystem that is missing predators and label the problems within the ecosystem. Then draw a picture of an ecosystem with predators and label their role in its maintenance. **(Answer: see fact sheet *A Place for Predators*.)**

4. Construct two food pyramids out of old cans. Cut out pictures from magazines to decorate the cans.

In the first pyramid exclude humans. Place predator species at the top and discuss what would happen to the pyramid if all the predators were gone.

In the second pyramid, place humans at the top. Ask students which can they could remove without causing others to fall down. Only the top can — humans — can be removed; if any others are lost the pyramid is destroyed.

Discuss with students the fact that our existence depends upon the existence of other species and that we must maintain healthy ecosystems for the pyramid to remain intact. This includes clean water and air, uncontaminated soil, and renewable energy sources that do not pollute.



5. Complete "Work Sheet 2 "Planning for Predators."

WORK SHEET 1

WHAT WILL I EAT FOR DINNER TONIGHT?

Instructions: Using the pie chart, answer the following questions on cheetah hunting success.

1. What is the chance that you will have an antelope for dinner?

2. What is the chance that you will be successful hunting for dinner?

3. What is the chance that you will be injured? Die from your injury?

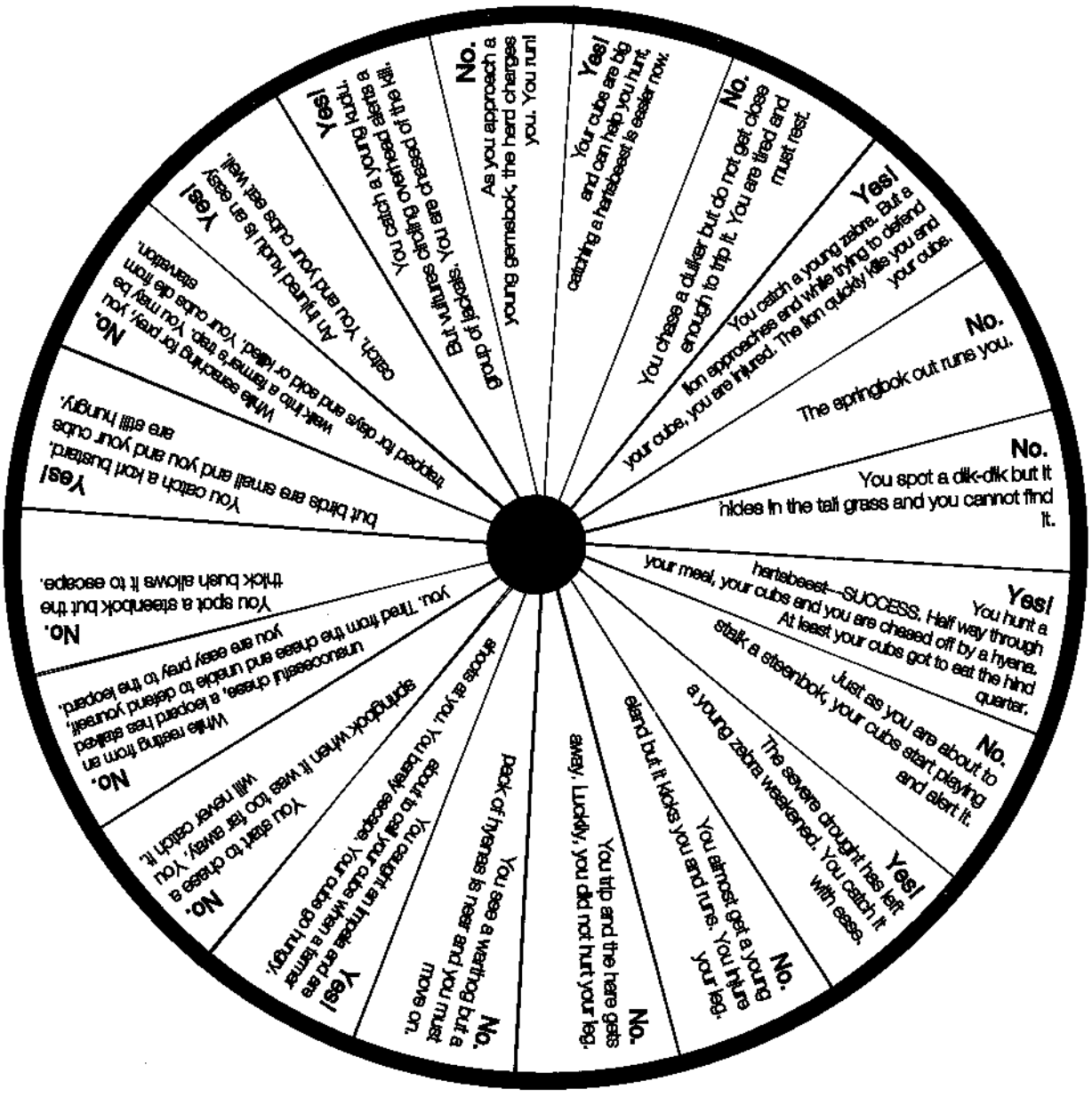
4. What is the chance that you and your cubs will die while you are hunting?

5. What is the chance that your prey will be stolen from you?

6. What is the chance that you are chased off a kill by a predator?

Pie Chart: For use with Work Sheet 1

Cheetahs capture prey only 50% of the time. Mothers with cubs succeed even less.



ANSWER KEY

WHAT WILL I EAT FOR DINNER TONIGHT?

1. **What is the chance that you will have an antelope for dinner?**

   You capture antelopes 5 times but only had 3 meals.
   Three chances out of 20: 15 percent.

2. **What is the chance that you will be successful hunting for dinner?**

   Seven chances out of 20: 35 percent.

3. **What is the chance that you are injured? Die from your injury?**

   There are 3 chances out of 20 that you will be injured: 15 percent.
   Two chances out of 3 that you will die from your injury: 67 percent.

4. **What is the chance that you and your cubs will die while you are hunting?**

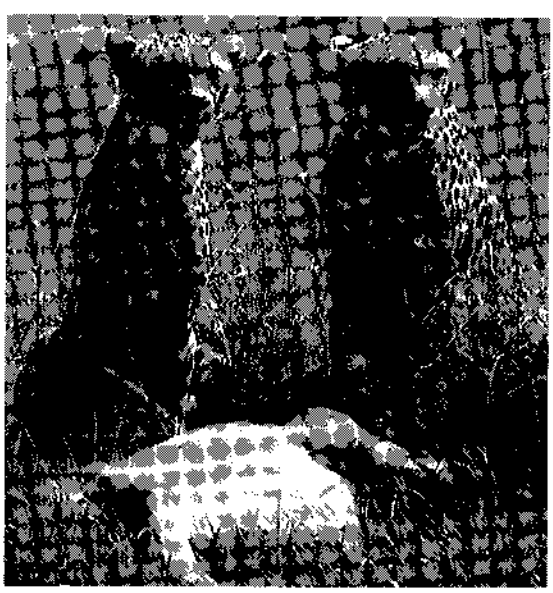
   There are 3 chances out of 20 that you will be killed: 15 percent.

5. **What is the chance that your prey will be stolen from you?**

   Two chances out of 7: 29 percent.

6. **What is the chance that you are chased off a kill?**

   Three chances out 7: 43 percent.



WORK SHEET 2 PLANNING FOR PREDATORS

Instructions: You are a member of the Cheetah Conservation Fund team. Find the best management technique(s) that you might use to reduce cheetah/human conflicts. Write the correct numbers of the management techniques you would recommend next to the management problems.

Farm Management Problem

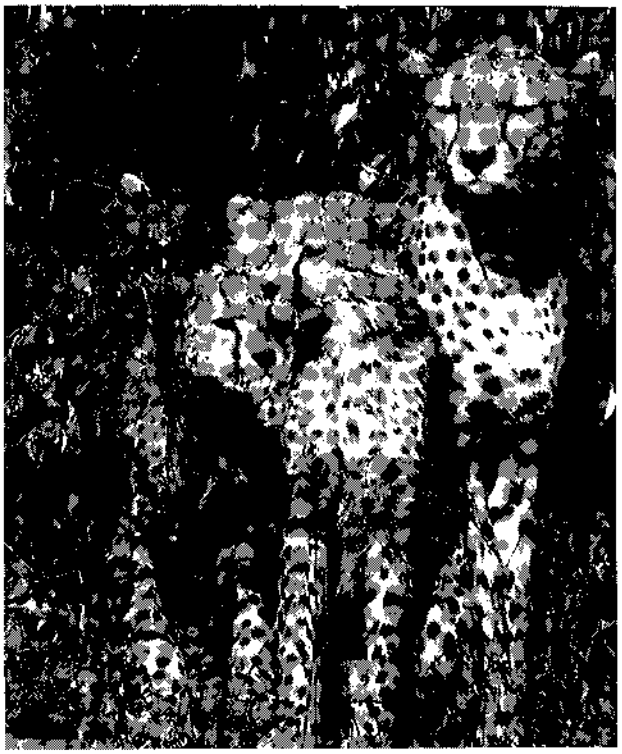
_____ Carnivores have access to domestic livestock during calving time.
_____ Drought has caused the death of a large amount of wildlife on your farm, and cheetahs have begun to attack small stock for food.
_____ Cheetahs are killing young hartebeest in your game farm. They have managed to get through the game fence by crawling through warthog holes in the fence.
_____ Heifers continue to lose a large number of calves to predators each year.
_____ Cows giving birth in camps where cheetah tracks are seen and that have playtrees lose more young than those in camps closer to the homestead that have only acacia trees.
_____ Overhunting of wildlife on a farm to provide more grazing area for cattle has caused predators in the area to hunt livestock.
_____ Five cows continue to lose young calves to predators year after year.

Management Technique

1. Electrify fence and barb the lower wires to prevent warthogs from digging holes.
2. Reduce calf losses by moving calving herds out of the areas where playtrees are located.
3. Bring cows closer to the homestead during calving times.
4. Keep a few older cows with heifers, because many losses of calves in herds occur because the heifers are inexperienced.
5. Keep a larger concentration of livestock in camps during calving to help protect the calves.
6. Keep a few cows or oxen with horns together with the calving herd.
7. Place a few female donkeys with calving herds, as donkeys are aggressive toward intruders and chase away cheetahs.
8. Rotate livestock more rapidly through camps.
9. Promote more aggressive breeds of cattle such as the Brahman and Afrikaaner.
10. Employ herders and large breeds of livestock guard dogs with small stock.
11. Promote wildlife repopulation on farms, because farms with larger wildlife populations experience fewer predator problems.
12. Slaughter cows that continue to lose young to predators.

Farm Management Problem

2, 3, 5, 6, 7	Carnivores have access to domestic livestock during calving time.
10	Drought has caused the death of a large amount of wildlife on your farm, and cheetahs have begun to attack small stock for food.
1	Cheetahs are killing young hartebeest in your game farm. They have managed to get through the game fence by crawling through warthog holes in the fence.
2, 4, 5, 6, 7	Heifers continue to lose a large number of calves to predators each year.
2	Cows giving birth in camps where cheetah tracks are seen and that have playtrees lose more young than those in camps closer to the homestead that have only acacia trees.
11	Overhunting of wildlife on a farm to provide more grazing area for cattle has caused predators in the area to hunt livestock.
12	Five cows continue to lose young calves to predators year after year.



ACTIVITY SHEET 9 ENDANGERED SPECIES

Fact sheets: *A Singular Species, Cheetahs and Farmers,* and *Wildlife Management on Commercial Livestock Farmlands: the Legal and Environmental Frameworks.*

Endangered species are ones that exist in low numbers and could go extinct if they are not protected and managed. Unfortunately, thousands of species are endangered, and each year more species become extinct. The cheetah, pangolin, black rhino, and Cape Vulture are a few of Namibia's endangered species.

As human populations increase, they change our planet at an ever faster rate, and many species of plants and animals suffer. Extinction has always been a natural process (for example, the dinosaurs went extinct before humans lived on the earth) but the current rate of extinction has increased dramatically. The introduction of exotic species, over-exploitation, and habitat loss are all responsible for the mass destruction of species occurring today. People are responsible for these problems. And people are capable of finding the solutions. But to find effective solutions and implement management programs wisely, we must understand why animals become endangered so that we can change our actions and prevent their extinction.

The number of cheetahs has decreased from 100,000 at the turn of the century to ±10,000 today. The cheetah suffers from habitat loss, declining prey bases, a lack of genetic diversity, conflicts with livestock farming, and an inability to survive in parks and reserves because of the presence of larger predators. If we learn more about the natural threats posed to the cheetah and work to reduce conflict with the species, we can reverse the current trends and save the cheetah from extinction.

Activities:

1. Ask students to identify problems that face cheetahs in the wild and in captivity. Identify threats that endanger the species in both environments. **(Answers: lack of genetic variation, high infant mortality, loss of habitat, declining prey numbers, illegal trade or poaching, human development and conflict with livestock and agricultural interests, and low reproduction in captivity all threaten the cheetah. Lack of genetic variation and high infant mortality affect the species in both the wild and captive environments.)**

2. Discuss with the students why cheetahs are in trouble and have them complete Work Sheet 3 "Animals at Risk."

WORK SHEET 3 ANIMALS AT RISK

Many animals are endangered because of humans and their activities. In addition to threats caused by humans, some species are endangered because of their special adaptations and/or habitat requirements. Animals and plants that are more likely to become endangered share certain characteristics. For example, they have limited geographical ranges; suffer from overuse or poaching; live in specialised habitats and eat special foods; exist in low population numbers; lack genetic variation; come into conflict with humans and development or are affected by human disturbances; are sensitive to environmental changes; have high mortality; and/or, have few offspring and long gestation periods. Animals that have one or more of the special biological characteristics listed may not suffer adverse effects until people start to interfere with them by destroying habitat, polluting environments, poaching, over-utilising through trade or hunting, or eradicating because of misconception or interference with development. Many carnivores have been endangered by human fears and misconceptions about their behaviours, and therefore have suffered adversely from predator control programs.

Instructions: Mark all of the characteristics that threaten the cheetah.

_____ Limited geographical range
_____ Lack of genetic diversity
_____ Specialised food and habitat needs
_____ Sensitive to environmental changes
_____ Few offspring & long gestation periods
_____ Low population numbers
_____ In conflict with humans and development
_____ Poaching
_____ Habitat Loss
_____ Over-utilisation
_____ Trapping by humans
_____ High mortality
_____ Declining prey numbers

How many characteristics did you check? Is the cheetah an animal that is prone to extinction? Do you think the cheetah may need special help to survive? Why or why not?

Which of the characteristics do you think poses the biggest threat to the cheetah?

Based on what you know about the cheetah, could it become extinct in the wild?

What can you do to help conserve the cheetah?

____	Limited geographical range	_x_	Habitat loss
_x_	Lack of genetic diversity	____	Over-utilisation
_x_	Specialised food and habitat needs	_x_	Trapping by humans
_x_	Sensitive to environmental changes	_x_	High mortality
____	Few offspring & long gestation periods	_x_	Declining prey numbers
____	Low population numbers		
_x_	In conflict with humans and development		
_x_	Poaching		

How many characteristics did you check? Is the cheetah an animal that is prone to extinction? Do you think the cheetah may need special help to survive? Why or why not?

Nine characteristics. Yes, the cheetah is an animal prone to extinction. Yes, many answers are possible.

Which of the characteristics do you think poses the biggest threat to the cheetah?

Conflict with humans and development, sensitive to environmental changes; and lack of genetic diversity.

Based on what you know about the cheetah, could it become extinct in the wild?

Yes, the cheetah could become extinct in the wild. The cheetah's survival depends on people and their willingness to manage the population and secure habitat for the species in the wild. The species' lack of genetic variation makes it susceptible to diseases and viruses. In addition it is less able to adapt to environmental changes or ecological disruptions. The cheetah is a survivor and has lived on this earth for four million years. But in order for it to survive, the cheetah must have habitat and a healthy prey base, and it must be allowed to increase in the wild so natural selection can strengthen the population.

What can you do to help conserve the cheetah?

(1) Help protect its habitat and insure a place for it on Namibian farmlands; (2) aid in the conservation of the wild prey base; (3) halt the indiscriminate capture and removal of the cheetah; (4) improve livestock management; and (5) educate everyone about the need to conserve biological diversity and the predator's unique role in healthy ecosystems.

ACTIVITY SHEET 10 CHEETAH RESEARCH IN NAMIBIA

Activities:

Radio tracking cheetahs by airplane

1. Complete Work Sheet 4 "Follow that Cheetah."

2. Ask students to choose a cheetah conservation profession and write its job description. Have students form groups with each of the scientists represented in a group. Ask them to choose one of the questions in "Follow that Cheetah" and to answer it by designing a research project that involves as many of the professions in the group as possible.

Scientists conduct research programmes to answer questions and help them solve problems. First, they ask questions about the topic of interest and then they collect information, called data, which is examined or analysed. The researcher then interprets the data and tries to identify solutions. Usually the collection of data leads the researcher to propose more questions as well as solutions to the original problem.

Scientists around the world are working together to learn more about the cheetah, its behaviours and physiology, in order to solve the following problems:

Problem 1: The cheetah is an endangered species because of loss of habitat and wild prey to human development. As livestock farms have grown in size and numbers, cheetahs have come into increased conflict with humans; livestock farmers continue to indiscriminately capture, remove, and kill cheetahs as "problem" or "livestock-killing" animals because they believe cheetahs are killing an excessive number of domesticated animals.

Problem 2: Increased competition with lion, leopards, and hyenas in national parks and reserves causes cheetahs to lose a large percentage of their young to predation and reduces their hunting success as they are scared away from game or off a kill.

Problem 3: A lack of genetic diversity in the species has led to their increased susceptibility to disease, high cub mortality, and low reproductive success in captivity.

WORK SHEET 4 FOLLOW THAT CHEETAH

Instructions: Imagine you are a wildlife conservationist studying the cheetahs living near the Waterberg Plateau. Read the story on the following page and then complete Work Sheet 5 at the end.

To solve these problems, we need to know more about the species in the wild and in captivity. Many questions about cheetahs remain unanswered, and their solutions may be critical to saving the species in the wild. For example:

1. What livestock and game-farming practices can farmers use to reduce loss to predators?
2. Why are some cheetahs problem animals? How much livestock is taken annually by cheetahs, and what is the economic impact?
3. What amount of wild prey is consumed by an adult cheetah annually, and what species do they prefer?
4. What is the significance of playtrees in Namibia in communication among cheetahs and as territorial markers? Do Namibian cheetahs hold down strong territories as do the cheetahs of the Serengeti National Park of Tanzania?
5. What are the movements of cheetahs through their home ranges?
6. Are Namibian cheetahs more social, and will they travel in family units?
7. What percentage of a cheetah's cubs are lost to predation?
8. What size population can a national park such as Etosha support? And, if cheetahs are unable to survive on farmlands, how will they be managed in national parks?
9. What percentage of the wild population breeds successfully?
10. Are wild cheetahs more genetically diverse? Are they as susceptible to disease and do they suffer from as high a cub mortality as the captive population?
11. What behavioural and physiological traits affect reproduction in captivity?

Scientists are studying cheetahs, in the wild and in captivity, hoping to answer these questions. Many different scientists are working together to collect their data to answer these questions. Following are some of the scientific professions involved in cheetah conservation.

Wildlife conservationists monitor the status of the wild population and work with the local communities to reduce conflict. **Geneticists** collect blood to analyse the relationships between individual cheetahs within a population, study the overall health of the population, and to prevent further inbreeding in captivity. **Behaviouralists** study social interactions within populations to understand more about breeding behaviours, territorial markings, and family relationships. And, **reproductive physiologists** try to increase breeding success by learning about the physiology of the species and developing techniques such as artificial insemination and in vitro fertilization.

LS–36

Cheetah Story

It is early on a Thursday morning and the CCF team (the Krauses, Co-directors of the Cheetah Conservation Fund, and you) is on its way to collect a cheetah on a farm near the Waterberg Plateau. A farmer trapped the cheetah on Tuesday but, because it was not a stock-killing animal, he has decided to release the cat. The farmer had heard about the Krauses' work from his daughter who attended a school where the CCF gave an assembly program. The farmer's daughter told him how a cheetah maintains a territory and, if a cheetah is not killing livestock, it is better to keep the animal on the property. If he removed the cat, more cheetahs could come to take its place or even worse, a stock-killing animal could replace it. The farmer decided to participate in the CCF's research and learn more about the cheetah. You have volunteered at the CCF base as part of a class project on wildlife conservation.

You arrive at the farm and begin talking to the farmer about his property, the wildlife found there, his livestock management practices, and predator problems. The CCF team learns that the cheetah was caught at a playtree on the farm. The farmer has caught a number of male cheetahs there. He has seen feces at the tree and scratch marks. The farmer only has one playtree on his property and that is where he has caught the most cheetahs. While talking with the farmer, the Krauses fill out a survey on the farm. Information gained from the survey will be entered into a computer database for use in a report to be given to all Namibian farmers on livestock management practices that help reduce losses to cheetahs and other predators. The Krauses also ask the farmer about cheetah social groups. The farmer mentions seeing seven adult cheetahs together about five years ago. All of this information is recorded in order to learn more about the species in Namibia and for future behavioural studies.

After completing the survey the CCF team discusses with the farmer non-lethal alternatives to predator control. Most of the farmer's problems with predators involve his small stock. While he has tried dogs, they do not seem to protect his sheep. The Krauses point out that special livestock guarding dogs are needed to protect small stock, and they provide the farmer with information on various species that can be used in Namibia. The farmer agrees to consider this alternative, which has worked successfully in a number of other countries and on some farms in Namibia.

Now the CCF team goes to work, collecting blood and taking measurements of the cheetah in order to learn more about the overall health of the wild populations. First, you anesthetise the cheetah and wait for it to fall asleep. The cheetah is a male, approximately five years old. While it is sleeping you work with Mrs. Kraus, collecting blood and fecal samples, and with Mr. Kraus, taking measurements. Before it wakes up you put an ear tag on the cat for future identification and radio-collar the animal in order to track its movements through the farmlands. Information gained from radio-tracking is shared with the farming community, letting farmers know about the movement of cheetahs through their property. Furthermore, it allows CCF to track the movement of cheetahs through areas where new livestock management techniques are being employed to test their effectiveness.

Cheetah Story (continued)

Slowly the cheetah wakes up from the tranquiliser and is ready for release. The cheetah is released back onto the farm at the site it was caught.

While the blood samples are still fresh, you prepare them for shipment to the United States where an international team of researchers, of which you are now a part, analyses them for genetic traits and disease problems. The team is composed of geneticists, reproductive physiologists, virologists, and pathologists. Information you obtain from the blood samples will help you manage the wild population and help you learn more about the relatedness of animals in captivity to those in Namibia — after all, 99 percent of the wild cheetahs imported to international zoos have come from Namibia.

On Friday morning, you and Mr. Kraus leave early for the Otjiwarongo Airstrip where Mr. Imbert waits to take you flying in order to track the newly collared cheetah. The plane takes off, and you start to listen for the cheetah's signal, which is transmitted from its collar. Two antennas attached to the plane's wings pick up the signal, and a receiver inside the plane directs you to the location of the cat. The signal from the transmitter gets stronger as you get closer to the animal. The cheetah is about 10 km from where he was caught. You are even lucky enough to see him on a fresh steenbok kill. Three days later, you again go out to track the animal and find that it has travelled 40 km away from its previous spot.

Approximately four months later, the blood analysis comes back from the United States, where pathologists and geneticists have been running tests. Comparing the blood results with those taken from other animals, the CCF team learns that the male had sired a litter with a female cheetah, which had been caught eight months before with four young cubs. CCF has collected samples on over 150 animals and is developing an extensive database on free-ranging cheetahs. The knowledge gained through their work will aid in the management of the Namibian population and aid in international efforts to save this endangered species. Your help in collecting data has been critical in their efforts.

The farmer took your suggestion to use livestock guarding dogs to protect his small stock. For the past three months, the farmer has employed Anatolian Shepherds with three goat herds. He has subsequently suffered no loss to cheetahs. While he remains skeptical that cheetahs can survive on the commercial farms where livestock is, he agrees to continue working with CCF to find non-lethal solutions to his problems.

WORK SHEET 5 CONSERVATION AND REASEARCH TOOLS

Instructions: What have you learned about the work of CCF and the scientific tools used to conduct their work? Write the number of the research and conservation tool next to the line explaining its use.

Conservation and Research Tools

1. Trap
2. Public Education
3. Farm Survey
4. Cheetah Field Notes
5. Tranquiliser and blowpipe
6. Syringe
7. Vacuum tubes
8. Scale
9. Plastic Bags
10. Tape measure
11. Ear tag and applicator
12. Radio-collar
13. Centrifuge
14. Storage tank with liquid nitrogen
15. Radio antenna and receiver
16. Airplane
17. Map
18. Binoculars
19. International newsletter for zoos and cheetah conservationists

Use of Research Tool

_____Catches cheetahs
_____Researcher marks the location of the cheetah and date when found on this paper
_____Provides information to international researchers concerning Namibian field work
_____Spins blood down for blood preparation
_____Shows the cheetah's location by sending signals from the battery-powered transmitters
_____Picks up signals from the radio-collar on the cheetah and enables the researcher to locate the cat
_____Researchers use this to spot cheetahs on the ground
_____Used to locate cheetahs when cars or tracking by foot is not possible
_____Drug and tool used to put cheetah to sleep
_____Working with local communities to help conserve the cheetah
_____Determines the weight of the cheetah
_____Needle used to draw blood samples for health tests
_____Measures the size of the cheetah
_____Place where livestock management practices and other farm data is recorded
_____Place to record biological information
_____Container for shipment of samples overseas
_____Bag for collection and transport of feces for parasite analysis
_____Placed on cheetah for future identification
_____Tubes used for blood collection

Conservation and Research Tools

1. Trap
2. Public Education
3. Farm Survey
4. Cheetah Field Notes
5. Tranquiliser and blowpipe
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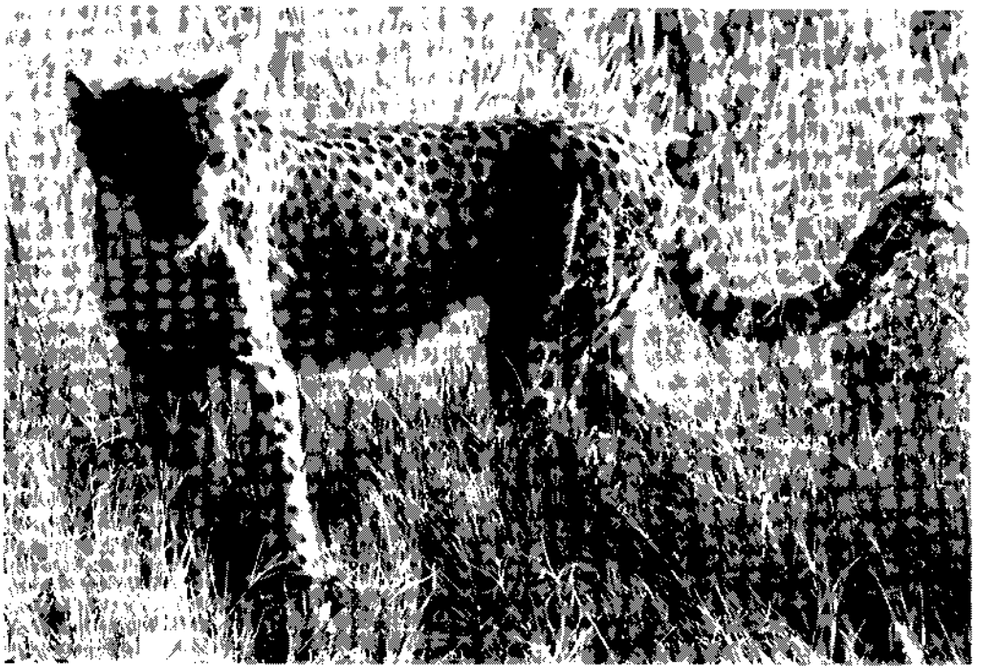
15. Radio antenna and receiver
16. Airplane
17. Map
18. Binoculars
19. International newsletter for zoos and cheetah conservationists

Use of Research Tool

__1__ Catches cheetahs
__17__ Researcher marks on this paper the location of the cheetah and date when found
__19__ Provides information to international researchers concerning Namibian field work
__13__ Spins blood down for blood preparation
__12__ Shows the cheetah's location by sending signals from the battery-powered transmitters
__15__ Picks up signals from radio-collar on cheetah and enables the researcher to locate cat
__18__ Researchers use this to spot cheetahs on the ground
__16__ Used to locate cheetahs when cars or tracking by foot is not possible
__5__ Drug and tool used to put cheetah to sleep
__2__ Working with local communities to help conserve the cheetah
__8__ Determines the weight of the cheetah
__6__ Needle used to draw blood samples for health tests
__10__ Measures the size of the cheetah
__3__ Place where livestock management practices and other farm data is recorded
__4__ Place to record biological information
__14__ Container for shipment of samples overseas
__9__ Bag for collection and transport of feces for parasite analysis
__11__ Placed on cheetah for future identification
__7__ Tubes used for blood collection

CHAPTER II

SOCIAL SCIENCES



SOCIAL SCIENCES

OBJECTIVES

1. To develop an awareness and understanding of geographical, historical, and cultural ideas;

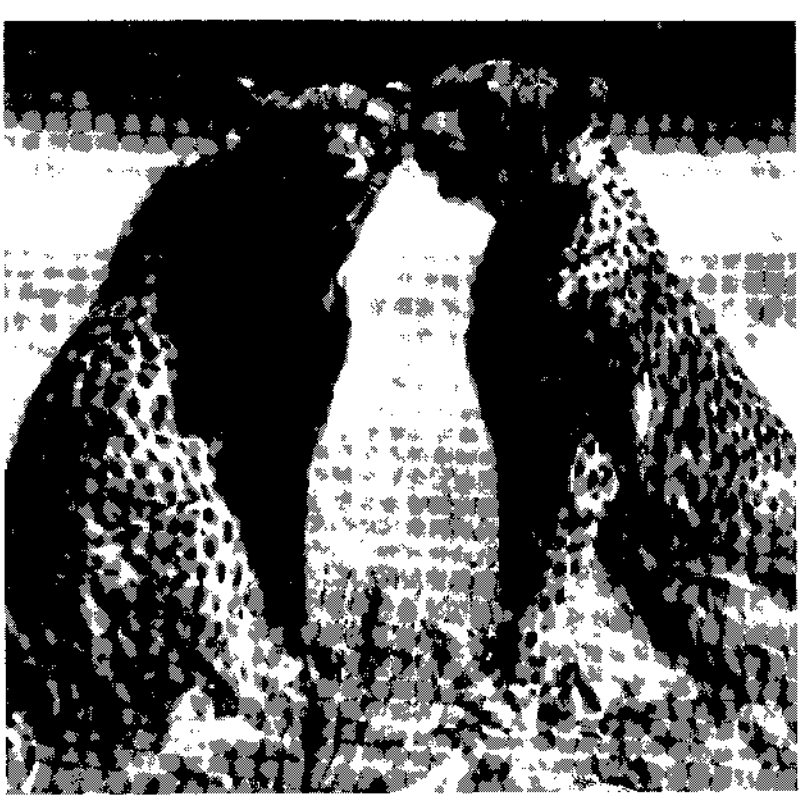
2. To learn to analyse and question attitudes related to environmental issues; and

3. To create an understanding of an individual's responsibility as a citizen of the national and world environment.

TEACHER'S BACKGROUND

Animals have many different types of homes they live in, foods they eat, and weapons they use to defend themselves, just like humans. Different kinds of behaviours shown by animals are exciting to watch and to try to understand. These include how animals interact with their mates, offspring, and other animals in their surroundings. People have been fascinated by animals throughout history. For example, Africa's oldest rock paintings are found in Namibia's Huns Mountains. These rock paintings, which depict mostly animals and geometric forms, are between 27,000 and 29,000 years old.

The social studies section contains ideas on how to integrate cheetah conservation into the subjects of world geography, history, and language. Discussion questions focus on how humans have changed the environment, the effects of these changes, and our use of natural resources. Refer to the following fact sheets for background information: *A Place for Predators*; *Cheetah History: A Race for Survival*; *Cheetahs and Farmers*; and *Wildlife Management on Commercial Livestock Farmlands: the Legal and Environmental Frameworks.* These fact sheets are designed to provide teachers with background information to aid in teaching or may be photocopied for students, too. Work sheets for students are at the end of the section.



QUESTIONS FOR DISCUSSION:

1. *How are humans changing the environment and what changes are leading to the endangerment of predators? Consider the five major causes of extinction listed at the beginning of this packet.*

Discussion Points. Loss of natural habitat and the reduction of prey species endanger predators. Namibian cheetahs are especially vulnerable to such problems. They need large tracts of land, between 800 and 1,500 km^2; cheetahs are losing more and more of the land where they can roam without contact with humans. The cheetah's unique adaptations make it the fastest land animal. But this specialisation has come at a cost to the animal. It lacks the strength of the other large predators; therefore, cheetahs capture smaller animals and need to have a sufficient number of prey animals in order to survive. Lack of information on and an understanding of the importance of large tracts of land for predators, changes in habitat, loss of biological diversity, and incompatible wildlife and livestock management practices in habitat are other threats to the survival of the cheetah and other predators. Indiscriminate trapping of cheetahs by some farmers is also endangering the cheetah. Other large predators such as the lion and hyena have been eradicated from the commercial farm lands. Habitat destruction, loss of prey species, and overuse through indiscriminate trapping are the three major issues contributing to the endangerment of the species.

2. *Discuss how the development of commercial farms and wildlife policy in Namibia have changed the composition of the environment. What are the major events responsible for the changes? How have they affected the cheetah? Should cheetahs be removed from farmlands?*

Discussion Points. See fact sheet entitled *Wildlife Management on Commercial Livestock Farmlands: the Legal and Environmental Frameworks*, which discusses important developments in commercial farming and wildlife policy that have changed the composition of the environment.

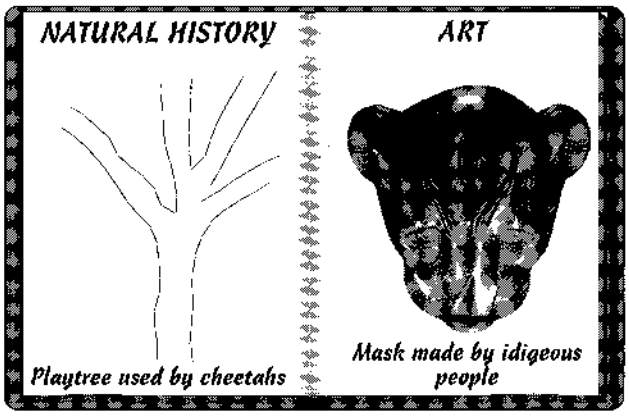
3. *How have people utilised predator species, and especially the cheetah, in the past? What cultural beliefs do people have about wildlife, predators, and cheetahs? For example, there is an Owambo saying: "Never kill the cat that cries."*

Discussion Points. Review the fact sheet entitled *Cheetah History: A Race for Survival.* People have hunted predators for trophies and used them as tourist attractions in zoos and guest lodges. In the past, people would make fur coats to protect themselves against the cold; however, today coats made out of fur are more often used for fashion than necessity. The illegal trade in spotted-cat furs endangers many species. In Asia, the cheetah would be used to hunt antelope for sport, known as "coursing." Indians used to consider the cheetah as a sign of royalty. In ancient Egypt, the cheetah was considered a goddess who carried the Pharaoh's soul to the afterworld. Many Nangas in Zimbabwe use cheetahs and other predators as their totems. Large predators are admired for their strength and hunting ability. The cheetah is admired for its speed.

1. Have students learn more about the other countries of the world where cheetahs are found (for the list of countries where cheetah populations are found, see Work Sheet 1 "Where Do Cheetahs Live in Africa and Asia?"). Ask them to learn about the country and its physical climate, wildlife and plants, and exported natural resources. What habitats do cheetahs live in there, and what are people's attitudes and cultural beliefs about predators. Have them contact wildlife officials and nongovernmental organisations in these countries to learn more about what they are doing to conserve cheetahs.

2. Pretend that you are an explorer in Namibia or another country in Africa where cheetahs live. Describe your journey in a log book.

   Sketch a picture of a cheetah, record information about its behaviours, numbers, and habitats. Record what they eat and how much they eat. What do local people think about the cheetah? Have a page for each of the following subjects: natural science, history, geography, art, English, agriculture, and other subjects of interest.



3. Cheetahs were one of the most widely distributed of all land mammals. They migrated over land and ice bridges from North America into the southern regions of the Commonwealth of Independent States (formerly the Soviet Union), eastern Asia, and then through deserts and steppe regions into the Middle East, southern Europe, and Africa.

   Using the map on page SS—5, "The Prehistoric Range of the Cheetah: 2–6 Million Years Ago," show students on a world globe the movement of cheetahs from the United States to Asia, Europe, and into Africa. Ask them to:

   (a) Find the states of Nevada, Texas, and Wyoming in the United States of America;

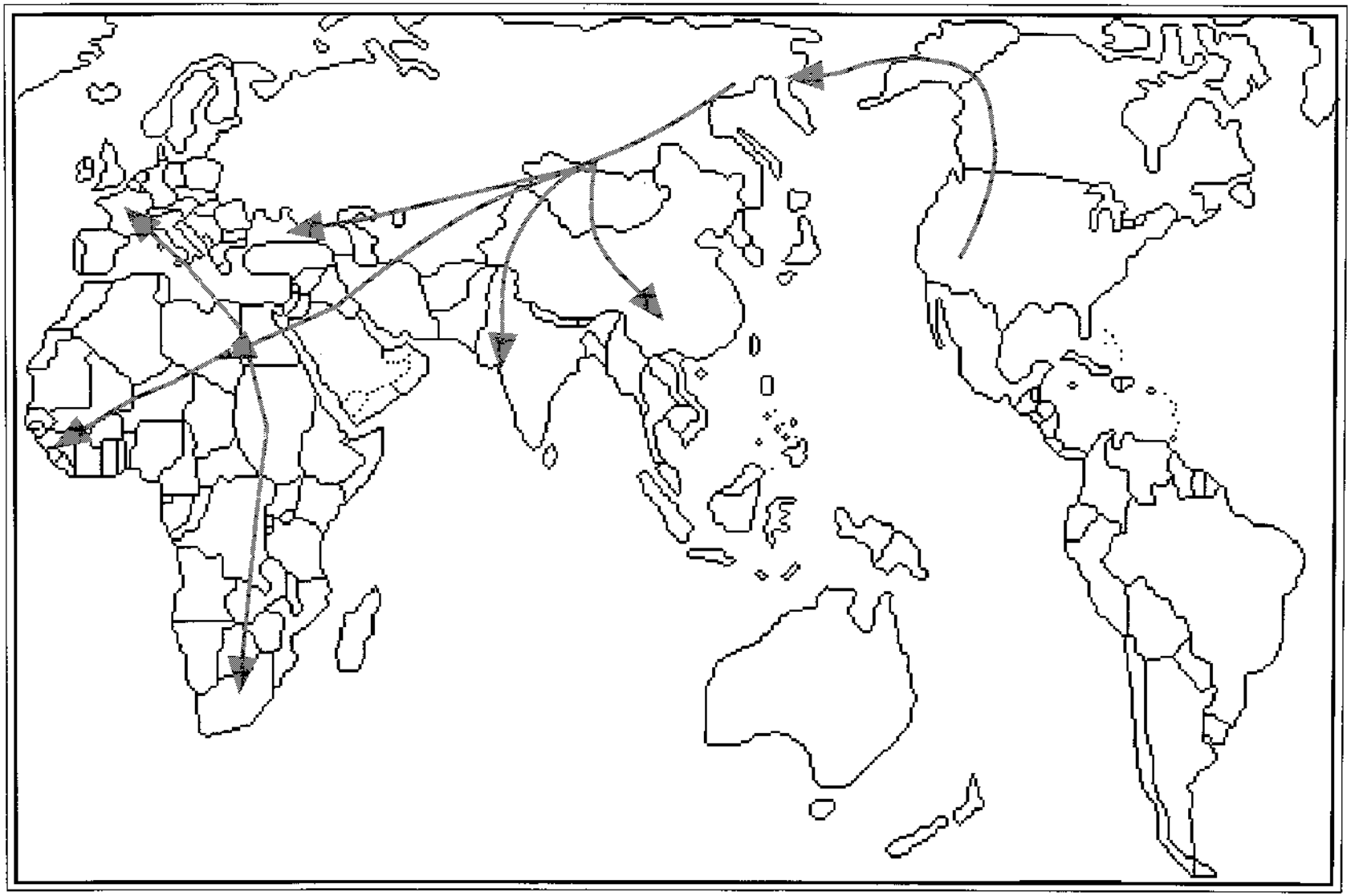
   (b) Locate the Bering Strait (explain how a land bridge that once existed between Alaska in North America and the eastern peninsula of the Commonwealth of Independent States is now under water); and

   (c) Name the continents where cheetahs did not live during this period (Answers: South America, Antarctica, and Australia).

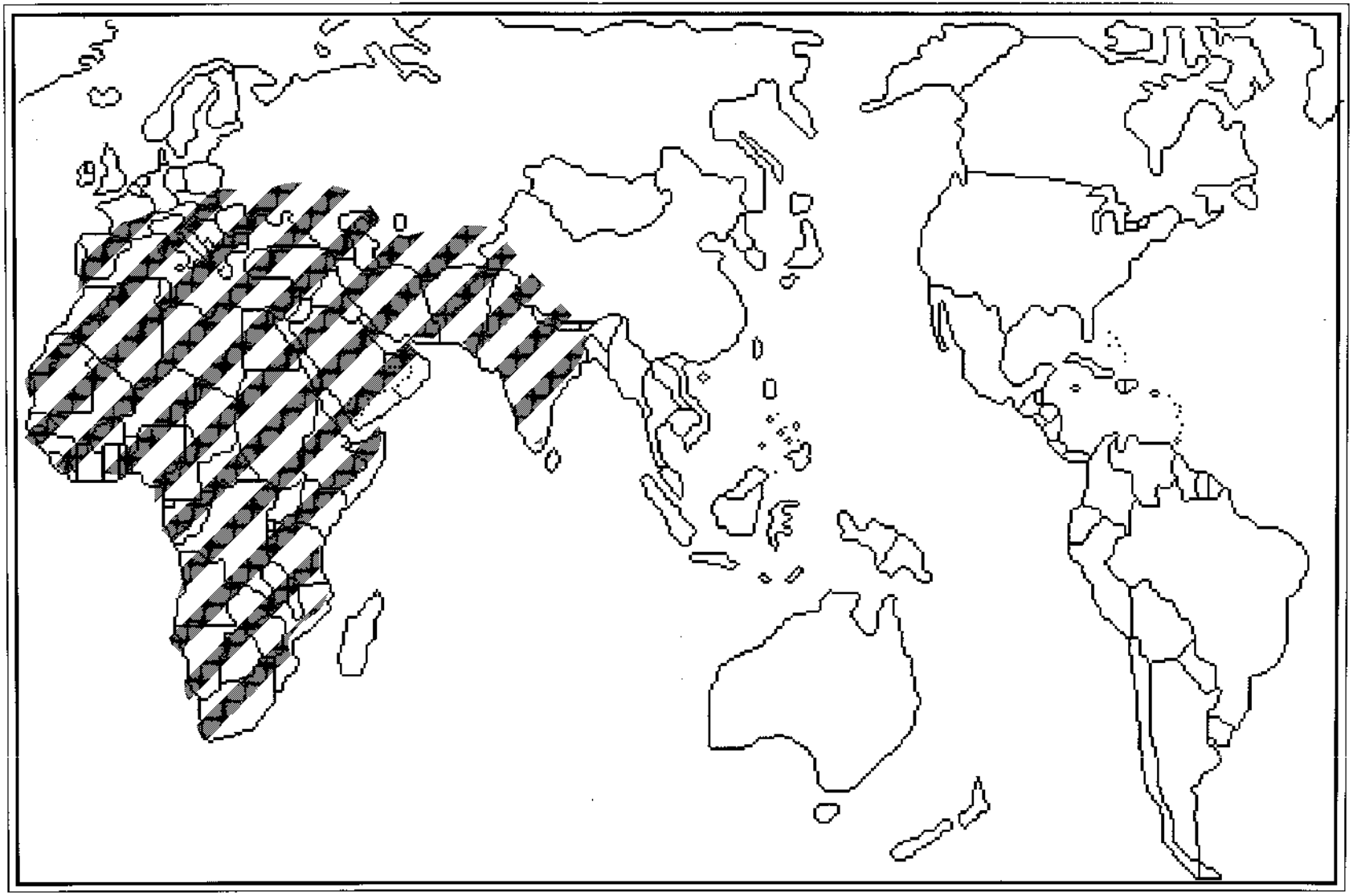
4. Using the map on page SS—6, "Range of the Cheetah at the End of the Pleistocene Epoch," show students how, at the end of the Pleistocene Epoch, the cheetah's range was drastically reduced because of climatic changes and species extinction. The Pleistocene Epoch, also known as the Great Ice Age, is a geological time period approximately 2 million years to 10,000 years ago. Ice covered a large part of the northern hemisphere and sea levels fell. Changes in climatic conditions may have caused cheetahs to migrate to more suitable environments in the southern hemisphere.

5. Complete Work Sheets 1 "Where Do Cheetahs Live in Africa and Asia?," Work Sheet 2 "Where Have All the Cheetahs Gone?" and Work Sheet 3 "Cheetahs of Namibia." Maps for use with these activities are located on pg SS—9 and 10 at the end of this section. Please reproduce as needed. The map of Africa is needed for "Where Do Cheetahs Live in Africa and Asia?" and "Where Have All the Cheetahs Gone?" Both activities may be done on the same map. The map of Namibia is for "Cheetahs of Namibia."

(Answers to questions for "Where Have All the Cheetahs Gone?": 1-a) 13, b) see list; 2– Namibia; 3– South Africa; 4– Iran; 5– Botswana/Namibia/Zimbabwe, Kenya/ Tanzania. **Answers to "Cheetahs of Namibia":** 1– Otavi and Otjiwarongo; 2– No; 3–north–central farmlands; 4– Orange and Kunene Rivers; 5– Yes; 6– surveying of people who live in area, and sightings of cheetahs and their spoor.



The Prehistoric Range of the Cheetah
2—6 million years ago



Range of the Cheetah at the End of
The Pleistocene Epoch

WORK SHEET 1 **WHERE DO CHEETAHS LIVE IN AFRICA AND ASIA?**

Instructions:

1. Label the following on the map of Africa:

   Atlantic Ocean
   Indian Ocean
   Mediterranean Sea
   Persian Gulf
   Red Sea

2. Label the following countries on the continent of Africa on the map.
   * Indicates countries inhabited by cheetahs.

* Algeria	Gambia	Nigeria
* Angola	Ghana	Rwanda
* Benin	Guinea	Sao Tome & Principe
* Botswana	Guinea-Bissau	Senegal
* Burkina Faso	Ivory Coast	Sierra Leone
Burundi	* Kenya	* Somalia
* Cameroon	Lesotho	* South Africa
* Central African Republic	Liberia	* Sudan
* Chad	Libya	Swaziland
Comoros	Madagascar	* Tanzania
Congo	Malawi	Togo
Djibouti	* Mali	Tunisia
Egypt	* Mauritania	* Uganda
Equatorial Guinea	Morocco	Western Sahara
Eritrea	* Mozambique	* Zaire
* Ethiopia	* Namibia	* Zambia
Gabon	* Niger	* Zimbabwe

3. Label the following countries in Asia on the map:

Afghanistan (not on map)	Iraq	Lebanon	Saudi Arabia
Commonwealth of	Israel	Oman	Syria
Independent States	Jordan	Pakistan (not on map)	Turkey
*Iran	Kuwait	Qatar	United Arab Emirates
		Yemen	

4. Shade-in the countries with * next to their names. These are the countries where cheetah live. Namibia has been done for you.

WORK SHEET 2 WHERE HAVE ALL THE CHEETAHS GONE?

One hundred years ago cheetahs were widely distributed throughout Africa and Asia. The species was found in 33 African countries and 11 Asian countries. Cheetahs are now extinct in 10 Asian countries and at least 3 African countries. Because of civil wars and a lack of resources, researchers have been unable to collect data on many cheetah populations. It is possible that a number of countries whose populations are listed as "Possibly Viable" or "Possibly Not Viable" are now extinct!

The cheetahs that still do exist live in populations that are classified as: viable, possibly viable, and possibly not viable. Viable populations are groups of animals that are capable of living, growing, and developing.

Using the colours listed below, colour-in those countries that have viable, possibly viable, and possibly not viable populations. Answer the questions using the map.

Crayons:	Red	=	Extinct
	Brown	=	Possibly Not Viable
	Blue	=	Possibly Viable
	Green	=	Viable

Extinct	Possibly Not Viable	Possibly Viable	Viable
Afghanistan (not on map)	Algeria	Chad	Botswana
Commonwealth of Independent States	Benin	Angola	Kenya
India (not on map)	Burkina Faso	Ethiopia	Namibia
Iraq	Cameroon	Iran	Tanzania
Israel	Egypt	South Africa	Zimbabwe
Libya	Mali	Sudan	
Oman	Mauritania	Central African Rep.	
Pakistan (not on map)	Mozambique	Uganda	
Saudi Arabia	Niger		
Syria	Senegal		
	Somalia		
	Zaire		
	Zambia		

1. a) In how many countries is the cheetah now extinct? b) In which countries is the cheetah extinct?

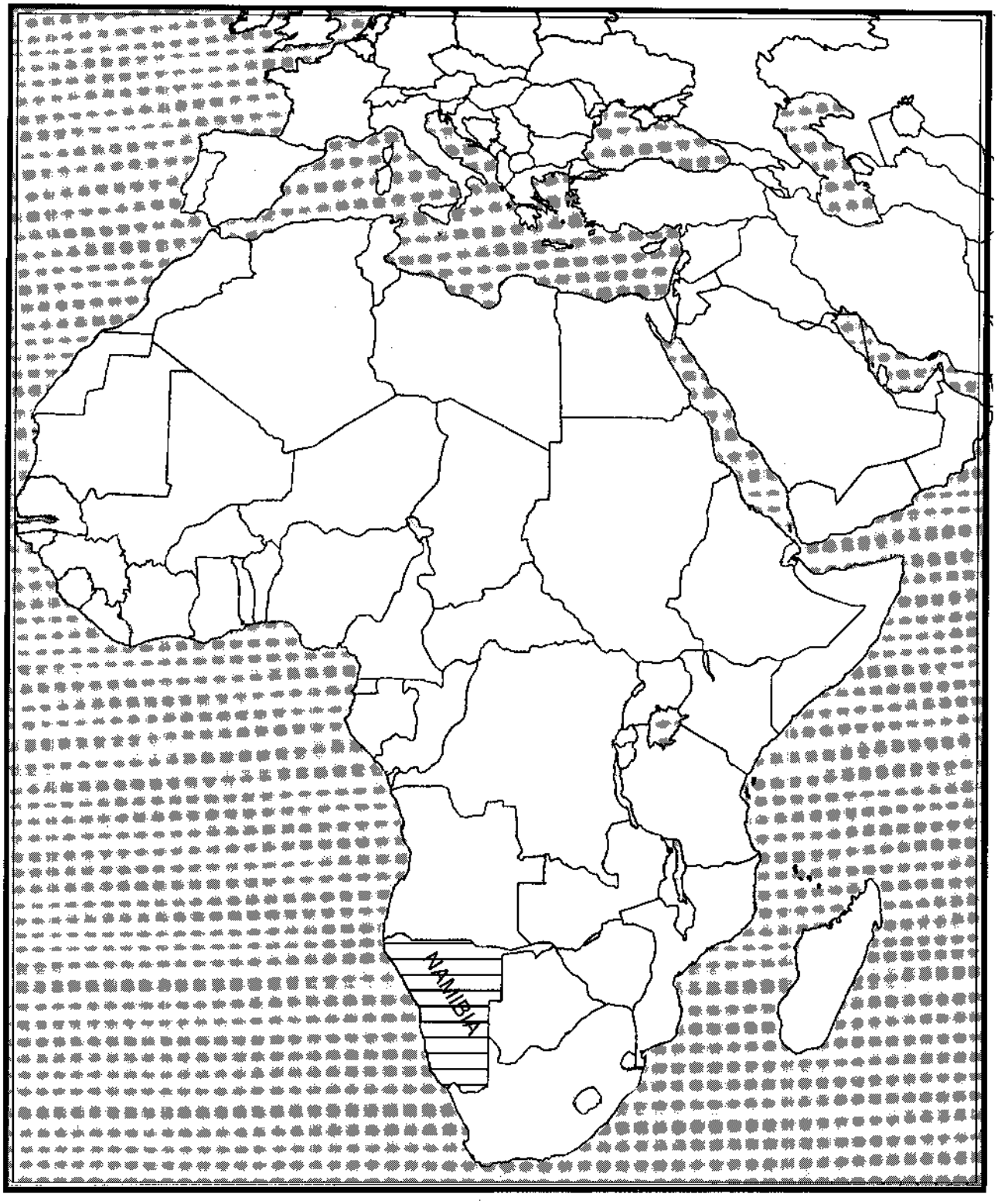
2. What country has the most cheetahs?

3. One southern African country does not have a viable population of cheetahs; which one is it?

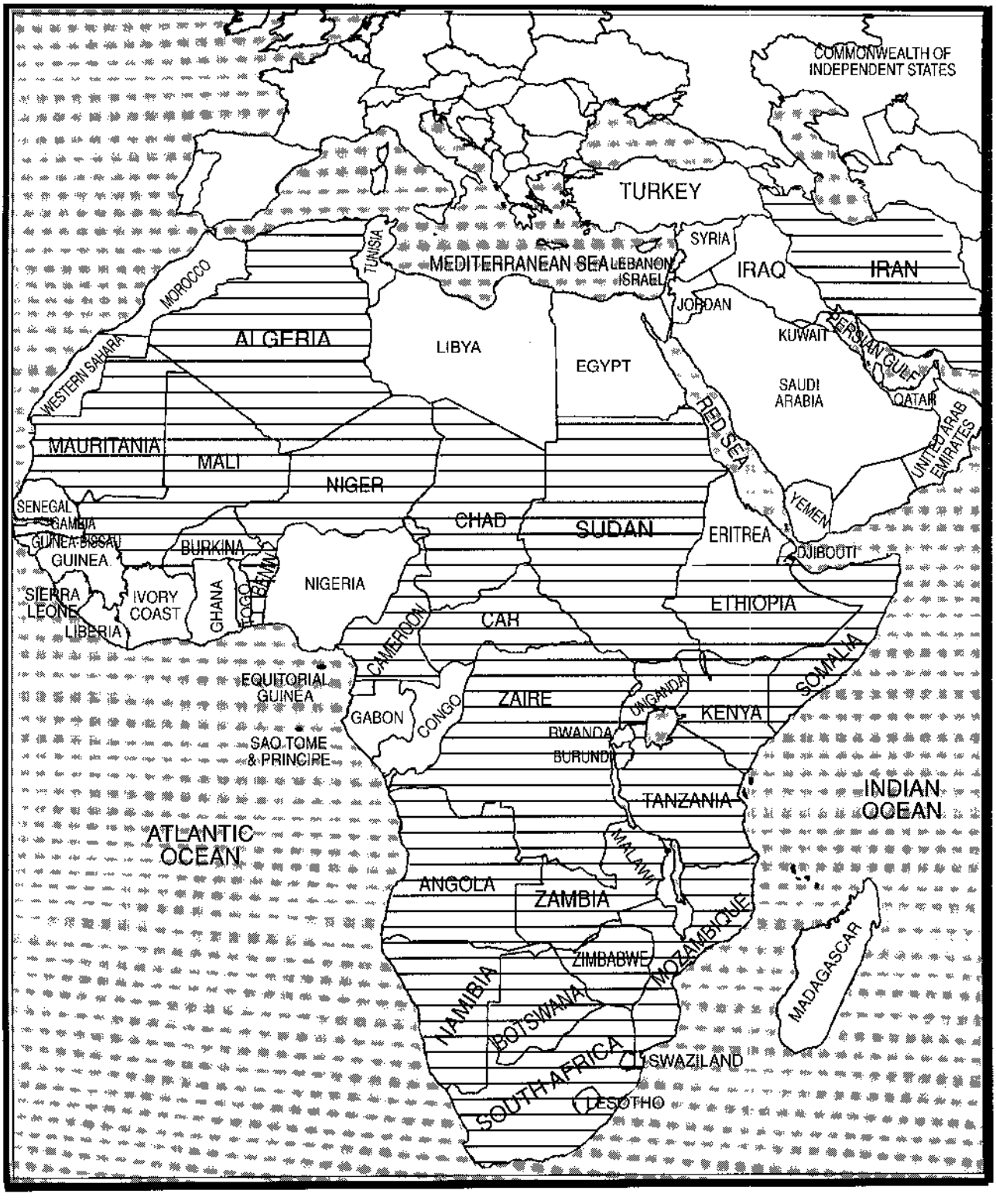
4. What Asian country still has wild cheetahs?

5. Group the five countries with viable populations into two groups that have geographically connected populations.

"WHERE DO CHEETAHS LIVE IN AFRICA AND ASIA?"
"WHERE HAVE ALL THE CHEETAHS GONE?"

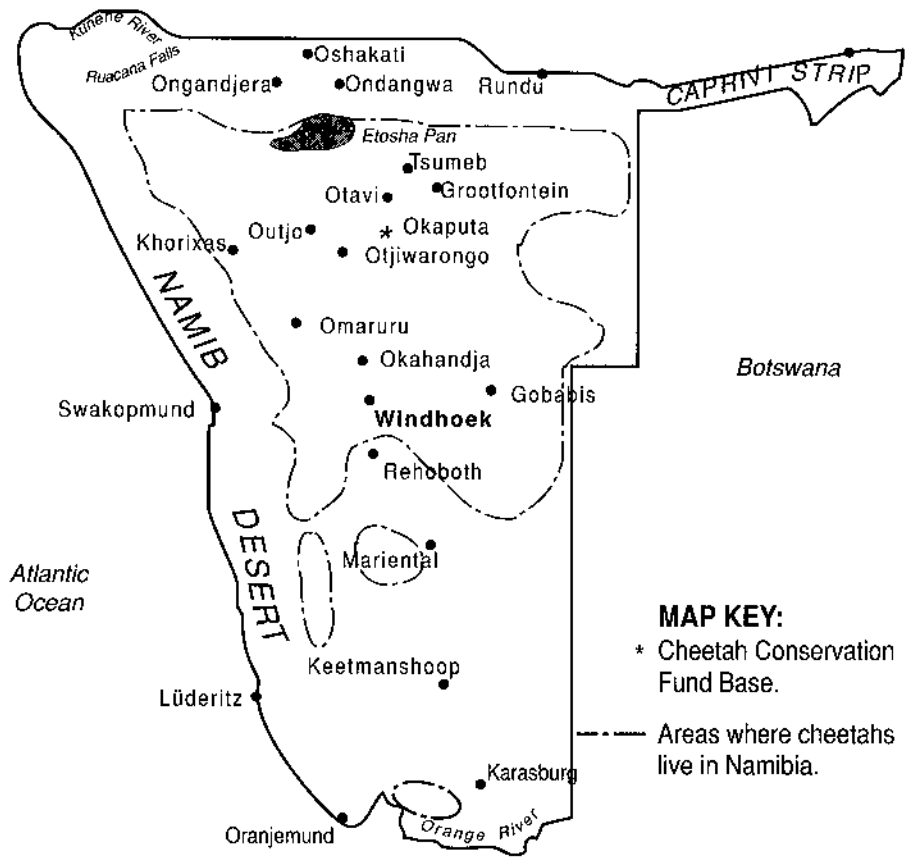


ANSWER KEY "WHERE DO CHEETAHS LIVE IN AFRICA AND ASIA?"



WORK SHEET 3 **CHEETAHS OF NAMIBIA**

Instructions: Colour in the areas on the map where cheetahs live and answer the questions using the information provided on the map.



MAP QUESTIONS

1. Name the two towns closest to the Cheetah Conservation Fund's base at Okaputa.

2. Are cheetah found in Oshakati and Ondangwa?

3. Which region inhabited by cheetahs in Namibia is the largest?

4. Name two rivers that cheetahs live near.

5. Do the Namibian and Botswana cheetahs form a geographically connected population?

6. How do you think researchers have discovered where cheetahs live in Namibia?

ACTIVITY SHEET 2 HISTORY

Activities:

1. Have your students draw a Time Line referencing changes in cheetah history to historic events and scientific discoveries. Start the Time Line 155–190 million years ago during the Triassic Period of the Mesozoic Era, when mammals came into being.

Events to consider for a cheetah history:

(a) 3,500,000 to 4,000,000 years ago, cheetahs first appear.

(b) 15,000 to 20,000 years ago, during the Pleistocene Epoch, cheetahs cross land bridges from the United States into Asia, Europe, and Africa and live on all 4 continents.

(c) 10,000 years ago, cheetahs become extinct on every continent except Africa and Asia.

(d) 5,000 years ago, African cheetah population splits into East African and southern African subspecies. Sumerians begin taming cheetahs for hunting at Court.

(e) 1,500 years ago, Italians use cheetahs to hunt for sport.

(f) 1,000 years ago, over-hunting causes sharp decline in the southern African cheetah, making it more inbred than the East African cheetah.

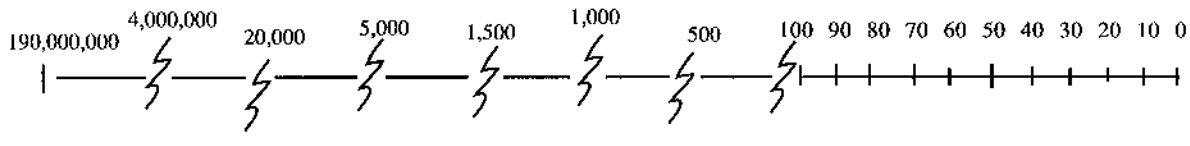
(g) 500 years ago, Akbar the Great keeps 9,000 cheetahs in Court, during his 49 year reign.

(h) 100 years ago, India and Iran begin to import cheetahs from Africa for hunting purposes.

(i) 40 years ago, the Indian cheetah becomes extinct, and the first cheetah reproduces successfully in captivity.

(j) 17 years ago, the cheetah is placed on Appendix I of CITES.

(k) 3 years ago, Namibia gains independence, and the Cheetah Conservation Fund is established to help protect wild cheetahs.



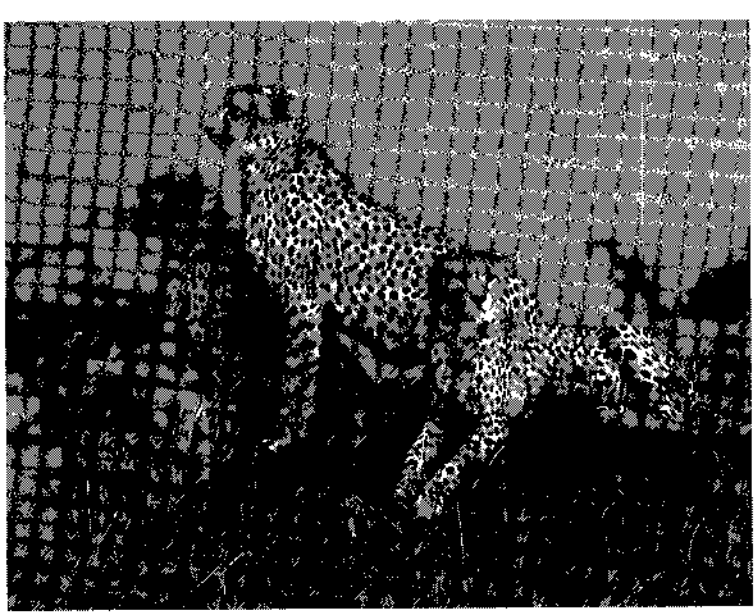
SAMPLE TIME LINE

2. Complete the Work Sheet 4 "Ancient Cheetahs."

3. In Egypt, during the time of the Pharaohs, cheetahs were considered goddesses. Egyptology is the study of ancient Egypt, and people who study about ancient Egypt are called "Egyptologists." Hieroglyphics are pictures or symbols used in writing. They were used in the writing system of ancient Egypt. Write a story about one of the pictures in the work sheets "Ancient Cheetahs." Why do you think the ancient Egyptians considered the cheetah a goddess? **(Possible answers: speed, agility and grace, skill as a hunter, and beauty.)**

4. Study the ancient culture of the Egyptians which arose in the Nile delta or North Africa. Study their art and architecture. What do the pictures tell you about how people interacted with their environment? Why do you think the cheetah was a sign of nobility? **(Possible answers: speed, agility and grace, skilled hunter, and beauty.)**

5. What was the significance of the cheetah in Asian cultures? What caused the dramatic decline in the Asiatic cheetah population? **(Answers: The Asian cultures used cheetahs to hunt for sport. In India, the cheetah was a sign of nobility. Because of capture of wild cheetahs for pets and hunting companions, the Asiatic subspecies declined drastically in numbers. Cheetahs had to be exported from Africa to supply animals for hunting purposes in Iran and India.)**



ACTIVITY SHEET 3 LANGUAGE

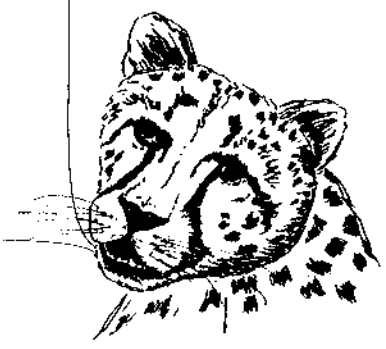
While English is Namibia's official language, a majority of the population's first language is an indigenous Namibian language, German, or Afrikaans. The Ministry of Education and Culture is encouraging students and future teachers to learn more about languages indigenous to Namibia in order to promote an appreciation of these languages and to develop an understanding of their cultural importance in a multilingual society.

Encourage students to learn other names for the cheetah from some of those listed below. Have your students add to this list with other languages. Try to find the English translation of the following words and learn what it means about the animal and why. Send the results to the Cheetah Conservation Fund along with any additions or corrections to the list.

Examples: In Oshikwanyama, "cheetah" is "Etotongwe," meaning "spotted leopard." Etot=spotted and Ongwe=leopard.

The English word "cheetah" comes from the Hindu word "chita" meaning the "spotted one."

Word	Language
!à'ó	Ju 'hoan
!Arub	Khoekhoegowab (Damara/Nama)
Cheetah	English
Chita	Hindu
Duma	Kiswahili
Etotongwe	Oshikwanyama
Gepard	German
Guépard	French
Ingulule	Zulu
Jagluiperd	Afrikaans
Letotsi	Setswana
Lièbaó	Chinese
Otjitotongwe	Otjiherero
Yuz	Farsi (the language of Iran)
	Silozi
	Oshindonga
	Rukwangali
	Rugciriku



ACTIVITY SHEET 4 ANCIENT CHEETAHS

Instructions: Using the key below, identify the symbols for the cheetah in each of the three Egyptian tomb paintings. Symbols may appear backwards or forwards. Write a story based on the pictures.

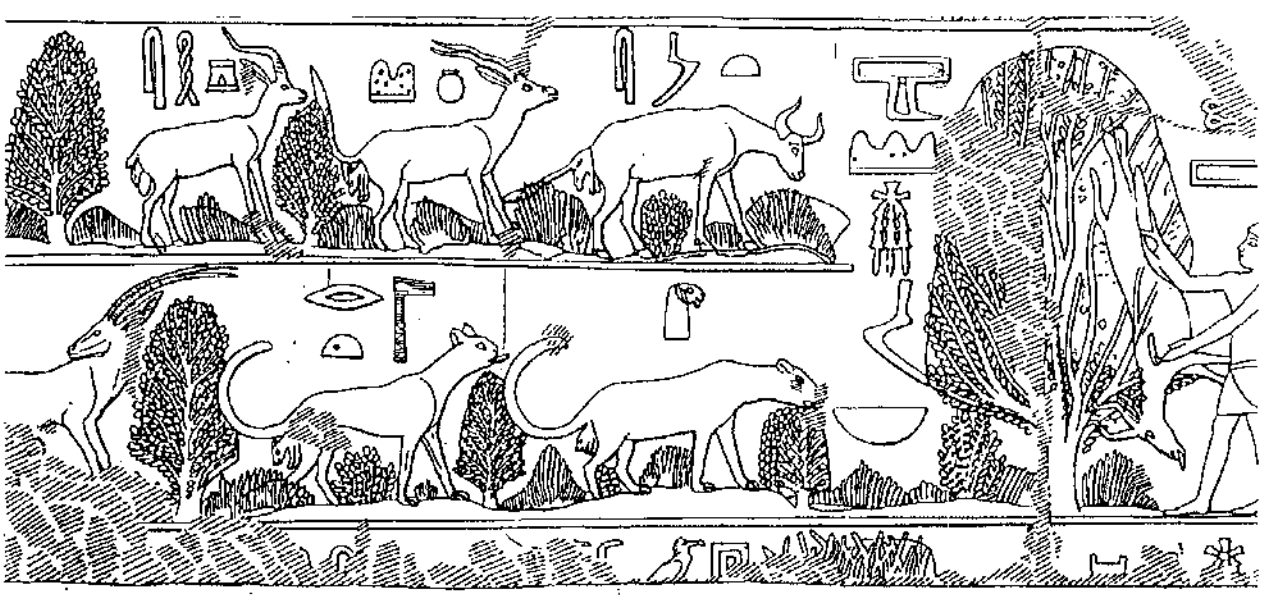
Hieroglyphic Key:

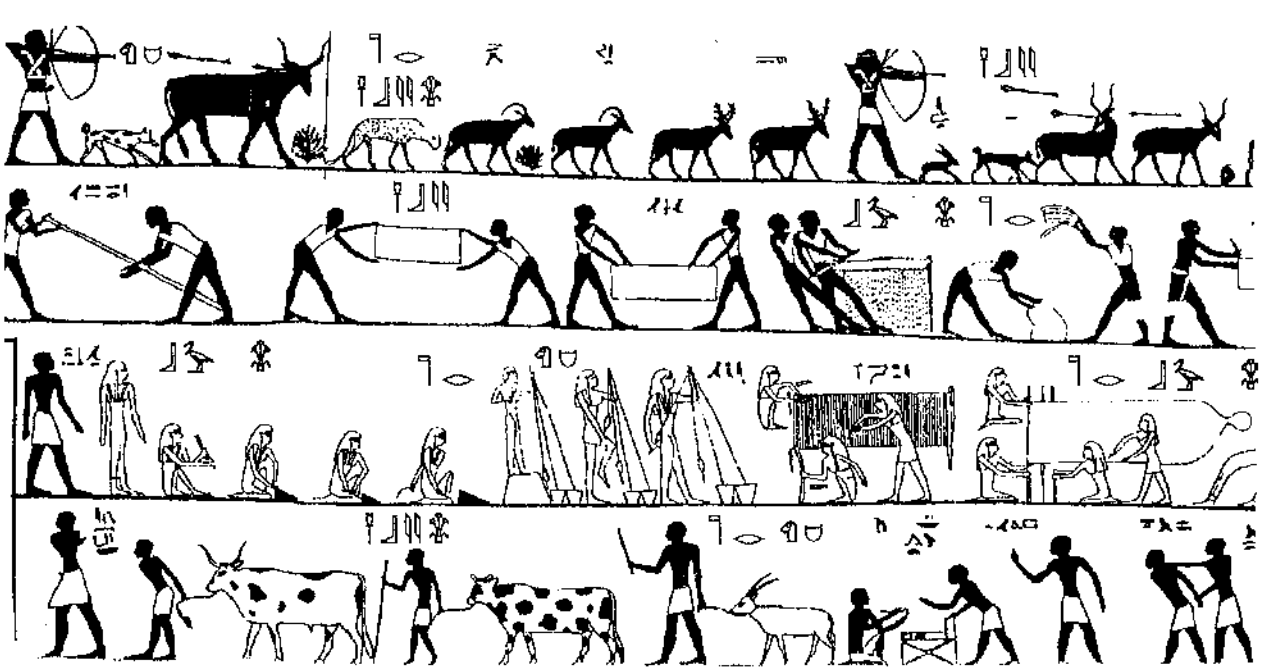
"the divine", "Goddess"

"panther of Lower Egypt"

"panther" (leopard or cheetah)

"panther of Lower Egypt" or +





CHAPTER III

ENGLISH

ENGLISH

OBJECTIVES

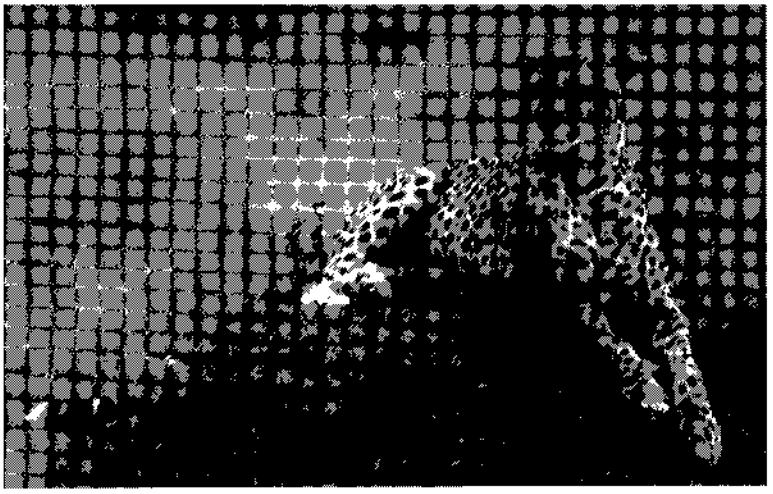
1. To develop skills in reading comprehension, composition and essay- writing, note-taking, and public speaking and listening;
2. To expand vocabulary;
3. To improve English grammar; and,
4. To acquire language skills necessary for study in other subjects.

TEACHER'S BACKGROUND

The expression of our relationships with nature is an important way for us to learn more about how we feel toward the natural world and to clarify these relationships. Creative writings, poems, essays, and compositions provide learners with the means to share their attitudes, beliefs, and fears about the environment and the plants and animals with which they share the world. Words and phrases associated with wildlife conservation and environmental issues have implied and emotional connotations as well as literal meanings. Therefore, an understanding of vocabulary words associated with wildlife conservation and the environment is necessary to express these ideas.

Suggested activities in this subject area are focused on the development of communication skills and expansion of the students' vocabularies. Composition topics are designed to encourage students to explore their relationships with the natural world, understand their responsibilities as stewards of the land, and appreciate the importance of predators in their societies.

The vocabulary list used in these activities is located in the section CHEETAH FACTS. Educators and students may wish to review the reference materials within this section in order to provide background information for essays and compositions.



ACTIVITY SHEET 1 WRITING EXERCISES

Activities:

1. Write down all the adjectives your class can think of to describe a cheetah. Have each student write a poem or short paragraph using 10 to 15 of these words.

2. Have your students write a short story or poem about predators, their habitats, and/or threats to their survival. Have your students read the poems and stories to the class.

   One simple poem form to try is a cinquain (pronounced sing-Kane). A cinquain is a five-line poem or stanza that will help students describe a cheetah or other predator in a few words.

Cinquain Form

Line 1 _____
Animal Name

Line 2 _____ _____
Two words that describe the animal

Line 3 _____ _____ _____
Three action words or words expressing one action

Line 4 _____ _____ _____ _____
Four-word phrase that tells how or what the poet feels about the animal

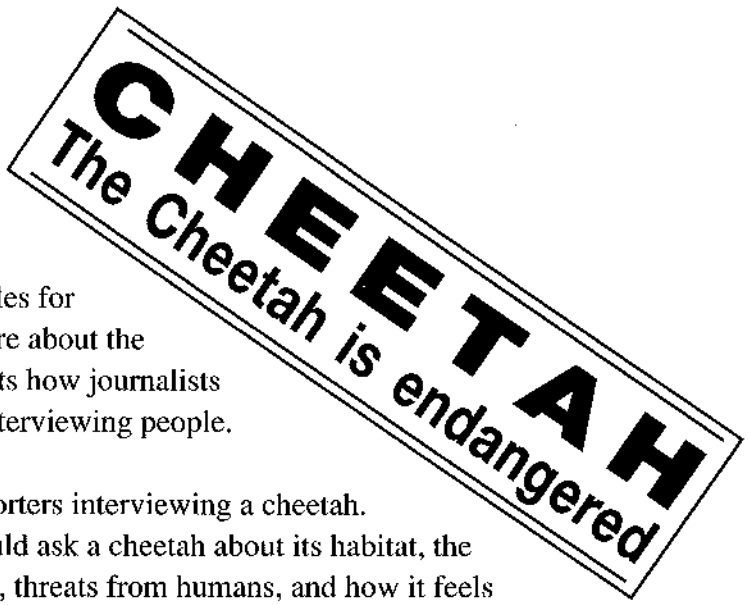
Line 5 _____
Word that sums up the animal

Example of Cinquain

Cheetah
Spotted Sphinx
Swift African Hunter
The cat that cries
Unique

3. Read to your class or have your students read the story in Work Sheet 1"How the Cheetah Got Its Spots." Answer the questions at the end of the story.

4. What Namibian folk tales involving the cheetah or other predators do you know? Students can collect traditional stories by talking with elders and storytellers in their community. You can divide the stories into categories depending on their content. Build a library and share these stories with teachers and learners from other regions. Send copies of myths, stories, and sayings to the Cheetah Conservation Fund (CCF).



5. CHAT WITH A CHEETAH

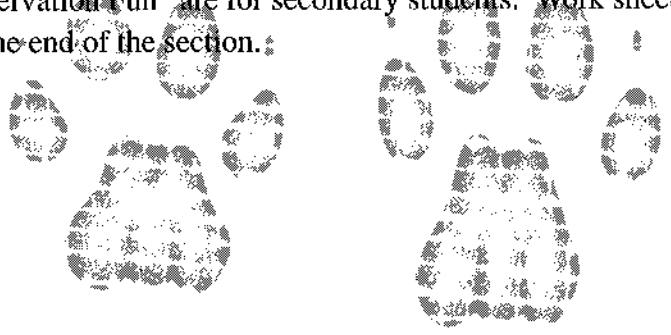
By interviewing people and writing articles for newspapers and magazines, we learn more about the world around us. Explain to your students how journalists find out information about subjects by interviewing people.

Have your students imagine they are reporters interviewing a cheetah. Write down questions that a reporter would ask a cheetah about its habitat, the food it likes to eat, fears about extinction, threats from humans, and how it feels about the misconceptions humans have of its species.

Then have the students take turns interviewing and being interviewed. While they are being interviewed they will play the role of a cheetah and answer questions about their behaviours, habitats, adaptations, and other interesting topics. As the interviewer asking the questions, your student can learn more about a particular aspect of the cheetah and its lifestyle. You may want to expand interviews to include other predators, prey species, farmers, and wildlife managers. Allow time for students to research the cheetah; encourage the use of reference materials, contact with nongovernment organisations, and government officials. As interviewers they should take notes just like a journalist. After taking turns interviewing and being interviewed, have your students write articles for newspapers and magazines, draw illustrations, and then publish a cheetah magazine. Send copies of the newspaper to CCF for possible publication in our international newsletter.

6. Have your students learn the vocabulary words found in the section of this packet entitled CHEETAH FACTS and use them in a sentence. For words that may be used as verbs or nouns, ask students to write two sentences using the words in both forms.

7. Complete Work Sheet 2 "Cheetah Challenge One" and Work Sheet 3 "Cheetah Challenge Two" crossword puzzles, and Work Sheet 4 "Cheetah Cuisine" and Work Sheet 5 "Cheetah Conservation Fun" word searches. "Cheetah Challenge One" and "Cheetah Cuisine" are designed for primary students. "Cheetah Challenge Two" and "Cheetah Conservation Fun" are for secondary students. Work sheets and answer keys are located at the end of the section.



ACTIVITY SHEET 2 COMPOSITION TOPICS

Activities:

1. Have your students write a composition about a cheetah's or another predator's perspective on people.

2. Why should we save cheetahs and predators for the future? Consider some of the following points.

   (a) Aesthetic value -- beauty and uniqueness of species.

   (b) Ethical/Moral value — humans have been responsible for the extinction of many species. Plants, insects, animals, and fungi are each unique and represent millions of years of evolution, but humans can destroy these species in a short time. Because we have caused many problems for these species and threatened their survival, we are obligated to help endangered species recover.

   (c) Ecological value — all living organisms fulfil a unique part of delicate, natural systems; humans depend on animals and plants for survival in ways we do not fully understand. Besides their role as food sources, organisms break down wastes and return elements to the system. Without these elements, life on earth would eventually end. The future of our planet is dependent on this important role of plants and animals.

   (d) Scientific value— wildlife contributes to human health through medicine, medical research, etc. By destroying plant and animal habitats, we risk an immeasurable loss. The possible benefits to humans could compensate for the cost of their conservation.

   (e) Economic value — income can be generated from utilising wildlife in a sustainable manner. Some say that the best way to save wildlife is to make it pay for itself. What are the good and bad points of this argument? Sustainable utilisation requires sound management and planning. Utilising wild species or developing tourism in wild areas can bring new sources of income to people trying to improve their standards of living and is one reason for preserving wildlife.

3. The following are some famous quotes concerning wildlife conservation and species extinction. You may want to have your students memorize a few or write an essay or composition using the quote as the thesis.

It is also true that when there is no wildlife left in the land the rain does not come...Because wild animals are God's animals, if He looks down and sees the animals under the trees without food, He will send rain.

—Herero/Himba belief

Never kill the cat that cries.

—Owambo saying

When the sky has been swept clean of eagles
And the winds carry echoes of the past,
What will you answer when the children ask,
'Where are the animals? Did you see them go?'

—Tom Knothe

What is man without beasts? If all the beasts were gone, man would die from great loneliness of spirit, for whatever happens to the beasts also happens to man. All things are connected.

—Chief Seattle

Destroyed buildings can be rebuilt; destroyed works of art may possibly be replaced by new creations; but every animal and every flower which becomes extinct is lost forever in the most absolute of all deaths.

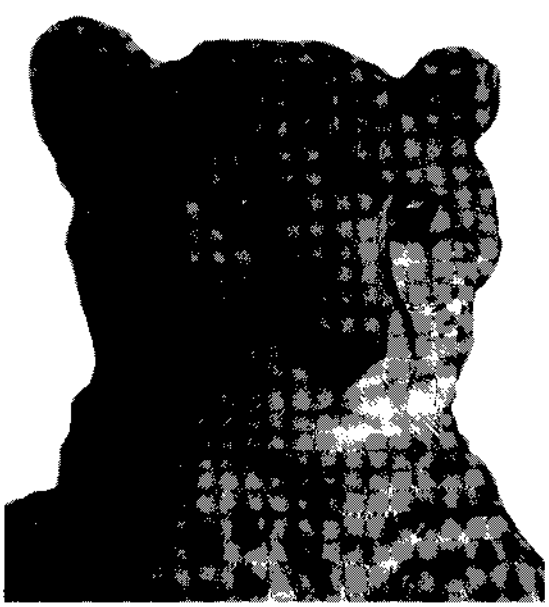
—Joseph Wood Krutch

...everyone shares a deep need for meaning. Everyone wants to know where he or she belongs, how he or she fits into the world. I am convinced that some of the essential answers can and must come from the source that shaped our origins and still underpins our lives: nature.

As we work to reinforce connections in the environment, so we build connections of our own. As we care for natural communities, so we strengthen our own communities' sense of well-being. As we heal the living world around us, so the healing begins inside. All this, too, is part of biodiversity. What I don't understand is why the hope held out by environmentalism has not captured more attention...Here, in plain sight, is a means of restoring a sense of wholeness.

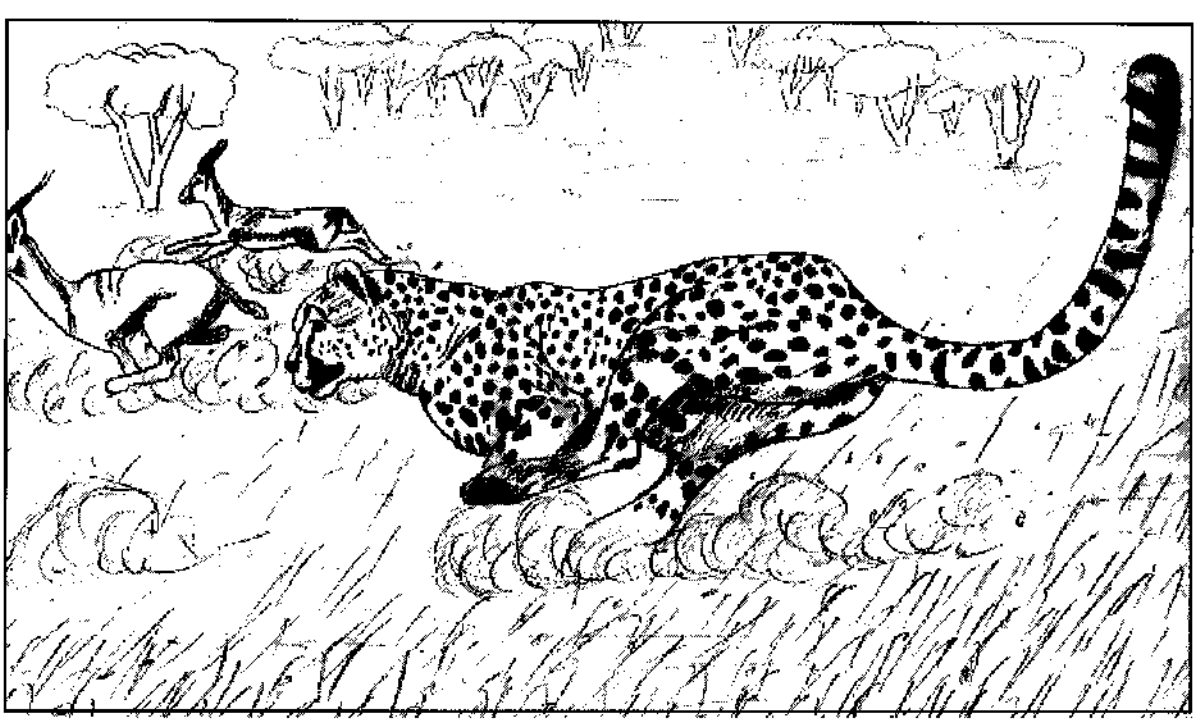
—Douglas Chadwick

4. The management of natural resources to provide for future generations requires long-term planning; otherwise, animals that are endangered today may be extinct by the time our children or grandchildren are adults. While we may have legal ownership of some resources, for example wildlife and real estate, and control of their use during our lifetimes, ethically we are not the owners of these resources, but rather stewards for future generations. As stewards of the Namibian environment, how will you provide a future for predators and other wildlife on commercial farmlands and in rural areas?



ACTIVITY SHEET 3 PROJECT TOPICS ON THE CHEETAH

1. History of the Cheetah in Namibia
2. The Role of the Cheetah in a Healthy Ecosystem
3. The Breeding of Cheetahs in Captivity
4. The Importance of the Cheetah in Ancient Egypt
5. An Animal Built for Speed: Specialisations that Make the Cheetah the Fastest Land Animal on Earth
6. Will the Cheetah Survive in the Year 2025?
7. Endangered Species or Vermin?
8. Cheetahs of Iran, East Africa, and Southern Africa
9. Cheetahs and Humans: 5,000 Years of Friendship
10. Social Behaviour and Hunting Style of the Cheetah
11. Cheetah Conservation: What Can We Do to Save the Cheetah?



ACTIVITY SHEET 4 CONSERVATION ACTIVITIES

1. Collect newspaper articles about wildlife conservation problems in your community.

2. Write a letter to students in other countries or at other schools asking them about the wildlife in their area and what their government has done to help protect wild species. Share with them your favourite animal and why you think protecting the environment and that species is important.

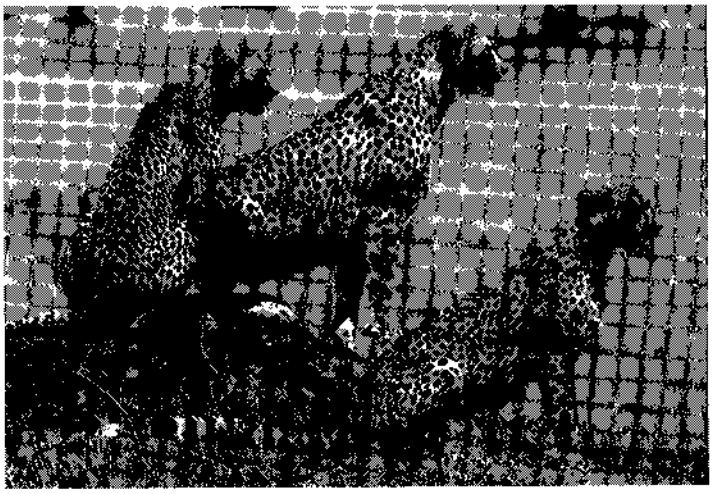
3. Start a sister-school exchange program with a school in another country. Contact the Cheetah Conservation Fund for more information.

4. Write letters to non-governmental conservation organizations that work on issues in their country as well as others. These groups pursue a variety of approaches, including biological research, training of foreign scientists and wildlife managers, and development of legislation.

5. What environmental problems do you think are the most important and affect the community where you live? In Namibia? What can you do as an individual to solve these problems? What can the Government of Namibia do?

6. Assume that you have been elected to the National Assembly. Propose a wildlife management program that would be helpful to your community. Or assume you are a farmer having problems with livestock loss to predators. What non-lethal management practices can you use to reduce livestock loss to predators.

7. Write letters to His Excellency, Dr. Sam Nujoma; members of the National Assembly and National Council; the Minister of Environment and Tourism; and the Minister of Agriculture thanking them for their commitment to protect Namibia's environment and encouraging them to maintain Namibia's cheetah population for future generations. Ask them how you can help or be involved in the conservation of endangered or threatened species. Share with them your ideas on how to protect Namibia's fragile environment and how to reduce predator/human conflicts.

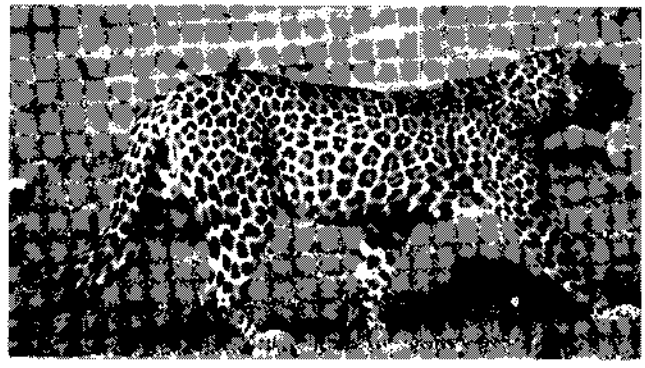


WORKSHEET 1 HOW THE CHEETAH GOT ITS SPOTS

Stories are important tools for learning. They teach us about our past and share how we feel about our world. This story is based on an African tale on how the cheetah got its spots. Words underlined in the text are listed on the vocabulary list at the end of the story.

One day two children, Moffet and Elisabeth, were walking in the bush. In the distance they saw a water hole where three big cats were drinking. In order to get a better look at the animals, they tried to approach the water hole. As soon as they stepped closer, the predators saw the two children and ran away.

Leopard



Elisabeth said, "Moffet, did you see how fast those cheetahs ran? And how well their coats concealed them in the thick bush?"

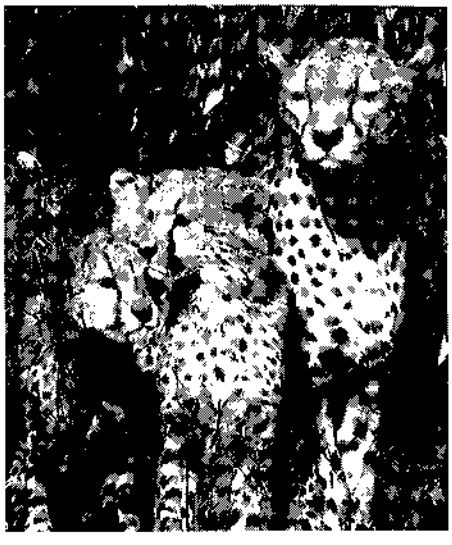
"Those were not cheetahs," Moffet exclaimed, "they were leopards! You better stay away from them, they are very strong animals."

The two argued all the way back to their village. Elisabeth was sure the three cats were cheetahs. Moffet insisted they were leopards. The two children decided to speak with the headman to find out about cheetahs and leopards. Hopefully, he could help put an end to their argument.

The headman, a wise old man, wanted to help the two children. He asked Moffet and Elisabeth about the animals at the water hole. Elisabeth described them in great detail.

"The bodies of the three cats were slender with long legs. Their coats were the colour of dry grass and black spots covered their bodies. Their heads were small and they seemed to be crying. When we approached them, they sprinted away, running faster than any animal I have ever seen."

Cheetahs



"Crying?" exclaimed Moffet, "They were not crying."

The headman, being very wise, asked, "Why do you think they were crying, Elisabeth?"

Elisabeth answered, "Because, wise headman, the long black lines on their faces looked like tear marks."

Moffet agreed with her description of the animals. But, he thought "tear marks" was a silly way to describe the black lines. The headman told the children that they had seen three cheetahs drinking at the water hole. Elisabeth could not help saying, "I told you so, Moffet."

The headman continued, "The cheetah is one of the most unique animals found on this earth.

Thousands of years ago, we could find cheetahs throughout the world; in North America, Asia, Europe, and of course, Africa. There were a great many cheetahs all over Africa. Today, the populations have declined because people feared big cats and hunters killed cheetahs for their beautiful skins."

"Where do most of the cheetahs live?" Elisabeth wondered.

"Namibia is the cheetah capital of the world; it has more cheetah than any other country in Africa. Even here, our cheetahs are becoming less and less. Humans and cheetahs live on the same land. Most humans do not want to share the land with the cheetah. Farmers remove cheetahs from their land if they think the cheetahs are eating their young livestock. And people kill cheetahs even when the cats are not eating livestock."

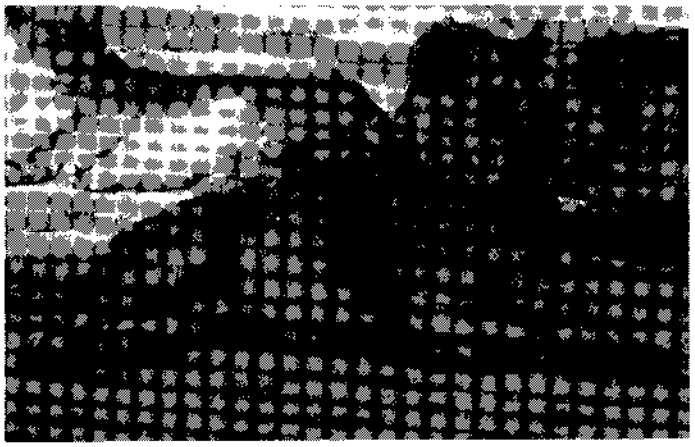
"Cheetahs are beautiful animals. It seems wrong to kill them out of fear," Moffet said. "Headman, could you tell us how the cheetahs that Elisabeth and I saw at the water hole got their spots."

"I will be happy to tell you how the cheetah got its spots," the headman said. And this is his story:

A very long time ago when the earth was first created, all the animals came down onto the savannah. The animals, birds, and insects were all different shapes and different colours. When the cheetah first came to earth, just like all the other animals, it shook its body and stretched its legs, and took a deep breath of the new clean air. The cheetah thought it felt very good to be alive. Each animal had to get used to its own body, so the cheetah started running and found out that it could run very very fast.

The cheetah ran and ran across the vast plains of the world. After a time of wandering the plains alone, the cheetah became lonely and decided to look for friends of its own kind. One day, the cheetah, with its great eyesight, spotted some large cats off in the distance and eagerly went running as fast as she could toward these cats. As she was running toward them, one of the cats, which was much much larger than the others, stood up and roared. The loud noise frightened the cheetah and she dug her claws into the dirt and came to an abrupt halt. The cat was a big male lion, and he roared out to the cheetah in a very low booming voice, "Who are you and what do you want?"

Lions



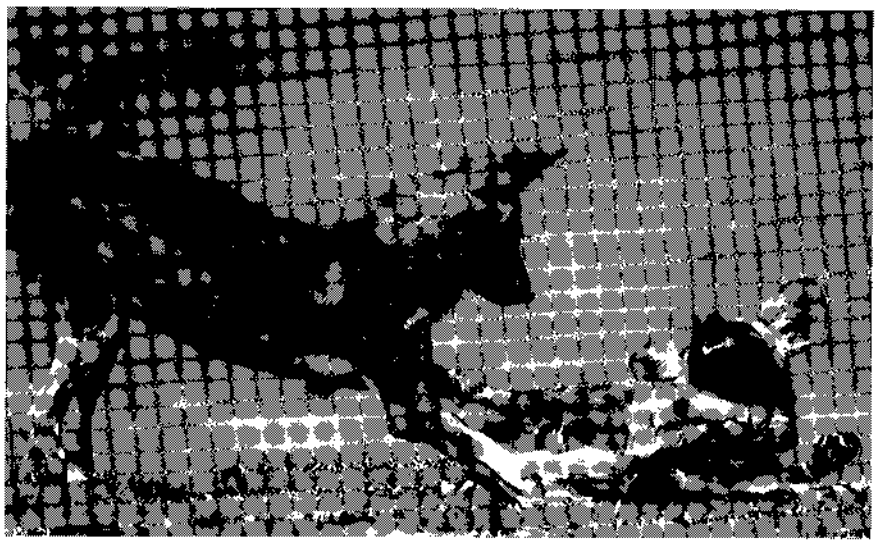
The cheetah, which is much smaller in size than a lion and who by nature is a

very shy and timid animal, said, "I am lonely and have been searching the savannah trying to find friends of my own kind."

The lion roared, "Well, you are not a lion! Look at your legs and body, you are much thinner than we are. And look at your feet, you have claws like a dog's. Your claws do not retract all the way back into your feet like ours do. You are not a cat, you are a dog. So, you better run away fast and try to find someone in your own family."

The cheetah lowered her head and put her tail down, and crept away feeling a bit discouraged. She thought big cats were very unfriendly. The cheetah continued her search looking for a friend of her own kind. The days went by. Then one day, the cheetah saw a pack of wild dogs playing in the sun. The cheetah went racing up to the pack. The whole pack was yelping and barking furiously. The cheetah stopped immediately, and the pack leader yelped at her, "Who are you and what do you want?"

African Wild Dogs



The cheetah began to tell the wild dogs her story about trying to find a family of her own. During her search, she was scared by a lion and saddened when he told her that the cheetah was not a cat but a dog. The whole pack of wild dogs howled in laughter, and barked at her, "You are not a dog at all. Look at your round head and ears, and your rough tongue. They are like a cat's. Your tail is long just like other cats. You are not a dog at all!" The pack chased the cheetah off, biting at her heels.

This time the cheetah raced away very fast because she was scared. After running a safe distance from the dogs, the cheetah laid down to rest under a big camel thorn tree. She felt sad. She thought about how the lion roared and did not want her, and how the wild dogs yelped and bit at her feet, and she felt sadder and sadder. The cheetah felt so sad that she started to cry. She was very lonely.

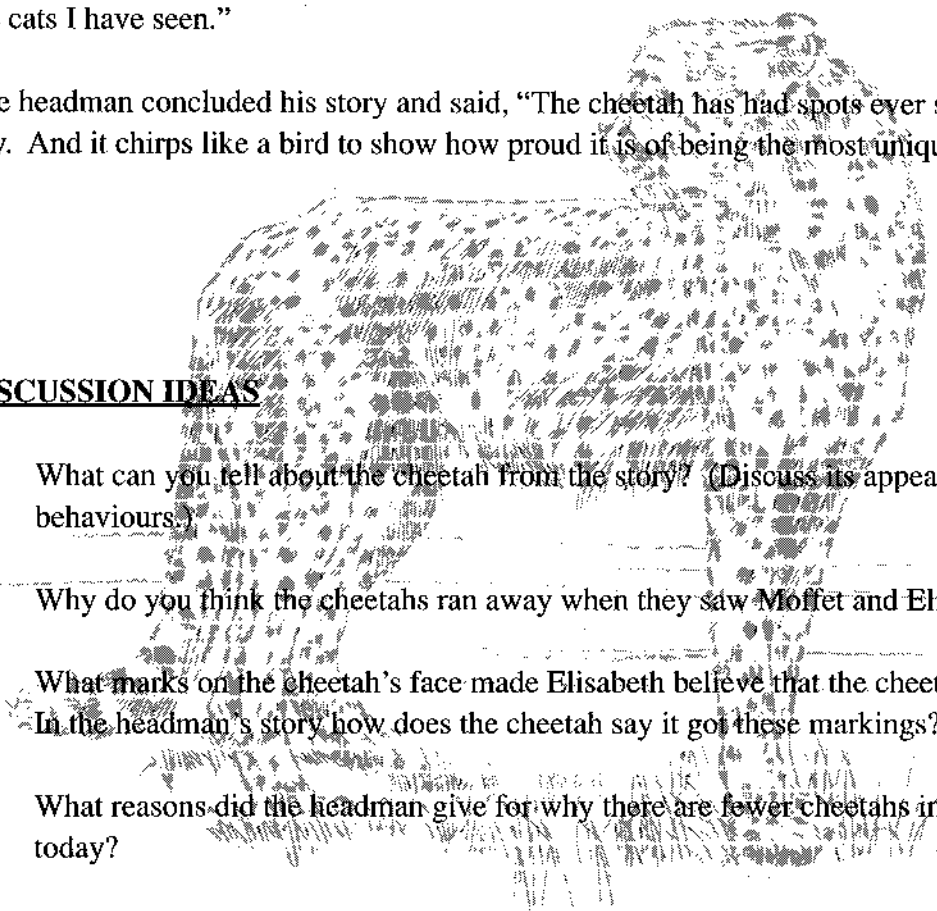
The cheetah did not realize that any other animals were near her. A giraffe had walked up quietly while the cheetah was crying. The giraffe, looking down at the cheetah with its big brown eyes, asked, "Why are you crying?" The cheetah was very surprised when the giraffe spoke. The cheetah looked up tearfully at the giraffe and proceeded to tell her sad story about the lions roaring and telling her she was not a cat, and the wild dogs chasing her and saying she was not a dog.

Sniffling, the cheetah said, "I have been sitting here crying, and I have cried so long and so hard. Look at my beautiful face, the tears have burnt marks in my face."

The giraffe, hearing the cheetah's story, also began to cry. And the giraffe's tears fell so far that they burnt spots in the cheetah's coat.

A bird, which was flying by the camel thorn tree, saw the beautiful cheetah and chirped, "I have travelled throughout this land. And you, cheetah, are the most splendid and unique of all the cats I have seen."

The headman concluded his story and said, "The cheetah has had spots ever since that lonely day. And it chirps like a bird to show how proud it is of being the most unique of all cats."



DISCUSSION IDEAS

1. What can you tell about the cheetah from the story? (Discuss its appearance and behaviours.)

2. Why do you think the cheetahs ran away when they saw Moffet and Elisabeth?

3. What marks on the cheetah's face made Elisabeth believe that the cheetah was crying? In the headman's story how does the cheetah say it got these markings?

4. What reasons did the headman give for why there are fewer cheetahs in the world today?

5. Which country has the most cheetahs in the world? Can you name other countries where cheetahs are found?

6. What characteristics of the cheetah made the lion say that it was a dog? And what features did the wild dog say made the cheetah a cat? Is the cheetah a dog or a cat?

7. What markings of the cheetah help it hide in the dry grass?

8. Why do you think humans are fearful of predators?

WORKSHEET 1 **VOCABULARY LIST**

Abrupt —	sudden
Approach —	to come near or nearer to
Cheetah —	the fastest land mammal on earth; today, it is found only in 26 African countries and Iran (in Asia); the cheetah has a thin body with long legs
Chirp —	a short high-pitched sound, as of a small bird
Conceal —	to hide, to keep from discovering or seeing
Crept —	moved slowly
Describe —	to tell about in detail
Decline —	to become slowly less in number
Frighten —	to make suddenly afraid, cause fear
Leopard —	solitary cat found in Africa and Asia; it is a powerful, stocky cat with muscular limbs and a coat with small black spots and spots in a circle.
Predator —	an animal that hunts and kills another animal for food
Proceed —	to continue on
Realize —	to understand or be aware of
Retractable claws —	nails on an animal's foot (claws) which can be pulled back into the animal's foot
Savannah —	a large treeless area
Species —	a group of animals or plants of the same kind, that give birth to young like themselves. The leopard and cheetah are two different species of cats.
Slender —	thin or lean
Sprint —	to run very fast; a short run at top speed
Surprise —	to occur without warning, something that is not expected
Timid —	shy, fearful
Wise —	having knowledge, knowing much information
Yelp —	a short bark or cry

DISCUSSION QUESTIONS

1. What can you tell about the cheetah from the story? (Discuss its appearance and behaviours.)

Cheetahs are slender with long legs. Their fur is tan or "the colour of dry grass," and black spots cover their bodies, which camouflage them in the Namibian bush. They have a small head with black "tear marks," which run from the corner of the eyes down the sides of the nose to its mouth. The cheetah's claws are semi-retractable, and its feet look more like a dog's than a cat's. The cheetah's tongue is rough so that the cat can remove meat from bones, and it has small teeth. The cheetah has a long tail, which helps it when running. The cheetah also sounds like a bird when it chirps. While the cheetah sounds like a bird and has feet like a dog, it is really a cat!

The cheetah is a shy animal and will avoid humans. Female cheetahs live alone except when they are raising cubs. Male cheetahs live alone or in groups made up of brothers from the same litter. Elizabeth and Moffet either saw three brothers or a female with two juvenile (young) cheetahs, which were her cubs.

The cheetah can run very fast. In fact, it is the fastest land mammal — it can run 100 km/h over short distances.

Namibia has more cheetahs than any other country in Africa. About 2,500 cheetahs live in Namibia. Unfortunately, farmers continue to trap and remove cheetahs in Namibia, and this is endangering the species.

2. Why do you think the cheetahs ran away when they saw Moffet and Elizabeth?

Cheetahs are not aggressive animals and they do not pose a threat to humans. The cheetah is a fast animal, but not strong like the leopard or lion, so it will run away when it feels threatened. Evolution has favoured speed and not strength for this species.

3. What marks on the cheetah's face made Elizabeth believe that the cheetah was crying? Tear marks.

In the headman's story how does the cheetah say it got these markings? The cheetah's tears burned the black tear marks onto its face.

4. What reasons did the headman give for why there are fewer cheetahs in the world today?

Farmers and cheetahs live on the same land, and many people do not want to share the land with cheetahs. Farmers remove cheetahs from their land if they think the cheetahs are eating their young livestock. And people kill cheetahs even when the cats are not eating livestock;

this is called "indiscriminate" capture. Fear of predators has caused the endangerment of many species including cheetahs. Trade in skins and live animals has also endangered the species, and in some African countries illegal trade continues to endanger the species.

5. ***Which country in the world has the most cheetahs? Namibia.***

Can you name other countries where cheetahs are found?

Algeria, Angola, Benin, Botswana, Burkina Faso, Central African Republic, Cameroon, Chad, Ethiopia, Iran, Kenya, Mali, Mauritania, Mozambique, Namibia, Niger, Somalia, South Africa, Sudan, Tanzania, Zaire, Zambia, and Zimbabwe, Egypt, Senegal, Uganda.

6. ***What characteristics of the cheetah made the lion say that it was a dog? Its feet.***

And what features did the wild dog say made the cheetah a cat?
Small rounded head and ears, and a rough tongue.

Is the cheetah a dog or a cat? CAT!

7. ***What markings of the cheetah help it hide in the dry grass?***

Its tan coat and black spots help the cheetah blend, or camouflage, into its environment.

8. ***Why do you think humans are fearful of predators?***

People fear predators for many reasons, but the primary one is that they are carnivores, they eat meat. Because predators must hunt and kill other animals for food, people have many misconceptions about them, such as the belief that cheetahs will kill humans. Have your students discuss whether or not they are scared of predators and why they fear them.

WORKSHEET 1 LANGUAGE STUDY

1. Use the following words or expressions in sentences:

   running faster than
   out of fear
   savannah

2. For the following words, write a word that has the same meaning and a word that has the opposite meaning.

   abrupt
   conceal
   retract
   timid

3. Find three words or phases on the first page that describe the cheetah.

4. Make up the conversation between the cheetah and giraffe as you think it might have sounded.

5. Change the following sentences from the past tense to present tense:

   Moffet, did you see how fast those cheetahs ran? And how well their coats concealed them in the thick bush?

ACTIVITIES

1. Make up your own story or poem of how the cheetah got its spots. Act out the story with your friends. Draw pictures to illustrate your story.

2. Ask elders and community leaders about stories they were told about cheetahs or other predators, their beliefs about the species, or if they have ever seen cheetahs.

3. Tell a story about being kind to animals. Discuss why is it important for humans to conserve animals.

4. Write to environmental groups asking about a specific animal and what you can do to help conserve the species.

5. Learn more about predators and their adaptations and report to the class about what you found. Why do predators play such an important role in ecosystems?

6. Write to His Excellency, Dr. Sam Nujoma, and the Honourable Nico Bessinger, Minister of Environment and Tourism. Thank them for their commitment to protect Namibia's environment and encourage them to maintain Namibia's cheetah population.

7. Write an Animal Cinquain. A cinquain is a five-line oriental poem that will help students describe a cheetah or other predator in a few words.

Cinquain Form

Line 1 _____

Animal Name

Line 2 _____ _____

Two words that describe the animal

Line 3 _____ _____ _____

3 action words or words expressing one action

Line 4 _____ _____ _____ _____

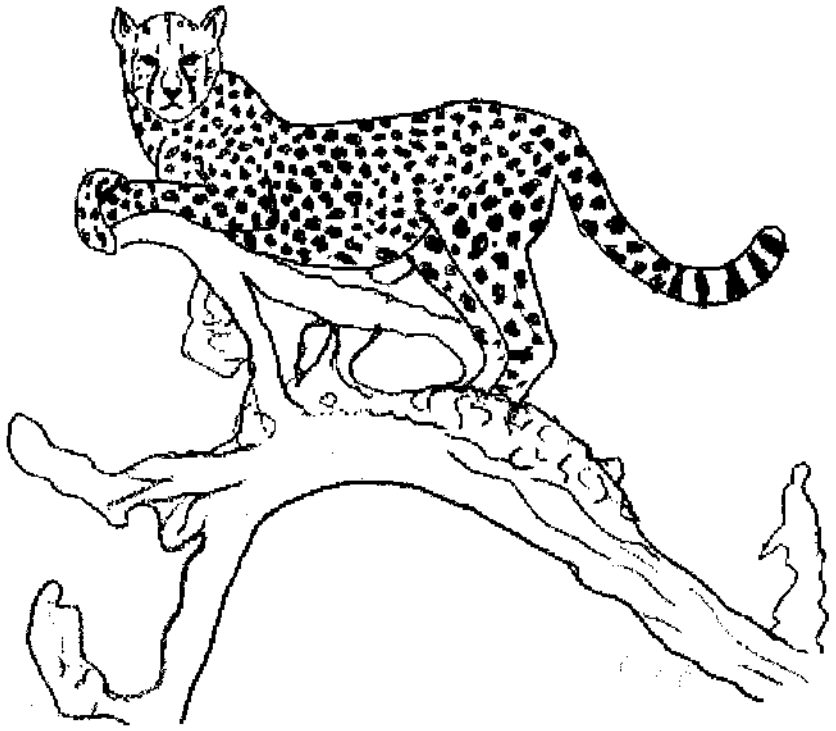
4 word phrase that tells how or what the poet feels about the animal

Line 5 _____

Word that sums up the animal

Example of Cinquain

Cheetah
Spotted Sphinx
Swift African Hunter
The cat that cries
Unique



1. Use the following words or expressions in sentences:
   running faster than
   out of fear
   savannah

   EXAMPLES:

   The cheetah was running faster than a Mercedes.
   People kill carnivores out of fear.
   The savannah is full of wild prey for the cheetah to hunt.

2. **For the following words, write a word that has the same meaning and a word that has the opposite meaning.**

   EXAMPLES:

   abrupt — sudden, hasty, hurried (synonyms)
   gradual, slow (antonyms)
   conceal — hide, mask, camouflage (synonyms)
   expose, reveal (antonyms)
   retract — withdraw, recede, take back (synonyms)
   reveal, expose, bare (antonyms)
   timid — shy, quite, apprehensive (synonyms)
   brave, unafraid, confident (antonyms)

3. **Find three words or phrases on the first page that describe the cheetah.**

   Slender, long legs, coats were the colour of dry grass, they seemed to be crying, long black lines on their faces, tear marks,

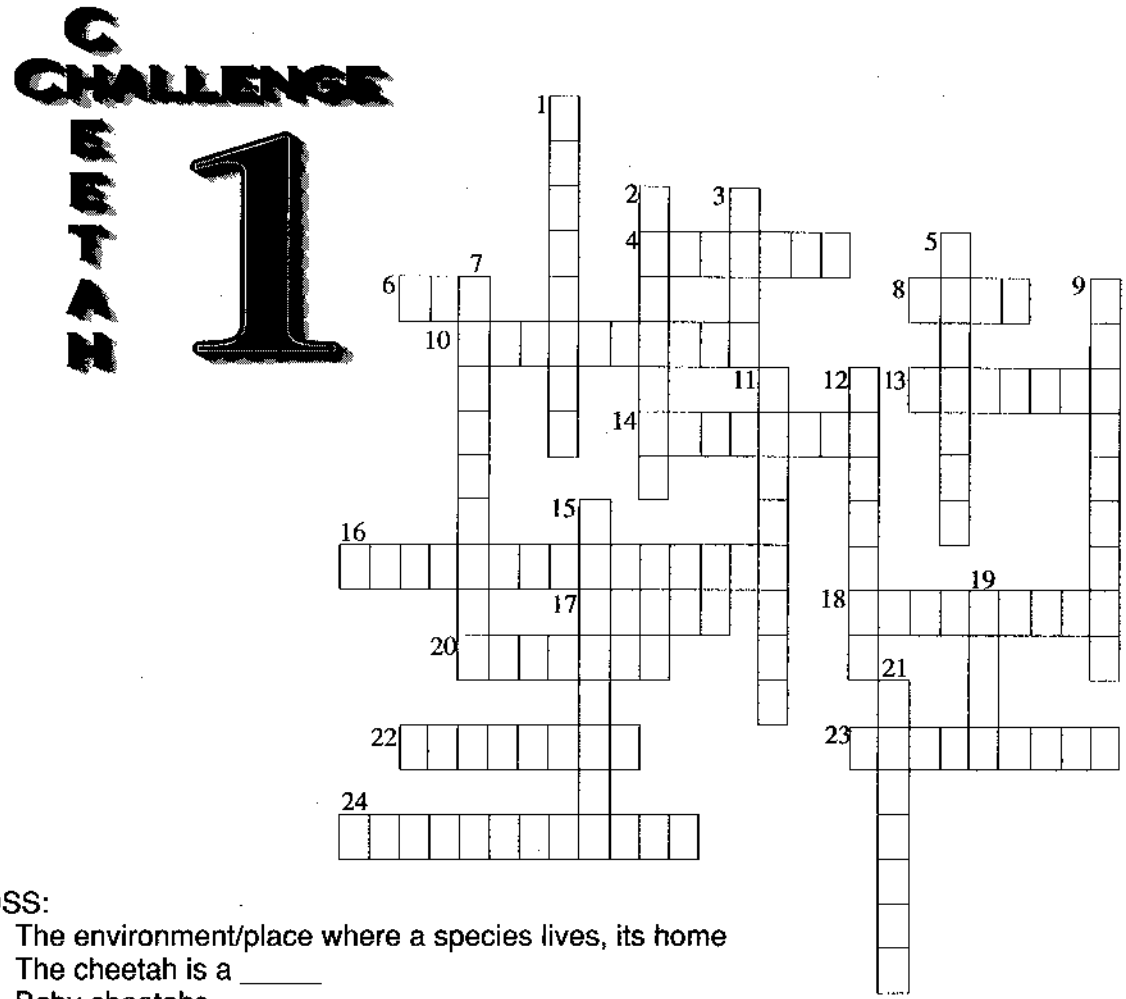
4. **No specific answer to this question.**

5. **Change the following sentences from the past tense to present tense:**

   Moffet, did you see how fast those cheetahs ran? And how well their coats concealed them in the thick bush?

   Moffet, can you see how fast those cheetahs run? And how their coats conceal them in the thick bush.

WORK SHEET 2



ACROSS:

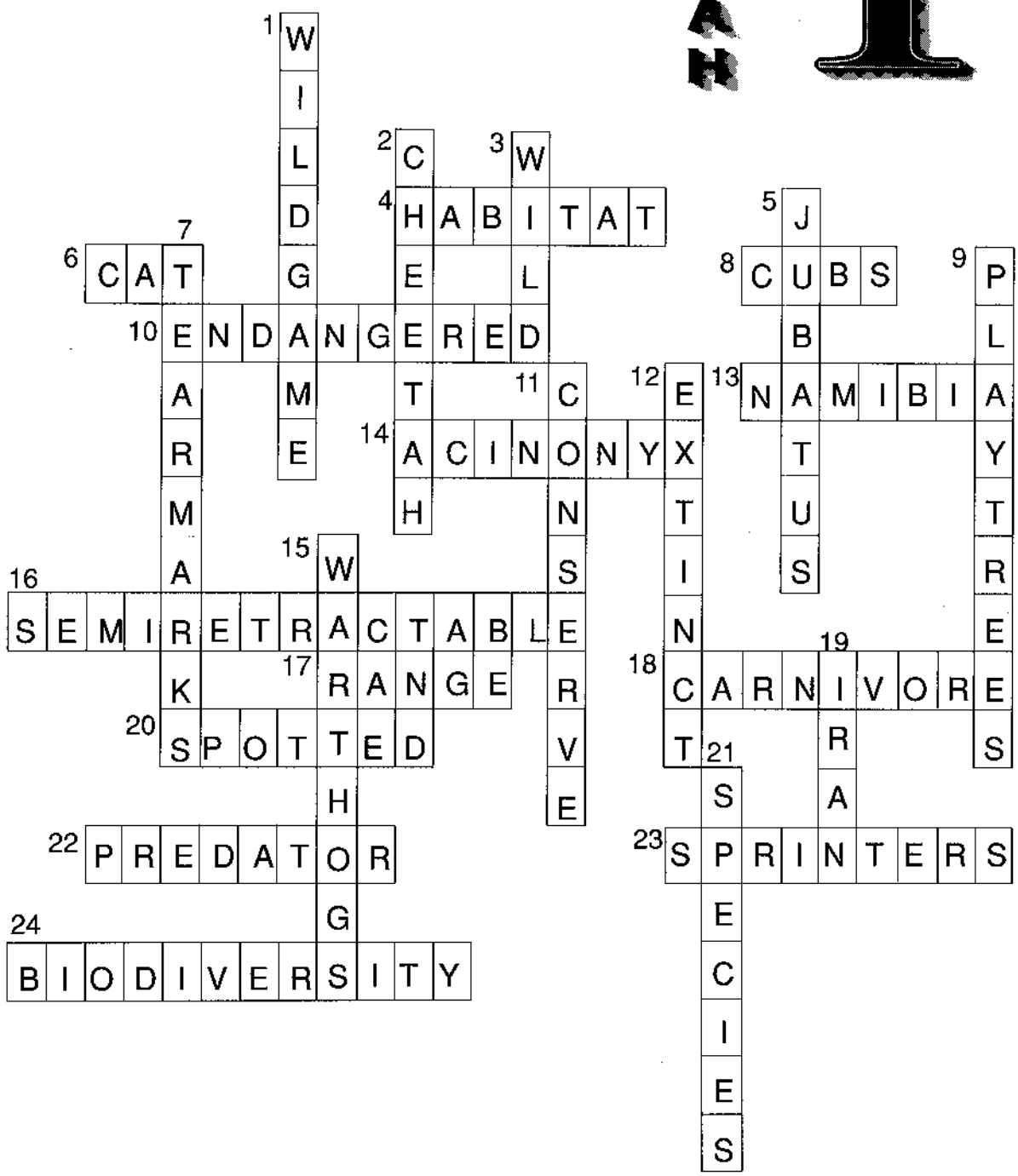
(4) The environment/place where a species lives, its home
(6) The cheetah is a _____
(8) Baby cheetahs
(10) Low population numbers worldwide and a lack of genetic diversity make the cheetah an _____ species
(12) The country with the largest number of cheetahs
(14) The cheetah is the only cat in this genus
(16) The cheetah's claws, unlike other big cats, are _____
(17) The area where an individual species of plant or animal or population lives
(18) A meat eater
(20) The cheetah is also known as the _____ sphinx
(22) An animal that hunts and kills another animal for food
(23) Frankie Fredericks and the cheetah are both _____
(24) The full variety of life on earth and all the processes and interactions that sustain it

DOWN:

(1) Cheetahs prefer _____ to livestock
(2) The world's fastest land mammal
(3) Living in a natural state; not domesticated or tamed
(5) The cheetah is a member of this species
(7) Black lines that run from the corner of the cheetah's eyes down the side of the nose to the corner of its mouth
(9) Trees that cheetahs in Namibia use to mark territories, usually camelthorn trees
(11) To use a resource wisely so as not to overuse it
(12) A species no longer in existence
(15) Tusked animals that the cheetah preys on; bush pigs
(19) Country in Asia where cheetahs are still found
(21) A group of animals or plants of the same kind that reproduce young like themselves; all organisms of the same kind

ANSWER KEY

CHEETAH CHALLENGE 1



WORK SHEET 3

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																		A							U							
						3	G				25				4	C		R				R			B							
		5	S	U	S	T	A	I	N	A	B	L	E			H	6	N	O	N	R	E	N	E	W	A	B	L	E			
					A		M				I					E		I				S			T							
					V		E				O					E		V				O			U							
					A				7	A	D	A	P	T	A	T	I	O	N			U			S							
			8	T	N						I					A		R				R										
				E	N						V					H		E				C	9	A	C	I	N	O	N	Y	X	
			10	R	A	R	E				E							11	G				E	12	C	A	P	T	I	V	E		
				R	H				13	E	R								E				14	M	A	M	M	A	L				
				I			15	C	O	N	S	E	R	V	A	T	I	O	N						O								
				T						D	I								E						U							
17				O						A	T		16	P	R	E	D	A	T	O	R				F							
H	O	M	E	R	A	N	G	E		N	Y								I						L							
				Y						G									C						A							
							18	S	P	E	C	I	E	S					D						G							
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														24	C	A	R	R	Y	I	N	G	C	A	P	A	C	I	T	Y		

Instructions: On a separate sheet of paper, write the phrases or questions that answer the clues on the backwards crossword puzzle.

DOWN:

1. Carnivore — a meat-eating animal.
2. Jubatus — the cheetah's genus.
3. Game — legal designation for animals that may be hunted.
4. Cheetah — a long-legged, swift-running spotted African cat.
8. Territory — the area of land in which an animal lives and defends.
11. Genetic Diversity — the variety of genes in an organism or a population.
13. Endangered — in immediate danger of becoming extinct.
22. Prey — an animal caught by another for food; food for a predator.
25. Biodiversity — the full variety of life on earth and all the processes and interactions that sustain it.

ACROSS:

5. Sustainable — use of species in a way and at a rate that does not lead to the long-term decline of biological diversity.
6. Nonrenewable — a resource that cannot be restored or renewed.
7. Adaptation — changes in a structure, behaviour, or body function, which helps an animal or plant exist in its environment.
9. Acinonyx — the genus of the cheetah.
10. Rare — a species not currently in danger of extinction, but of concern because of low numbers.
12. Captive — any animal that lives inside a zoo or is kept as a pet.
14. Mammal — an animal that has hair on its body and is warm-blooded; most species bear live young instead of laying eggs. The young get milk from their mother's body until they are old enough to find food on their own.
15. Conservation — protecting the environment and wild species.
16. Predator — an animal that hunts and kills other animals for food.
17. Home range — the area where an animal roams during its normal activities; different than an animal's territory.
18. Species — a group of animals of plants of the same kind that reproduce young like themselves.
19. Wildlife — animals that are not tamed or domesticated.
20. Felidae — the scientific name for the family of animals that includes all cats.
21. Extinct — no longer found on the earth, no longer living, gone.
23. Threatened — a species decreasing in numbers and range, which may become endangered if not helped
24. Carrying capacity — the amount of living matter that can be supported by an area.

WORKSHEET 4 **CHEETAH CUISINE**

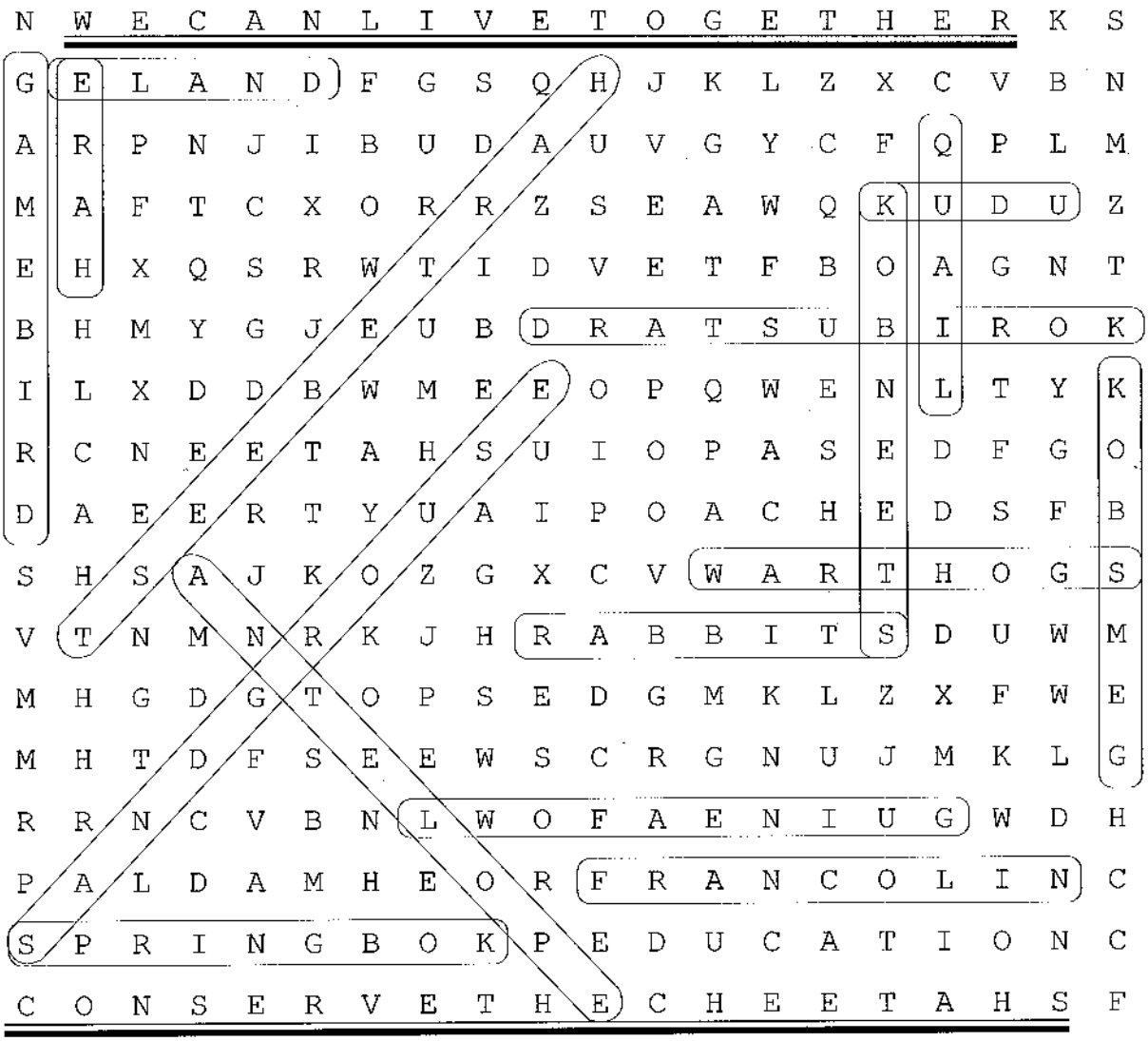
WORD SEARCH

Cheetahs are predators and carnivores just like you! How many of the cheetah's favourite foods can you find in this word puzzle? Words go up and down, diagonally, and even backwards. Try to find each animal that the cheetah preys on in the list below. Can you find two secret messages?

Antelope
Eland
Gemsbok
Hartebeest
Kudu
Springbok
Steenbok
Hare
Warthogs
Game Birds
Francolin
Guineafowl
Kori Bustard
Quail
Sandgrouse

N W E C A N L I V E T O G E T H E R K S
G E L A N D F G S Q H J K L Z X C V B N
A R P N J I B U D A U V G Y C F Q P L M
M A F T C X O R R Z S E A W Q K U D U Z
E H X Q S R W T I D V E T F B O A G N T
B H M Y G J E U B D R A T S U B I R O K
I L X D D B W M E E O P Q W E N L T Y K
R C N E E T A H S U I O P A S E D F G O
D A E E R T Y U A I P O A C H E D S F B
S H S A J K O Z G X C V W A R T H O G S
V T N M N R K J H R A B B I T S D U W M
M H G D G T O P S E D G M K L Z X F W E
M H T D F S E E W S C R G N U J M K L G
R R N C V B N L W O F A E N I U G W D H
P A L D A M H E O R F R A N C O L I N C
S P R I N G B O K P E D U C A T I O N C
C O N S E R V E T H E C H E E T A H S F

ANSWER KEY CHEETAH CUISINE



Messages: We Can Live Together
Conserve the Cheetahs

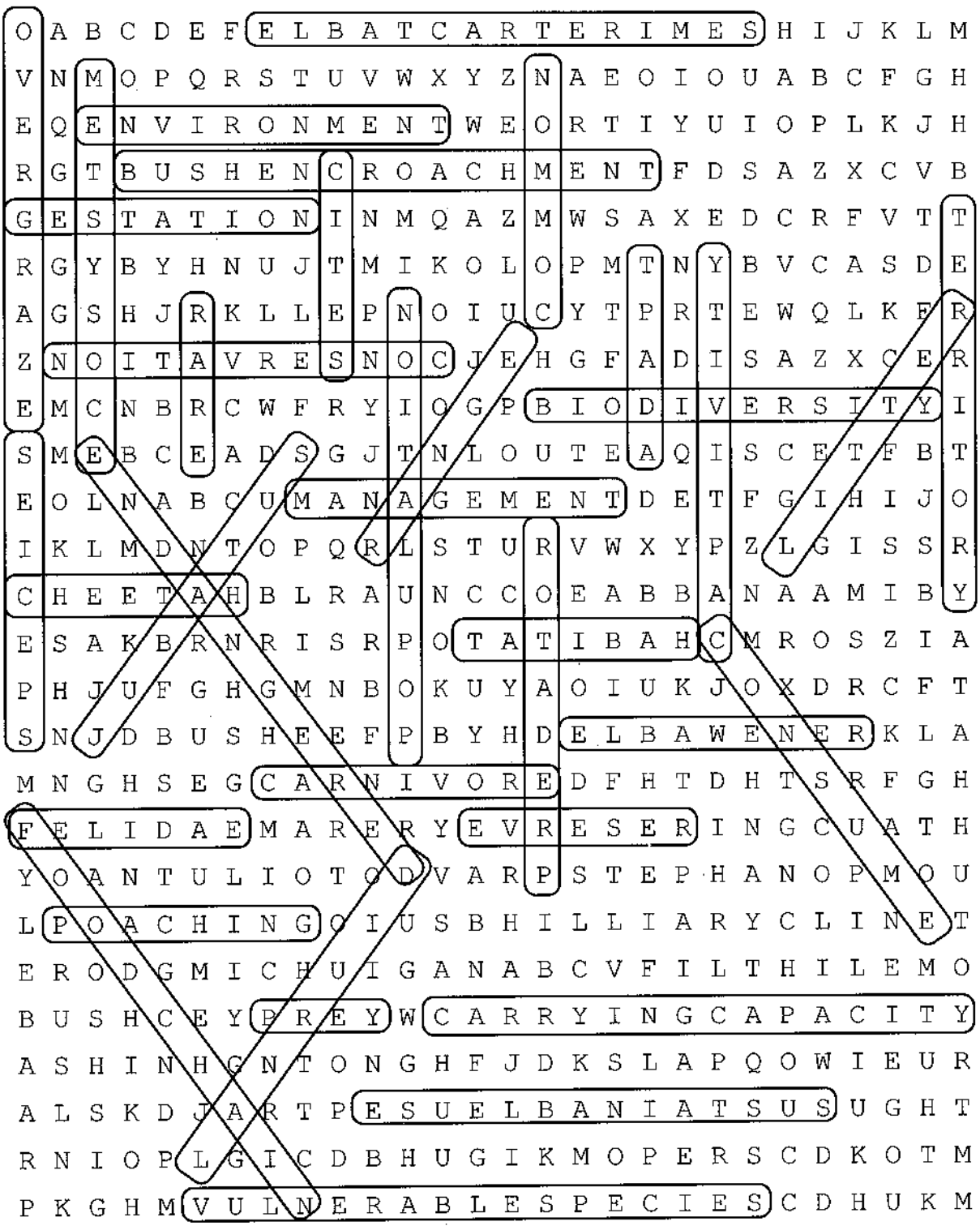
WORK SHEET 5 CHEETAH CONSERVATION FUN

WORD SEARCH

How many of the cheetah conservation words can you find? Words go up and down, diagonally, and even backwards.

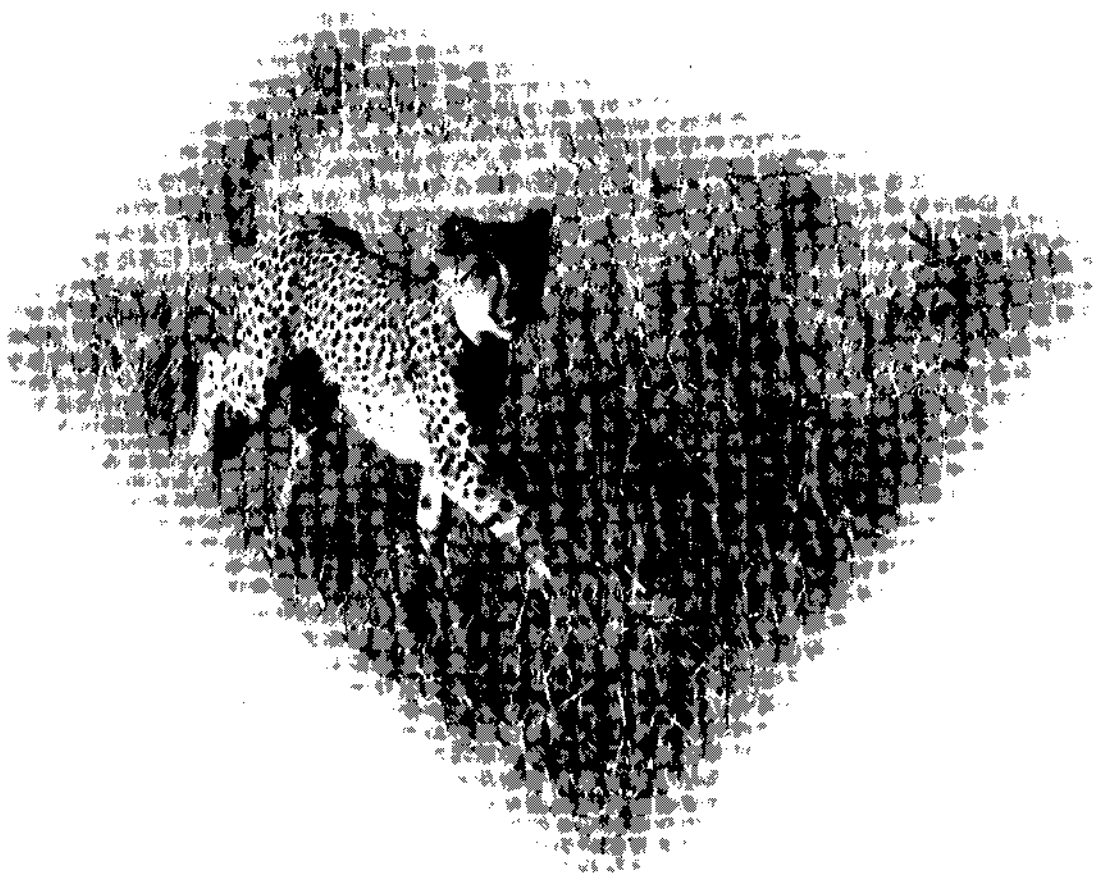
Adapt
Biodiversity
Bush Encroachment
Captivity
Carnivore
Carrying Capacity
Cheetah
CITES
Common
Conservation
Consume
Diurnal
Ecosystem
Endangered
Environment
Felidae
Food Chain
Gestation
Habitat
Jubatus
Management
Litter
Overgraze
Poaching
Population
Predator
Prey
Range
Rare
Renewable
Reserve
Semi-retractable
Species
Sustainable Use
Territory
Vulnerable Species

O A B C D E F E L B A T C A R T E R I M E S H I J K L M
V N M O P Q R S T U V W X Y Z N A E O I O U A B C F G H
E Q E N V I R O N M E N T W E O R T I Y U I O P L K J H
R G T B U S H E N C R O A C H M E N T F D S A Z X C V B
G E S T A T I O N I N M Q A Z M W S A X E D C R F V T T
R G Y B Y H N U J T M I K O L O P M T N Y B V C A S D E
A G S H J R K L L E P N O I U C Y T P R T E W Q L K F R
Z N O I T A V R E S N O C J E H G F A D I S A Z X C E R
E M C N B R C W F R Y I O G P B I O D I V E R S I T Y I
S M E B C E A D S G J T N L O U T E A Q I S C E T F B T
E O L N A B C U M A N A G E M E N T D E T F G I H I J O
I K L M D N T O P Q R L S T U R V W X Y P Z L G I S S R
C H E E T A H B L R A U N C C O E A B B A N A A M I B Y
E S A K B R N R I S R P O T A T I B A H C M R O S Z I A
P H J U F G H G M N B O K U Y A O I U K J O X D R C F T
S N J D B U S H E E F P B Y H D E L B A W E N E R K L A
M N G H S E G C A R N I V O R E D F H T D H T S R F G H
F E L I D A E M A R E R Y E V R E S E R I N G C U A T H
Y O A N T U L I O T O D V A R P S T E P H A N O P M O U
L P O A C H I N G O I U S B H I L L I A R Y C L I N E T
E R O D G M I C H U I G A N A B C V F I L T H I L E M O
B U S H C E Y P R E Y W C A R R Y I N G C A P A C I T Y
A S H I N H G N T O N G H F J D K S L A P Q O W I E U R
A L S K D J A R T P E S U E L B A N I A T S U S U G H T
R N I O P L G I C D B H U G I K M O P E R S C D K O T M
P K G H M V U L N E R A B L E S P E C I E S C D H U K M


O A B C D E F E L B A T C A R T E R I M E S H I J K L M
V N M O P Q R S T U V W X Y Z N A E O I O U A B C F G H
E Q E N V I R O N M E N T W E O R T I Y U I O P L K J H
R G T B U S H E N C R O A C H M E N T F D S A Z X C V B
G E S T A T I O N I N M Q A Z M W S A X E D C R F V T T
R G Y B Y H N U J T M I K O L O P M T N Y B V C A S D E
A G S H J R K L L E P N O I U C Y T P R T E W Q L K E R
Z N O I T A V R E S N O C J E H G F A D I S A Z X C E R
E M C N B R C W F R Y I O G P B I O D I V E R S I T Y I
S M E B C E A D S G J T N L O U T E A Q I S C E T F B T
E O L N A B C U M A N A G E M E N T D E T F G I H I J O
I K L M D N T O P Q R L S T U R V W X Y P Z L G I S S R
C H E E T A H B L R A U N C C O E A B B A N A A M I B Y
E S A K B R N R I S R P O T A T I B A H C M R O S Z I A
P H J U F G H G M N B O K U Y A O I U K J O X D R C F T
S N J D B U S H E E F P B Y H D E L B A W E N E R K L A
M N G H S E G C A R N I V O R E D F H T D H T S R F G H
F E L I D A E M A R E R Y E V R E S E R I N G C U A T H
Y O A N T U L I O T O D V A R P S T E P H A N O P M O U
L P O A C H I N G O I U S B H I L L I A R Y C L I N E T
E R O D G M I C H U I G A N A B C V F I L T H I L E M O
B U S H C E Y P R E Y W C A R R Y I N G C A P A C I T Y
A S H I N H G N T O N G H F J D K S L A P Q O W I E U R
A L S K D J A R T P E S U E L B A N I A T S U S U G H T
R N I O P L G I C D B H U G I K M O P E R S C D K O T M
P K G H M V U L N E R A B L E S P E C I E S C D H U K M

CHAPTER IV

MATHEMATICS



MATHEMATICS

OBJECTIVE

To help students learn basic mathematical skills and functions.

TEACHER'S BACKGROUND

Following are sample problems for use in teaching:

A. Number Facts, Averages, and Unit Conversion
B. Fractions and Percentages
C. Acceleration and Velocity
D. Logic and Probability

For background information see fact sheets "Cheetah" and "Go For the Gold." You may also want to review the physical education activities that compare human speed to the cheetah's.

CHEETAH COMPUTATION

A. Number Facts, Averages, and Unit Conversion

1. A cheetah can cover 7–8 meters in each stride. If a large cheetah that covers 8 meters in a stride were to run 200 meters, how many strides would it take? What speed is the cheetah running? (Assume a cheetah runs 4 strides/sec.)

   A second cheetah can cover only 7 meters in a stride. How many strides would it take to run 200 meters? How fast is the cheetah running? How many seconds more does it take the second cheetah to run 200 meters?

2. At maximum speed (110 km/h), how long will it take a cheetah to run a distance equal to the diameter of the Earth? (The earth's diameter is 12,700 km).

3. If a cheetah runs 110 km/h, how many seconds will it take for the cheetah to run 300 meters?

4. If a cheetah and a human were to run 100 meters, how long would the cheetah wait at the finish line for the human to finish? Assume the cheetah runs 30 m/sec and the human 10 m/sec. **Note:** To increase the difficulty level of this problem give learner the speed in km/h and ask them to convert the speed to m/sec.

5. If a cheetah kept in captivity eats 2 kg of meat a day, how many kilograms of meat will it eat in a year? How many grams? (There are 365 days in a year.)

6. If a cheetah weighs 300 g at birth and 45 kg when full grown, how much weight will it gain?

7. If a cheetah is 219 cm from the tip of its nose to the end of its tail and its tail is 84 cm long, how long is the cheetah's body?

8. If the gestation period (pregnancy) for a cheetah is 95 days, would a cheetah be pregnant for 20 weeks?

9. In the captive population in 1992, 180 cubs were born in 55 litters. What was the average litter size? If you were to round this figure to a whole number, what would the average litter size be?

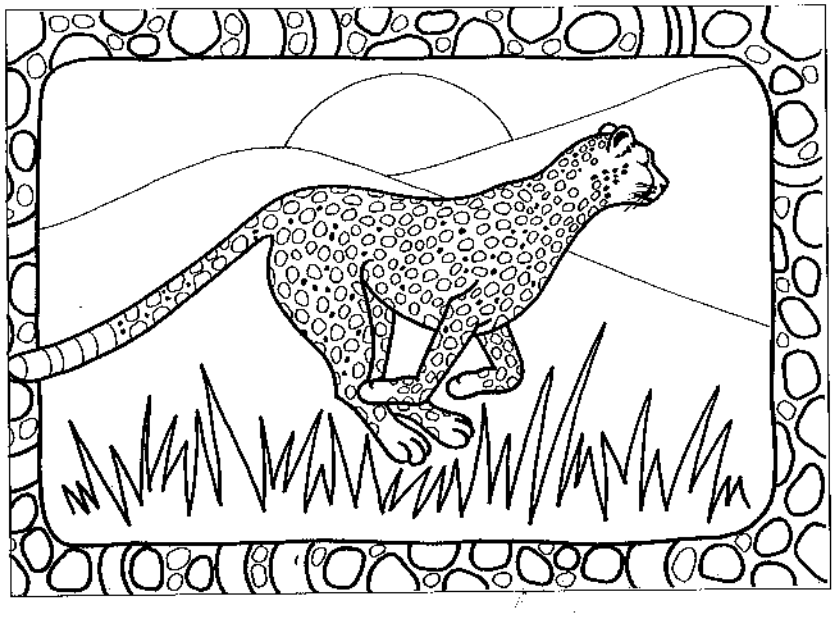
B. Fractions and Percentages

1. In the Serengeti National Park, 20 cheetah cubs are born in a study area and 90 percent die before they are 3 months old. How many of the cubs survive?

2. Namibia has the largest number of cheetahs in the world. A total of 2,500 wild cheetahs live in Namibia. The world's population of wild cheetahs is approximately 12,500 animals. What percentage of the total population lives in Namibia? If two-fifths of the cheetahs found in Namibia die or are killed, how many will be left in Namibia. How many cheetahs will be left in the world?

3. In 1992, there were 2,006 captive cheetahs in the world. What percentage of the total world population of cheetahs does this represent? (Assume the total wild population is 12,500 animals.)

4. Cheetahs successfully catch half of the prey they hunt. How many times would a cheetah have to hunt in order to catch 5 animals?



5. The following is a list of all the cheetahs in one study area that had cubs, the number of cubs each one had, and the number that survived the first 3 months.

Cheetah	# of Cubs Born	# of Cubs Alive after 3 Months
Malkia	3	1
Sukari	6	0
Gizzy	2	2
Khama	5	3
Tamu	4	4

How many cubs were born in this area?
What was the average number of cubs born?
How many cubs survived the first 3 months?
What percentage of the cubs did not live to be 3 months old?
Which mother successfully raised the most cubs?
Which of the mothers raised the highest percentage of her cubs?

C. Acceleration and Velocity

1. If a cheetah can go from 0 km/h to 72 km/h in 2 seconds, what is its rate of acceleration? (Assume a constant rate of acceleration.) If prior to acceleration the cheetah's initial velocity was 5 m/sec, what is its rate of acceleration over 2 seconds?

2. What is the distance in meters travelled by a cheetah accelerating from 0 km/h to 72 km/h in 2 seconds? What is the distance travelled if the cheetah's initial velocity was 5 m/sec?

3. Assume a cheetah runs at 20 m/sec and a wildebeest at 15 m/sec, the wildebeest is 60 meters ahead of the cheetah, how long before the cheetah catches up with the wildebeest?

4. A resting cheetah sees a wildebeest 60 meters away. How long before it catches the wildebeest? (Assume the cheetah can accelerate at 20 m/sec^2.)

D. Logic and Probability

1. Lions and hyenas kill large numbers of cheetah cubs. This is one of the biggest threats to young cheetahs living in national parks and reserves. More lions and hyenas live in Etosha National Park than on the commercial farmlands of Namibia. Where would cheetah mothers have the greatest probability or greatest chance of success raising their offspring?

ANSWER KEY NUMBER FACTS, AVERAGES AND UNIT CONVERSION

1. $\frac{\text{Distance (d)}}{\text{Time (t)}} = \text{Speed (s)}$

First Cheetah

$$200 \text{ meters} \div \frac{8 \text{ meters}}{\text{strides}} = 25 \text{ strides}$$

$$25 \text{ strides} \div \frac{4 \text{ strides}}{\text{sec}} = 6.25 \text{ secs.}$$

$$\frac{200 \text{ meters}}{6.25 \text{ sec.}} = 32 \frac{\text{meter}}{\text{sec.}}$$

Second Cheetah

$$200 \text{ meters} \div \frac{7 \text{ meters}}{\text{stride}} = 28.6 \text{ strides}$$

$$28.6 \text{ strides} \div \frac{4 \text{ strides}}{\text{sec.}} = 7.15 \text{ sec}$$

$$\frac{200 \text{ meters}}{7.15} = 28 \frac{\text{meter}}{\text{sec.}}$$

It takes the second cheetah .90 seconds more to run 200 meters.

2. $\frac{12{,}700 \text{ km}}{t} = 110 \frac{\text{km}}{\text{h}}$ Time = 115.5 hr

3. $110 \times \frac{1000 \text{ m}}{1} \times \frac{1}{60} \times \frac{1}{60} = 30.6 \text{ m}$

$$\frac{d}{t} = s \frac{300 \text{ m}}{t} = \frac{30.6 \text{ m}}{\text{sec.}}$$

$t = 9.8$ sec.

4. Cheetah:

$$\frac{d}{t} = s \quad \frac{100\text{ m}}{t} = \frac{30\text{ m}}{\text{sec.}} \qquad t = 3.3\text{ sec.}$$

Human:

$$\frac{100\text{ m}}{t} = \frac{10\text{ m}}{\text{sec.}} \qquad t = 10\text{ sec.}$$

The cheetah will wait 6.7 seconds at the finish line for the human to finish.

5. $$\frac{2\text{ kg}}{\text{day}} \times 365\frac{\text{days}}{\text{year}} = 730\frac{\text{kg}}{\text{year}}$$

$$\frac{730\text{ kg}}{\text{year}} \times \frac{1000\text{ g}}{1\text{ kg}} = 730{,}000\frac{\text{g}}{\text{year}}$$

6. $$45\text{ kg} \times \frac{1000\text{ g}}{\text{kg}} = 45{,}000\text{ g}$$

45,000 g - 300 g = 44,700 g gained

or

$$300\text{ g} \times \frac{1\text{ kg}}{1000\text{ g}} = 0.3\text{ kg}$$

7. 219 cm - 84 cm = 135 cm body length

8. Gestation: $95\text{ days} \times \frac{1\text{ week}}{7\text{ days}} = 13.6\text{ weeks}$

A cheetah would not be pregnant for 20 weeks.

9. $\frac{180\text{ cubs}}{55\text{ litters}} = 3.27\frac{\text{cubs}}{\text{litter}}$ Average litter size

Whole number average = $3\frac{\text{cubs}}{\text{litter}}$

ANSWER KEY FRACTION AND PERCENTAGES

1. $90\% = .9 = \frac{90}{100}$ x= # of cubs that died

$\frac{90}{100} = \frac{x}{20}$ x=18

2 cubs will survive

2. $\frac{2{,}500 \text{ cheetahs in Namibia}}{12{,}500 \text{ total wild animals}}$ = 0.2 or 20% of the world's cheetah population

$2{,}500 \times \frac{2}{5} = 1{,}000$ are killed

2,500 - 1,000 cheetahs = 1,500 cheetahs left in Namibia

12,500 - 1,000 cheetahs = 11,500 wild cheetahs left in the world

3. $\frac{2{,}006 \text{ captive animals}}{14{,}506 \text{ total population}} = .14 = 14\%$ of total world population

12,500 wild animals + 2,006 captive animals = 14,506 total world population

4. 2 attempts for every successful hunt
2 attempts x 5 successes = 10 attempts

5. 3 cubs + 6 cubs + 2 cubs + 5 cubs + 4 cubs = 20 cubs born

Average No. of Cubs Born = $\frac{20 \text{ cubs}}{5 \text{ litters}} = 4$ cubs / litter

Cubs surviving first 3 month = 1 + 0 + 2 + 3 + 4 = 10 cubs

% cubs not surviving 3 month = $\frac{10}{20} = .5$ or 50%

Cheetah #3 and #5 both raised all of their cubs to 3 month old. Cheetah #5 raised the most cubs.

Cheetah #3 and #5 raised the highest percentage of cubs.

1. Velocity = acceleration x time $v = at$

Change km/h to km/s because the units of acceleration are distance/sec^2.

$$72\frac{km}{hr} \times \frac{1\ hr}{60\ min} \times \frac{1\ min}{60\ sec} = 0.02\ km$$

$v = at$ $\quad 0.02\frac{km}{sec} = a \times 2sec$ $\quad a = 0.01\frac{km}{sec^2}$ or $10\frac{meter}{sec^2}$

$v = v_o + at$ $\quad v_o$ = initial velocity

$$20\frac{m}{sec} = 5\frac{m}{sec} + a\,(2sec) \qquad \frac{15\frac{m}{sec}}{2\ sec} = a$$

$$a = 7.5\frac{m}{sec^2}$$

2. distance $= \frac{1}{2}$(acceleration)(time)$^2 = \frac{1}{2}at^2$ $\quad s$ = distance

$$s = \frac{1}{2}\left(10\frac{meter}{sec^2}\right)(2\ sec)2 = 20\ \text{meters travelled}$$

$$s = v_o t + \frac{1}{2}at^2 \qquad s = \left(5\frac{meter}{sec}\right)(2\ sec) + 1\left(7.5\frac{meter}{sec^2}\right)(2sec)^2$$
$$= 25\ \text{meters}$$

3. Distance + (velocity gnu)(time) = (velocity cheetah)(time)

$$60\ \text{meters} + \left(15\frac{meter}{sec}\right)(t) = \left(20\frac{meter}{sec}\right)(t)$$
$$t = 12\ \text{secs}$$

4. Distance + (velocity gnu)(t) $= \frac{1}{2}at^2$

$$60\ \text{meters} + \left(15\frac{meter}{sec}\right)t = \frac{1}{2}\left(20\frac{meter}{sec^2}\right)t^2$$

$$60\ \text{meters} + 15t\ \frac{meter}{sec} = 10t^2\ \frac{meter}{sec^2}$$

$$\text{Time} = \frac{15 \pm \sqrt{(10)^2 + 4(60)}}{2} = \frac{15 \pm 18.4}{2} = 16.7 \text{ or } -1.7$$

Because time is not a negative quantity the -1.7 is not an answer.

The cheetah would take 16.7 seconds to catch the gnu/wildebeest.

CHAPTER V

PHYSICAL EDUCATION

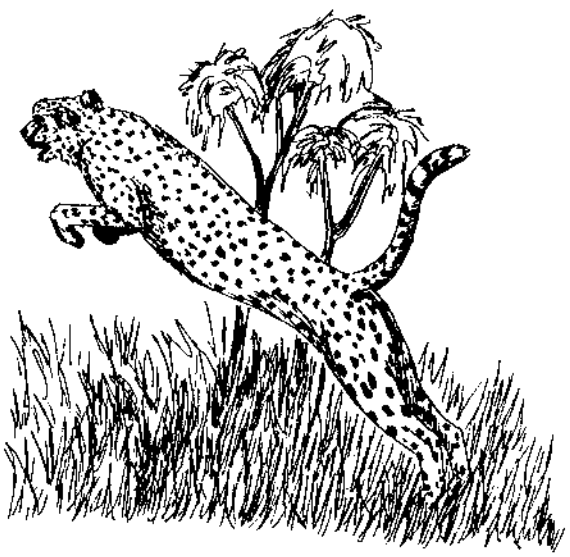
PHYSICAL EDUCATION

OBJECTIVES

Develop an appreciation for the cheetah's unique adaptations. Encourage students to learn more about their own bodies and human adaptations.

TEACHER'S BACKGROUND

Review fact sheet *Go For the Gold.*



CHEETAH OLYMPICS

1. A cheetah can run up to 110 km/h.
   A sprinter can run _____ km/h.

2. At 100 km/h, a cheetah can run 28 meters in 1 second.
   I can run 28 meters on two legs in _____ seconds and on four legs in _____ seconds.

   How many seconds faster can a cheetah run this distance?_____

   How much faster can a cheetah run this distance in a percent?_____

   Example: If you run 28 meters in 9 seconds, the cheetah is 8 seconds faster. Divide 8 by 9 to find the percent that the cheetah is faster.

3. A cheetah can cover 8 meters in one stride.
   I can cover _____ meters in one stride.
   (A stride is one cycle of sequential footsteps, that is, two steps for a human and four steps for a cheetah.)

   How many more meters can a cheetah cover in a stride than you can?_____

   How many more strides does it take you to cover 8 meters?_____

   How many strides does it take a cheetah to run 56 meters?_____

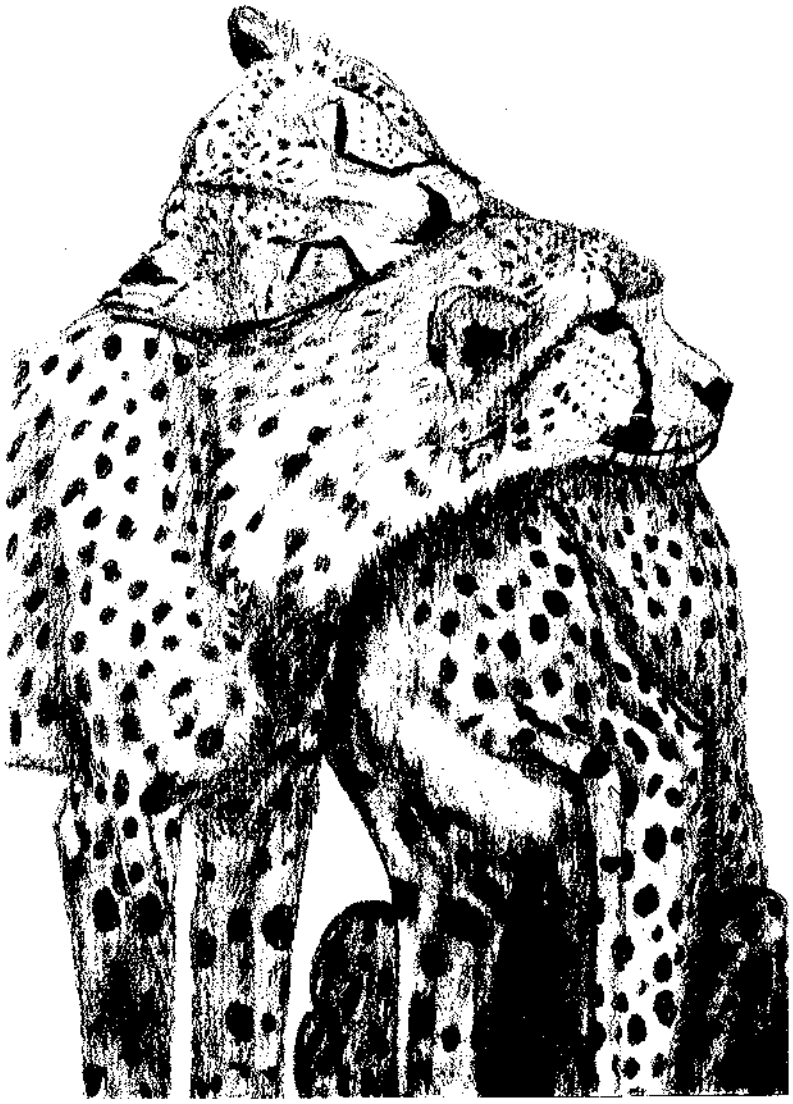
4. A cheetah's breath rate goes from 60 breaths per minute to 150 breaths after running.

How much does the cheetah's breathing increase?_____

What percentage increase is this?_____
(Divide the increase by 150.)

Count your breath rate before and after running for 3 minutes. To count your breath rate, place your hand on your chest where your bottom ribs meet. Count one breath for each time your chest rises. Count the number of breaths you take in one minute.

What is your resting breath rate per minute?_____
What is your breath rate after running for 3 minutes?_____
How much did your breathing rate increase?_____
What percentage increase is this?_____
(Divide the increase by your breath rate after running for 3 minutes.)



ANSWER KEY CHEETAH OLYMPICS

1. 40 KM/H

2. Individual answer

3. Individual answer
   It takes a cheetah 7 strides to cover 56 meters.

4. 90 breath per minute
   60% increase
   Individual answer

CHAPTER VI

ARTS

ARTS

OBJECTIVES

To introduce students to the natural world, animals, and animal behaviours through the visual arts, drama, and music.

TEACHER'S BACKGROUND

For the story, "How the Cheetah Got Its Spots" see the English activities section. Review fact sheets *Cheetah*, *A Place for Predators*, and *Cheetahs and Farmers*.

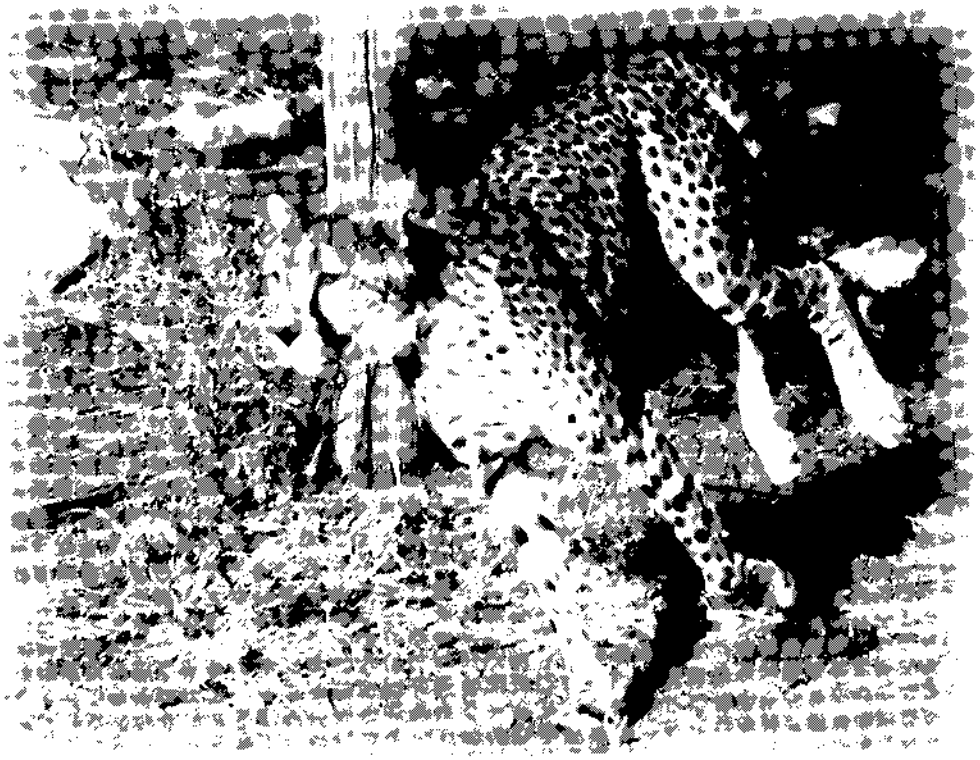
ACTIVITIES

1. What carnivores are most represented in advertising, letterheads, logos, and posters? Design a logo for a tourist company in your area using the cheetah or another predator.

2. Act out the story of how the cheetah got its spots. Write a song about the cheetah using traditional instruments; perform a dance.

3. Role playing game. Each student should be assigned or pick a particular animal, either a predator or prey species. Students should work together in groups if their animal is social. Let them do some research and reading about their animal so they will know more about it (behaviour, hunting style or defense mechanisms). If this is to be a class play, let them act out an average day in the life of a predator. Remember that most predators do not have a high success rate in their hunting. You may want to establish some area of safety for the prey animals where the predators cannot go. The predator may also have to select between several animals, some that are its usual prey, some that are not, and even some that are too big or dangerous to hunt.

4. Have a "Save the Cheetah" campaign at your school. On a large piece of paper draw a picture of a cheetah and write: "Save Me." On the poster write poems and stories; illustrate how humans and our activities harm cheetahs; give useful information about the cheetah and why it should be protected; and tell others how they can help save this species from extinction.



PROJECT TOPICS ON THE CHEETAH

1. History of the Cheetah in Namibia
2. The Role of the Cheetah in a Healthy Ecosystem
3. The Breeding of Cheetahs in Captivity
4. The Importance of the Cheetah in Ancient Egypt
5. An Animal Built for Speed: Specialisations that Make the Cheetah the Fastest Land Animal on Earth
6. Will the Cheetah Survive in the Year 2025?
7. Endangered Species or Vermin?
8. Cheetahs of Iran, East Africa, and Southern Africa
9. Cheetahs and Humans: 5,000 Years of Friendship
10. Social Behaviour and Hunting Style of the Cheetah
11. Cheetah Conservation: What Can We Do to Save the Cheetah?

CONSERVATION ACTIVITIES

1. Collect newspaper articles about wildlife conservation problems in your community.

2. Write a letter to students in other countries or at other schools asking them about the wildlife in their area and what their government has done to help protect wild species. Share with them your favourite animal and why you think protecting the environment and that species is important.

3. Start a sister-school exchange program with a school in the United States. Contact the Cheetah Conservation Fund for more information.

4. Write letters to non-governmental conservation organizations that work on issues in their country as well as others. These groups pursue a variety of approaches, including biological research, training of foreign scientists and wildlife managers, and development of legislation.

5. What environmental problems do you think are the most important and affect the community where you live? In Namibia? What can you do as an individual to solve these problems? What can the Government of Namibia do?

6. Assume that you have been elected to the National Assembly. Propose a wildlife management program that would be helpful to your community. Or assume you are a farmer having problems with livestock loss to predators. What non-lethal management practices can you use to reduce livestock loss to predators.

7. Write letters to His Excellency, Dr. Sam Nujoma; members of the National Assembly and National Council; the Minister of Wildlife, Conservation, and Tourism; and the Minister of Agriculture thanking them for their commitment to protect Namibia's environment and encouraging them to maintain Namibia's cheetah population for future generations. Ask them how you can help or be involved in the conservation of endangered or threatened species. Share with them your ideas on how to protect Namibia's fragile environment and how to reduce predator/human conflicts.