Goals: This is the second module in the three module fall series. At this point, students have had at least one experience using the scientific method (Module I – Microbiology). This activity seeks to further build upon this experience base, while introducing students to another field of scientific inquiry, the study of animal behavior. One primary goal is to demonstrate that the scientific method can be applied from microbes to meerkats. The second is to introduce students to the idea that careful observation itself can provide enough information to test hypotheses without the need for more invasive techniques. Mentors should also encourage students to think about animal behavior as a potential area for student-driven projects in the spring, and the field of animal behavior and zoo keeping as potential career options.

Age Level: 7th-8th Grade

Approximate Time: One 1½ hour session on site at the Phoenix Zoo (not including travel time), followed a week later by one 50 minute class period.

Background: Behavior is essential to the lives of all animals. Almost all aspects of an animal’s life are governed by their ability to accomplish specific behaviors. Grazing, hunting, sleeping, mating, migrating, fighting, flying, swimming, playing, communicating, these are all examples of activities that animals of all shapes and sizes engage in every day. However, animal species differ in the set of behaviors they perform, and even within a species, individuals may differ in their behavioral patterns. Males often differ from females in their behaviors so much so that one can tell a male and a female apart even if they look identical to each other. Young animals also can differ in their behaviors from older animals. For example, in many bird species and some fish species, only older males are able to hold territories, whereas younger males are confined to waiting their turn, acting like satellites around the territories of older males in the meantime. Because behavior is so important to the lives of animals, zoos pay particular attention to it when monitoring the health and wellbeing of their animals. Features of zoo exhibits are built to encourage healthy behavior patterns, and many veterinary diagnoses and treatments require paying attention to the behavior of sick animals. This module is designed to introduce students to the world of animal behavior using a set of animals housed at the Phoenix Zoo.

Objectives: Students will be able to:
- identify parts of the scientific method, including research questions, hypotheses, tests, predictions, results and conclusions within the context of an observational study of a focal species
- come up with their own hypotheses and predictions
- select a suite of behaviors using initial observations, construct an ethogram, and monitor a group of animals
- present the results of their observational study to classmates, including background information about their focal species

Standards:

National Science Standards (Grades 5-8):

Content Standard A. Science as inquiry.
- Develop abilities necessary to do scientific inquiry
- Develop understandings about scientific inquiry

Content Standard C. Life science.
- Structure and function of living systems
- Regulation and Behavior
- Diversity and adaptations of organisms

Arizona State Science Standards (Grades 5-8):

1SC-E1. Identify a question, formulate a hypothesis, control and manipulate variables, devise experiments, predict outcomes, compare and analyze results, and defend conclusions

PO 1. Design an experiment using a scientific method
PO 2. Conduct an experiment using a scientific method
PO 3. Analyze the results of an experiment
PO 4. Defend conclusions drawn from the analysis

1SC-E3. Organize and present data gathered from their own experiences, using appropriate mathematical analyses and graphical representations

PO 1. Construct a representation of data (e.g., histogram, stem-and-leaf plot, scatter plot, circle graph, flow chart)
PO 2. Interpret patterns in collected data

4SC-E7. Explain and model the interaction and interdependence of living and non-living components within ecosystems, including the adaptation of plants and animals to their environment

Materials:

1 ethogram (chart for keeping track of behaviors) per group
1 pair of binoculars
1 digital camera (optional)
1 watch
Procedure:

Day 1 – Field trip to Phoenix Zoo

1. Mentors will ride with students from school to zoo on school bus. This is an opportunity to get students thinking about the activity they are about to engage in. Student groups will be assigned a focal animal or group of animals prior to boarding the bus, and mentor-student groups should sit together.

2. Mentors will be given an animal fact sheet or set of sheets prior to the bus ride, and should share this information with students. Brainstorming on potential behaviors to look for, or distinctions between individuals (sexes, age classes) during this half hour ride is encouraged.

3. Upon arriving at the zoo, the group will be greeted by zoo personnel who will introduce them to the zoo and give a brief presentation about why animal behavior is important to zookeepers, veterinarians, etc. at the Phoenix Zoo. (10 minutes – end by 2:15)

4. Student/mentor groups will then move to their “field locations” within the zoo (see map), and will spend a short stretch of time just observing their focal animal, trying to identify individuals, sexes, age classes etc. as well as particular behaviors. (15 minutes – end by 2:30)

5. Student/mentor groups should then convene to discuss what behaviors should end up on the ethogram, and what hypothesis they would like to test. At this point, students should fill out both the scientific method flowchart and the ethogram. (15 minutes – end by 2:45)

6. Groups should then work to observe their focal animals, recording particular behaviors and the individuals who engage in them for a set amount of time, depending on goals and time constraints. Groups are encouraged to assign roles (recorder, photographer if camera available, observer(s)). (20-30 minutes – end by 3:15)

7. This session will end with a presentation by zoo personnel about opportunities and careers in zoo keeping, veterinary studies, and animal behavior, including a detailing of ZooTeen, a volunteer internship program at the zoo for high school students. (15 minutes – end by 3:35)

8. On the bus home, student groups have the opportunity to tally their data and try to answer their question.

Day 2 – Data analysis and presentations to class at school (50 minute class period)

1. If students didn’t get to it the week prior, groups should tally their data to try to answer their question.

2. Students should represent their data in some way, most likely a histogram or bar chart. Pie charts might also apply to certain types of data. If time is available, student groups are encouraged to do this on their laptops using Excel. This may be a tall order, so overhead sheets are available for hand graphing (see below). Groups should come to some conclusion regarding their hypotheses. (Total time available for this: 25 minutes – end by 2:00)

3. All groups are expected to present their results to the rest of the class during a group discussion moderated by program director (25 minutes – end by 2:30).
Animal Behavior Ethogram

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<th>Group Members:</th>
<th>Animal: __________________________</th>
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<td>Observation Length: ____________</td>
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<th>Mentor:</th>
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Question

Proposed Explanation (Hypothesis)

Experiment

Observe these behaviors ____________________________________________

_________ for ______ minutes, and record the number of times that the animals I’m watching perform the behaviors by writing the number down in an ethogram.

Predicted Result

Actual Result

Conclusion
Common Eland
*Taurotragus oryx*

**Range:** Confined to southern Africa from Ethiopia and southern Zaire to South Africa.

**Habitat:** Savannas and plains of Eastern and Southern Africa

**Size:** Length: up to 11.5 ft; Height: up to 6 ft at shoulder; Weight: 660-2200 lbs

**Young (# and name: foal, calf, cub, etc.):** 1 calf

**Gestation:** 9 months

**Diet (wild):** Grazer: various grasses, leaves, branches

**Diet (zoo):** Bermuda hay, alfalfa hay, herbivore pellets

**Life spans (wild):** Up to 25 years

**Life spans (captivity):** Up to 25 years

**Status (common, threatened, endangered, etc.):** Eland populations have declined or have been extirpated in many parts of their range, but overall are still relatively common. It is classified as a low risk, conservation dependent species by the IUCN (1996).

**Threats (to the wild population):** Human hunting and habitat loss

**Anatomy/Physiology (anything unique or interesting):** Have a smooth tan coat with narrow with vertical stripes on their flanks. Males are darker with a rug of hair on their foreheads. Slightly diverging horns are found in both sexes and are virtually strait with two twists. The horns can grow to 26 inches.

**Social/Family units:** Large groups of 20 to 70 animals

**Habits (unique to species/collection animals):** They are a gregarious species. They are active in the morning and late afternoon. Their home ranges will vary by sex and season. Adult males have a hierarchy.

**Communication (vocalization, etc.):** N/A

**Defensive/Aggressive behavior:** Males will defend with horns. Females will defend calves.

**Predators:** Lion, Leopard, Spotted Hyena

**Locomotion (type, top speeds, etc.):** Can run up to 42 mph

**Activity (diurnal, nocturnal):** Diurnal

**Any interesting story/fact (species or collection animal):** Exceptional jumpers can easily clear 5 feet. They are the second largest antelope in the world.
East African Crowned Crane  
*Balearica regulorum gibbericeps*

**Range:** East Africa, Congo, Uganda, Kenya, and Central Tanzania

**Habitat:** Open Country

**Size:** Height 3 feet, Length 38 inches

**Young:** Nest, 2-3 eggs

**Incubation:** 30 days

**Diet (wild):** Omnivore: plants, worms, snails, insects, frogs, lizards, mice and young birds

**Diet (zoo):** Avian pellets

**Life span (wild):** 15 years

**Status:** Common

**Threats:** Hunting, habitat loss

**Anatomy/Physiology:** They have long legs for wading through grasses. Their feet are large, yet slender, and are adapted for balance rather than defense or grasping.

**Social/Family units:** They are social and gregarious. They are monogamous and pair for life, both parents incubate, chicks go out first time with male for food.

**Habits:** Monogamous pairs dance together in large groups. They stamp their feet while walking flushes out insects which are then eaten.

**Communication:** They have an exceptionally powerful voice caused by an elongated trachea. They give a low purr when feeding and a loud honk when alarmed.

**Defensive/Aggressive behavior:** They are very defensive when comes to young. Other times they are very social non-aggressive.

**Prey items:** Plants, worms, snails, insects, frogs, lizards, mice and young birds

**Predators:** Eggs vulnerable to mammalian predators, large carnivores, and other birds of prey.

**Locomotion:** They are excellent flyers with large wings. They fly with their neck and legs extended.

**Activity:** Diurnal

**Any interesting story/fact:** Courtship ritual displays are preformed throughout the year, regardless of breeding season.
**Watusi Cattle** (a.k.a Ankole Cattle or Watusi-Ankole Cattle)

* Bos taurus *

**Range:** Currently graze with the Maasai people in Kenya and Tanzania. Breed has also been introduced to Europe, Asia, and North America in domestic situations.

**Habitat:** Savanna grasslands and desert grassland

**Size:** Cows 900 - 1200 pounds
  - Bulls 1000 - 1600 pounds
  - Newborn calves weigh 30 - 50 pounds
  - Horn bases that measure 28 inches in circumference, 8 inches in diameter and eight feet from tip to tip

**Young (# and name: foal, calf, cub, etc.):** single calf that are especially alert and are capable of running along with their mothers and the herd within a short time

**Gestation:** 9-11 months

**Diet (wild):** Grazer; grass and leaves

**Diet (zoo):** Hay

**Life spans (wild):** 18-25 years

**Life spans (captivity):** up to 36 years

**Status (common, threatened, endangered, etc.):** Very common throughout the world. The wild species that Watusi cattle originate from became extinct in the early 1600’s.

**Threats (to the wild population):** No wild population

**Names (of collection animals):** “Holy Moly” who was born in April of ‘93 and two cows with the registered names of “Temptation”, born on March of ‘97, and “Blanca” who was born May of ‘98. We will also be getting a heifer named “Holy Smoke” who was born Dec. ’02

**Point of origin (where they came from):** A breeder in Tucson

**Anatomy/Physiology (anything unique or interesting):** Watusi cattle have been bred specifically to tolerate temperature and weather extremes well. The large horns act as radiators; blood circulating through the horn area is cooled and then returned to the main body. This allows excess body heat to be dispersed. Horns are also hollow making them extremely lightweight.

Their digestive systems have the ability to utilize poor quality and limited quantities of food and water. Their native homeland can boast days in which temperatures can soar to 120° and nights can plummet to 20°, this in addition to low quality sparsely available...
feeds, seasonally limited water supplies, virulent diseases, predators and parasites that would have long ago destroyed less hardy animals.

In Watusi the cows and bulls are long legged, making them capable of running and jumping with tremendous agility. The cows have a small, tight udder that would not be an easy target for predators or thorn bushes, yet they produce milk to nourish their young that tests out with very high butter fat.

**Social/Family units:** The breed is highly social, much preferring to stay in a group for company and protection. At night they tend to form a circle with adults lying on the outside, horns out to protect the calves located in the inner circle. The calves will hang in groups; by day, always in close proximity to at least one adult and when frightened will instinctively run in front of the horns of a retreating mother or under her belly for protection.

**Defensive/Aggressive behavior:** They are very active, energetic animals. Some members of the species are quite aggressive and are known to charge strangers with little or no provocation. Dominant animals within the herd will also charge other cows, although they will more often just push the subordinate animals out of the way with their horns. In a large herd, many smaller animals will exhibit scars on their hindquarters from the horns of the dominant beasts.

**Predators:** Large carnivores such as lions and hyenas

**Competitors:** In African they sometimes compete for grazing space with the wild grazers.

**Locomotion (type, top speeds, etc.):** In Watusi the cows and bulls are long legged, making them capable of running and jumping with tremendous agility.

**Activity (diurnal, nocturnal):** Diurnal

**Any interesting story/fact (species or collection animal):** Watusi get their name from the Tutsi and Ankole tribes that originally bred them. Historically cattle herds played an important role in tribal life. The herds provided a form of barter, trade and a sign of wealth within the tribe. The animals provide a source of food when none would otherwise have been available. Seldom slaughtered for meat, except in ceremonies such as the coming of adulthood, the cows are frequently milked and bled to make a yogurt like high protein drink. The animals themselves provide status for a man within the tribe, his wealth being measured by the number and quality of animals that he owns. In addition they are used as gifts to a bride’s family at the time of marriage a tradition known as bridewealth. Today the maximum number of cattle an individual can own is more restricted by grazing rights to land so the cattle play less a role in establishing wealth and mainly provide sustenance to the tribe members. They are central to the life of the Maasai people in eastern Africa.
**Thompson’s Gazelle**
*Gazella thomsoni*

**Range:** East Africa, Serengeti to central Africa.

**Habitat:** They mainly stay in the grassy plains where food is most abundant and the landscape is open enough to allow large herds.

**Size:** Height; 25-26 inches at shoulder, Weight; 40-60lbs

**Young:** One foal is born, possibly twice a year.

**Gestation:** 5-6 months

**Diet (wild):** Grazer: leaves, short grasses herbs, buds, and shoots.

**Diet (zoo):** Herbivore pellets and alfalfa hay.

**Life spans: 10-12 years in both the wild and captivity.**

**Status:** Common

**Threats:** Hunting, agricultural development, and overgrazing by domestic stock.

**Anatomy/Physiology:** Thomson’s gazelles, or “Tommies”, have a light coat on top with a distinctive dark stripe on its side. They have a white under belly and rump. They also have dark brown tear lines from the inside corner of their eyes. Their horns are long and slightly curved. Males have strong, curved ringed horns that can reach 11 ½ feet in length. Female’s horns are shorter and more slender. Keen peripheral vision enables them to view a large area. They are ruminants so they chew their cud.

**Social/Family units:** Tommies are very playful, living in herds of up to 200 members. During migration thousands will travel together. When animals do not migrate, males form bachelor groups and territorial male groups. These males try to keep females that wander into their territories. Territories are side by side.

**Habits:** They get the water they need from the grass they eat.

**Communication:** They alert other Tommies by stotting.

**Defensive/Aggressive behavior:** Their only defense is to flee, and they are excellent escape artists. They can leap 10 feet into the air; jump 30 feet in a single bound, and make turns much faster than a cheetah can. When members of the herd see wild dogs, they jump into the air to signal others, bouncing in a stiff-legged fashion called “stotting”. They all bounce away and scatter in all directions. To escape from the cheetah, they do not bounce, but gallop and scatter quickly.
**Predators:** Tommies are the prey of many creatures, including cheetahs, cape hunting dogs, lions, honey badgers, jackals, hyenas, leopards, and crocodiles. Their young are preyed upon by several cats, jackals, baboons, eagles, and pythons.

**Locomotion:** They run at speeds of 40 mph. They have elongated feet and ankle bones, which give the thin-legged gazelle speed.

**Activity:** They move early in the morning and in the evening.

**Any interesting story/fact:** They are the favorite food of most of the carnivores on the African Savannah; they are the original “fast food.”
Ostrich
*Struthio camelus*

**Range:** South, east, and northwestern Africa, parts of Saudi Arabia, Iraq, and Iran

**Habitat:** Open savanna, semi desert and sandy grassland

**Size:** Height: up to 8 feet; Weight 300 lbs

**Young:** 4-6 eggs

**Incubation:** 6 weeks

**Diet (wild):** Omnivore; berries, seeds, grasses, leaves, small mammals, reptiles, and insects

**Diet (zoo):** Ratite, alfalfa hay, and lettuce

**Life span (wild):** 20-40 years

**Status:** Relatively common.

**Threats:** Poachers, and expansion of population

**Anatomy/Physiology:** Large eyes for superior visual acuity. Long strong legs with well developed thigh muscles for running help compensates for their inability to fly. Wings are rudimentary and are used only for display, defense, and to aid in braking and turning. Males are black because they sit on the nest at night and need to blend in with the night sky. Females sit on the nest during the day so they are grey to blend in during the day.

**Social/Family units:** Harem polygamy. One male usually with three or four females in group

**Habits:** A single nest is usually used by 3-4 females. The 18-20 eggs are then tended to by the male and the head female.

**Defensive/Aggressive behavior:** Strong legs allow for high speed and can administer a powerful and potentially lethal kick in defense against a predator.

**Prey items:** Insects, lizards, small mammals, berries, seeds, grasses, and leaves

**Locomotion:** Fast runners, reaching speeds up to 40 mph. Can not fly.

**Activity:** Diurnal

**Any interesting story/fact:** When the head female, or major hen, sits on the nest she puts her eggs in the center and the other females’ eggs on the edges in order to better protect her eggs and make sure they are well incubated. Also, so that it is harder for predators to get the major hen’s eggs since they are in the center.
Reticulated Giraffe  
*Giraffa camelopardis reticulata*

**Range:** The Reticulated Giraffe are found in northeast Kenya. Interspersed in central and southern Africa.

**Habitat:** The Giraffe species is found in the arid zones and drier regions of northern and southern Savanna, wherever trees grow. They are also found in semiarid plains, savannas, and woodland areas.

**Size:**  
- **Male:** Height: up to 18 ft; Weight: up to 4250 lbs (with an average weight of 2500 lbs)  
- **Female:** Height: up to 15 ft; Weight: up to 2600 lbs (with an average weight of about 1600 lbs)

**Young:** Giraffe’s can only have one calf at a time.

**Gestation:** 14 to 14 ½ months or 453-464 days

**Diet (wild):** Browser: mainly Acacia species of trees, but they do consume about 100 different trees. Giraffes are the ultimate browsers, competing only with the elephant for food.

**Diet (zoo):** They are fed mostly alfalfa hay.

**Life span (wild):** 25 years.

**Life span (captivity):** up to 28 years.

**Status:** Common. The wild population is stable but slowly declining. There are approximately 27,680 giraffes.

**Threats:** Hunted for their meat.

**Anatomy/Physiology:** The giraffe has only 7 vertebrae in their long neck, which happens to be the same as humans. Each adult giraffe vertebrae are approximately 11 inches long. Special valves in the neck arteries help control the blood flow and heart pressure when the animal raises and lowers its head. The blood control prevents the animal from passing out by maintaining a somewhat constant amount of blood to the brain. The prehensile lips and long, flexible tongue helps the giraffe to obtain food by plucking the leaves off of thorny branches. As a ruminant, the giraffe may swallow a great deal of leaves to store in one of 3 stomach compartments, to be regurgitated and chewed for later digestion. This allows the giraffe to watch for danger while chewing its cud. Their coat has a net-like pattern. They have acute peripheral vision. They have a great sense of smell, and hearing as well. Their height provides an increased range of vision.

**Social/Family units:** Giraffes are social animals with herds of up to 50 individuals, but more commonly 12-15. This allows for better protection of young from predators.
**Habits:** Browsing among tall trees. Giraffes avoid drinking for long periods of time and often stand when sleeping because it is very difficult to rise from kneeling position and standing with their heads down makes them vulnerable. Giraffes are the ultimate browsers, competing only with the elephant for food.

**Communication:** Normally silent. Some vocalizations are “bleat or moo” from calves and “snorts, moans, snore, hiss, bellows or coughs” are from the adults.

**Defensive/Aggressive behavior:** Vulnerable to predators when lying down. When cornered, it can inflict a destructive blow, kicking with the front legs.

**Predators:** Lions, hyenas, and man

**Locomotion:** Ambling walk or gallop. May run up to 35 mph.

**Activity:** They mostly feed during cooler hours in the a.m. and p.m.

**Any interesting story/fact:** A giraffe’s face grows calcium deposits, changing their appearance constantly. The females will give birth standing up so the first thing a baby giraffe knows is a 6 ft fall to the ground.
Golden Lion Tamarin  
*Leontopithecus rosalia*

**Range:** Atlantic lowland coastal rainforest of Brazil.

**Habitat:** Dense forest that is entangled with many vines and has a high density of fruit, the climate is extremely humid; they occupy the closed canopy, often remaining 10-30 meters off the ground.

**Size:** Body Length: 20-36.6 cm (13-15 in); Tail Length: 31.5-40 cm (10-15 in); Weight: 22-25 ounces.

**Young:** Usually non-identical twins.

**Gestation:** 130-135 days

**Diet (wild):** Omnivore: spiders, snails, small lizards, eggs, small birds, fruits and vegetables.

**Diet (zoo):** Vegetables, crickets, and mealworms.

**Life spans (wild):** 10-15 years

**Life spans (captivity):** 30 years or more

**Status:** Endangered, CITES Appendix I - Golden lion tamarins are one of the world's most endangered species. In the early 1970s, there were fewer than 200 of these small monkeys in Brazil's Atlantic coastal forest. Thanks to the National Zoo, other zoos, conservation organizations, and Brazil's government, there are now more than 1,200 living in the wild. – National Zoo

**Threats:** Habitat loss, the pet trade, and their use in medical laboratories.

**Anatomy/Physiology:** They have small, rounded heads with a thick golden mane on the crown, cheeks, throat, ears and shoulders. Their bare faces are flat and have widely spaced nostrils. Their bodies are covered in long, soft silky hair with colors ranging from pale golden to a rich reddish-gold. They have acute sight and hearing and a good sense of smell. All their digits bear modified claws except their big toe, which has a flat nail. Their claws are used to dig into large branches for a good hold. They have a non-opposable thumb.

**Social/Family units:** They are a social species and can be found living in groups of 2-8, usually made up of family members. The groups have a breeding pair, their offspring of 1 or 2 litters and possibly other relatives. The groups are usually nuclear families, but can be extended families.

**Habits:** There is one breeding pair per group and the rearing the young is a group effort, although it is mainly done by the father. The young will cling to its mother for the first few weeks. At about week 5, it begins to expand its curiosity and experience things on its own. In some cases, it has been observed that a parent prefers to tend to an offspring of its own sex, but with experienced parents, it did not make a difference. The adult males
spend a lot of time grooming the adult females. The juveniles play a lot by chasing each other around and wrestling.

**Communication:** They have very distinct vocalizations with about 17 different and specific calls used for things like alarms, defense, etc. Their sounds include trilling for solo activity, clucking during foraging, whining for contact, and long, song-like calls for vigilance. There is some sexual dimorphism in the calls.

**Defensive/Aggressive behavior:** They are very territorial and they defend their territories by scent marking and vocalized threats. When threatened they erect their mane, arch their back, stare, show their teeth, and shriek.

**Predators:** Cats, birds of prey, and snakes

**Locomotion:** They use all fours to get around. They run and walk through the trees and spring and leap between branches and vines. Nothing has been documented whether they use their tails to swing from or not.

**Activity:** Diurnal, but they do take midday naps

**Any interesting story/fact:** They eat insects using their long, slender fingers to get into small crevices in the tree bark. This technique is called "micromanipulation." They will sometimes share food among family members, but not with unrelated individuals. The juveniles, for example, have fun stealing food from parents or siblings.
Cotton-Top Tamarin

*Sanguinus oedipus oedipus*

**Status in the Wild:** Endangered

**Range:** Northwest Columbia

**Habitat:** Upper strata of the rainforest

**Size/Weight:** Head to body length is 19 to 31 centimeters. Tail length exceeds the body length for an overall length of 40 to 90 centimeters. They weigh about 260 to 900 grams.

**Coloration:** There is a distinctive crest of white hair on the head, they have a brown back, and yellow to white undersides and extremities. Their face is black and white.

**Habits:** They are monogamous and extensive parental care is provided to the young with assistance from older siblings. They live in social groups as large as 15, comprised of a breeding pair and their offspring. Tamarins are active 10 to 11 hours a day from sunup to sundown.

**Diet:** Cotton-top tamarins eat fruit, tender vegetation, insects, small lizards and eggs.

**Reproduction/Gestation:** The birthing season is from January to June with a gestation of 125 to 170 days. One to three young are born, typically twins.

**Behavior:** The cotton-top tamarin is arboreal and diurnal, arising an hour after dawn and retiring well before dark. It travels 1 - 2 km/day (0.6 - 1.2 mi/day), foraging for insects, feeding on fruit, and seeking favorite sleeping spots. One study showed that the percentages of time spent on different activities by two groups of cotton-top tamarins were quite different from each other: 44%/31% foraging, 37%/29% resting, and 19%/40% moving. Foraging generally takes place in mid-lower strata of the forest (at heights of 4.5 - 13.5 m (14.8 - 44') above ground in one study). The day range of one group was estimated at 1.5 - 1.9 km (0.93 - 1.2 mi)

**Group Structure and Composition:** Cotton-top tamarin groups do not represent extended families. A group may consist of a dominant mated pair, their young of the year, and a number of transient subordinates. The subordinates leave and re-enter the main group and sometimes form small groups of their own within the home range of the main group. Cotton-top tamarin groups consist of 2 - 12 animals, with groups of 3 - 9 animals being most common.

**Inter-group Relations:** Neighboring home ranges overlap substantially, but contact between groups appears to be agonistic. A group maintains a fixed territory within its home range, which the group defends physically; e.g. with bluff charges at territory boundaries, and with vocal displays. One adult member of the group acts as a sentry while other group members are occupied with foraging or other activities.

**Relations between Individuals:** Most groups appear to be monogamous, with only one reproductively active male and female, although exceptions to this trend have been found.
Only one female gives birth, while other females in the group are reproductively suppressed. Everyone takes care of infants. Initially, after birth, parents as well as other females take care of the baby, with the juveniles and young taking part later, after the first 3 weeks, as the new infant matures. In fact, this early infant caretaking experience appears to be critical for the future reproductive success for both males and females, because parental care in cotton-top tamarins is not instinctive - it is learned. If an animal is hand-reared or is removed from its family prior to carrying infants on its back, it will not successfully rear its own young. The sharing of food seems common, especially fathers sharing with their young ones and older siblings with younger siblings.

**Interesting Fact:** The cotton-top tamarin has been used in medical research, and currently there are more of these monkeys in captivity than in the wild.
**Hamadryas Baboon**  
*Papio hamadryas*

**Range:** Ethiopia and Somalia in Africa, and Saudi Arabia and Yemen on the Arabian Peninsula. They are found from sea level to 2600 meters.

**Habitat:** Inhabits semi-arid plains and rocky hill country and they spend the night on rocky cliffs.

**Size:** Length (without tail): 24-30in; Weight: males-up to 40 lbs & females are half the weight of males

**Young (# and name: foal, calf, cub, etc.):** One young is usual, rarely two

**Gestation:** 170-173 days

**Diet (wild):** Opportunistic: chiefly vegetarian supplemented with protein-rich insects, hares and other small animals. In parts of Arabia, they are becoming increasingly dependent on raiding crops and garbage dumps.

**Diet (zoo):** Monkey chow, leaf-eater biscuits, fruits, and vegetables

**Life spans (wild):** Unknown, but it is likely that the maximum is slightly lower in the wild

**Life spans (captivity):** 37.6 years

**Status (common, threatened, endangered, etc.):** They are common within their limited distribution. Arabian populations that become dependent on humans may be at risk. The Hamadryas has been exterminated in Egypt and reduced in numbers in other areas. Much of its former range has been brought under cultivation, leading to conflicts with people. It is listed as threatened by CITES (II) and near threatened by the IUCN.

**Threats (to the wild population):** Habitat loss, harvesting for food and for research, as well as outright persecution.

**Anatomy/Physiology (anything unique or interesting):** They have enormous canines, usually used in threat displays. Females and young are brown without mane. Infants are black. The tail is arched gently backwards. The face is reddish-pink with a very long muzzle in the same line as the brain case. The Ischial callosities are highly developed and bright red. Females have pronounced monthly genital swelling.

**Social/Family units:** Hamadryas baboons are socially and structurally distinct from other species of baboon. Males are related to each other and females move between groups. They sleep on rocky cliffs in aggregations that may number as many as 750. They travel and forage in bands of 50 to 100 individuals. In turn these bands are composed of the basic group of a single adult male with one to four females together with their offspring. The adult male keeps his harem together by strong disciplinary measures which include biting his females on the nape of the neck. Males kidnap young females who then bond to
them. A female threatened by her male will run towards not away from him. When a pair forms, rival males respect a possessor's right to his female. This species breeds throughout the year, but the peak seasons are May-June and November-December. Females reach sexual maturity in five years, males in seven. Their flexible social structure is adapted to two special local conditions: the lack of safe sleeping places and the difficulty of finding food in the tree-less semi-desert in which they live.

**Habits (unique to species/collection animals):** These animals are very social and are stressed by isolation. A direct stare is a threat. To threaten in return, they will raise their eyebrows, showing their white eyelid and partially open their mouth, displaying formidable canines. Intensifying the threat, they may yawn, raise their hair, slap hands and feet on the ground, grind their teeth and scream. Fear is shown by a “grin” with no eyelid threat. They have a number of calls; alarm is given by a dog-like bark. Social grooming is thought to help develop and maintain social bonds between animals. Within hamadryas baboons, most social grooming is performed by females and is directed toward the leader of the OMU. Other forms of tactile communication in this species include reassuring touches and embraces, as well as a variety of agonistic bites and slaps.

In their dry, sandy environment they learn where to find small pools and where to dig for water.

**Communication (vocalization, etc.):** Utilize visual signals and gestures, vocalizations, and tactile communication. Visual signals include social presenting, in which a females or juveniles display their hind quarters to the male. This submissive signal differs from sexual presenting (which females do to elicit copulation) in that the hindquarters are much lower to the ground. Staring is a threat behavior, the effect of which is enhanced by the differently colored fur in the region of the eye which is revealed when the baboon stares. The mouth may be opened during this type of staring, although the canine teeth typically remain covered. Bobbing the head up and down is also considered a threatening behavior among hamadryas baboons. Canine teeth are displayed by a tension yawn, as another threatening gesture. This last behavior is performed only by males toward their rivals or toward predators. Teeth chattering and lip smacking, although not technically vocalizations, are auditory cues of reassurance, often performed by a dominant animal when another is presenting to him. Vocalizations made by these animals include a two-phase bark, or "wahoo" call, which adult males direct toward feline predators or toward other males. It is thought to communicate the presence of the male and his arousal. All hamadryas baboons, except infants, make rhythmic grunting vocalizations when approaching another animal to signal affiliative intentions. A shrill bark is produced by all except adult males to indicate alarm, especially due to sudden disturbances.

**Predators:** Leopard, Verreaux’s eagle, but most natural predators have been virtually eliminated from most of the range of *P. hamadryas.*

**Locomotion (type, top speeds, etc.):** Quadrupedal, mainly terrestrial primates

**Activity (diurnal, nocturnal):** Diurnal

**Any interesting story/fact (species or collection animal):** The Hamadryas was the sacred baboon of the ancient Egyptians, often pictured on temples and monoliths as the
attendant or representative of Thoth, the god of letters and scribe of the gods. Baboons were mummified, entombed and associated with sun-worship. This is the only non-human primate found in Arabia. Also known as the sacred or “mantled” or Arabian baboon.
Meerkat or Suricate
*Suricata suricatta*

**Range:** Southern Africa including parts of Angola, Namibia, South Africa, and southern Botswana

**Habitat:** Semi arid plains, scrubland, and hard rocky soil.

**Size:** Head-body length: 20 in; Tail Length: 7 in; Weight: 2 lbs

**Young:** 2-5

**Gestation:** 70-75 days

**Diet (wild):** Opportunistic: insects and other invertebrates; occasionally small rodents, lizards, ground-nesting birds, snakes, and bulbs and/or roots of certain plants.

**Diet (zoo):** Carnivore diet, fruit, vegetables, dog kibble, and live insects.

**Lifespan (wild):** 10 years

**Lifespan (captivity):** 15 years

**Status:** In no danger of extinction, however erosion of habitat may be responsible for declining numbers.

**Threats:** Erosion of habitat.

**Anatomy / Physiology:** They are a small mammal with tan/brown coat. Their feet have long non-retractable claws adapted for digging. The tail is about 1/3 length of the body and is used for balance when standing on hind legs and signaling others. They have excellent vision used to spot predators. They have a keen sense of smell used to forage. Their sharp conical teeth are used to grab insects, lizards, etc.

**Social / Family units:** They have developed complex social organizations. There are troops of 5-40 individuals made up of smaller warrens. The labor is divided among troop members. Babysitters watch over the young. Sentries/Guards watch for potential predator and warn group of danger. Hunters gather food. Teachers show juveniles how to hunt for food.

**Habits:** They dig extensive burrow systems used for sleeping, protection, and housing the young. They are often seen watching for predators standing on hind legs or sitting on is haunches.

**Communication:** They keep in close contact with constant soft grunts. They also may bark, chirrup, trill, or growl according to circumstance.

**Defensive / Aggressive behavior:** When they are threatened they will begin digging to create a cloud of dust and distract the attacker. They may stretch legs and arch back with
hair standing on end. Groups may advance on enemy in a series of mock attacks to scare of intruder. Bolder meerkats may bite if preceding displays fail.

**Prey items:** Insects, spiders, scorpions, lizards, snakes, ground- nesting birds, small rodents, and plant material

**Predators:** Eagles, hawks, jackals, vultures, and snakes.

**Locomotion:** Quadruped that rise onto hind legs for hire vantage point.

**Activity:** Diurnal

**Interesting story / facts:** Meerkats are immune to venom of snakes and scorpions. They are excellent diggers that can dig their own weight in dirt in a matter of seconds.
**Bornean Orangutan**  
*Pongo pygmaeus pygmaeus*

**Range:** Found only on the island of Borneo in South East Asia. (A different subspecies is found only on Sumatra)

**Habitat:** Lowland swamp and primary forest

**Size:**  
- **Male:** Height: 0.97 m (3.2 ft); Weight: 90 kg (198 lbs)  
- **Female:** Height: 0.78 m (2.6 ft); Weight: 50 kg (110 lbs)

**Young:** A single baby about every 4-8 years

**Gestation:** 260-270 days

**Diet (wild):** Frugivore/Omnivore: 60% fruit (mainly figs); other plant materials including leaves, bark, flowers, and nuts; and rarely insects and small mammals

**Diet (zoo):** Monkey biscuits, banana, apple, carrot, green peppers and hard boiled eggs

**Lifespan (wild):** Up to 40 years

**Lifespan (captivity):** Up to 50

**Status:** Endangered, CITES Appendix I

**Threats:** Habitat loss and the capture of baby orangutans for sale

**Anatomy / Physiology:** Their coat coloration can vary from an orange to a brown to a maroon. They have a fringe of hair on their foreheads and the hair on their arms runs in both directions towards the elbow to help shed rain water. They have are mostly hairless, dished face (except that adults have whiskers on the cheek and chin). Their skull is narrow and heavy and there is no visible neck. Their muzzles are large and rounded. The adult males have fatty pads on the sides of their faces, deep-set eyes, and a large throat pouch that extends under the arms and over the shoulders. They have long arms and short legs. Their legs are able to be at right angles to the body for better maneuverability in the trees. Their hands are long, slender and prehensile with a thumb that is short and set close to the wrist. The feet are hook-like with a small big toe, similar to hands. Their fingers and toes have strongly curved nails.

**Social / Family units:** They are usually found singly or an adult female with her most recent offspring. Each individual needs large amounts of fruit and the patches of food in the rainforest are small. Each patch of food can only support one orangutan, so this forces them to be solitary and have little social interactions.

**Habits:** Orangutans have tremendous strength, which enables them hang upside down from branches for long periods of time in order to retrieve fruit. They shelter themselves from rain and sun by holding leafy branches over their heads, and when they make a night nest in the trees, will sometimes add a leafy roof.
**Communication:** They are generally quieter than other apes. The male has a long call lasting up to 2 min. This call is aided by a large throat sac so that it can be heard up to 1 km (0.62 mi) away through the dense vegetation. This call helps the male define his territory. Both sexes can also make a “squeak-kiss” noise that shows annoyance.

**Defensive / Aggressive behavior:** The males are very aggressive towards one another and their territories do not overlap.

**Predators:** They live high in the canopy to avoid predators; therefore they have no natural predators.

**Locomotion:** Even though they are able to walk upright for short distances (with all four limbs, using the knuckle pads on the back of the digits of the hands) orangutans travel mostly by brachiating (swinging from one branch to another by the arms) through trees, using well-worn corridors in the forest canopy.

**Activity:** Diurnal

**Interesting story / facts:** Orangutans are among the few creatures in the animal kingdom that use tools. They use sticks to dig termites out of termite mounds, stones to crack nuts, and leaves to soak up drinking water or to clean themselves.

They play an essential role as seed dispersers throughout the forest of Indonesia as they digest and eliminate waste. They choose select green leaves and shoots, and as doing so act as pruners that aid in regenerating plant growth.
South American Squirrel Monkey
*Saimiri sciureus*

**Taxonomy:** Disputed.

**Genus:** *Saimiri*  **Species:** *boliviensis, oerstedti, sciureus, ustus, vanzolinii*

**Range:** Brazil, Guyana, French Guiana, Suriname, Venezuela, Columbia

**Habitat:** Primary and secondary forests, riverine forests, mangroves and swamps.

**Size:** Body Length: 10-14 in; Tail Length: ~16 in; Weight: 1-3 lbs. Average weight of the females in 2006 was 1.75 lbs and the male weighed 2.31 lbs

**Young:** Usually 1 young

**Gestation:** 152-168 days

**Diet (wild):** Omnivore: fruits, nuts, insects, spiders, young birds, and bird eggs

**Diet (zoo):** Leaf eater biscuit, primate diet, fruits, vegetables, meal worms

**Life spans (wild):** 12-20 years.

**Life spans (captivity):** 8-12 years.

**Status:** Listed as a Species of Special Concern

**Threats:** Habitat loss, illegal hunting, capturing for pets, and medical research

**Anatomy/Physiology:** They usually have white fur around the eyes, ears, throat and sides of the neck. The top of the head ranges in color from black to grayish, and the back, forearms, hands and front feet are reddish or yellow. Their shoulders and hind feet are grayish, while their underside varies from white to yellow. They have a bi-colored tail with a black tip. The skin on their lips and around their nostrils is black and almost hairless. Their thighs are shorter than their lower legs to give them more jumping force.

**Social/Family units:** They live in bands of 12-100 individuals. The band is broken into subgroups; the male section, the female and infant section, and the juvenile section. The females dominate the bands with the mother and young forming the core of each band and the males are on the outskirts and only mingle with the females during breeding season.

**Habits:** Mostly arboreal, they seldom come to the ground due to danger from predators. They have a safety in numbers philosophy. They often eat in large groups and it is almost impossible for larger primates to chase them away from the food. They are not territorial and sometimes different bands will come together to feed.

**Communication:** They are usually quiet but they can make a loud high-pitched cry when they are alarmed. They also distribute a musky glandular secretion throughout their fur to mark their territory, to leave a trail for other troop members to follow, or to deter hunters from killing them for food.
In a "urine-washing" display the monkey, male or female of any age, urinates on its hands and feet and then wipes its hands and feet on its shoulders, arms, and legs, spreading the urine over its body. Some functions of "urine-washing" may include marking trails for other members of the group to follow, self-cleaning, displays of dominance, enhanced grasping of branches during locomotion, controlling body temperature through evaporative cooling, or communicating reproductive hormone levels.

**Defensive/Aggressive behavior:** When an alarm call is given the females and young become quiet while the males investigate.

**Predators:** Small cats, bird of prey, and snakes

**Locomotion:** There tail is not prehensile, but used for balance when traveling and feeding. They are agile and are good jumpers.

**Activity:** Diurnal.

**Any interesting story/fact:** Juveniles are born with a semi-prehensile tail, but loose the ability in adulthood. They are so agile that they make little to no noise when they jump through the trees. They can leap up to 8 ft in the trees.
Chilean Flamingo
*Phoenicopterus chilensis*

**Range:** Parts on Central Peru, both coasts of Southern America, Argentina, Uruguay, Paraguay, and Southern Brazil.

**Habitat:** Large alkaline or saline lakes or estuarine lagoons that usually lack vegetation, mangrove swamps, tidal flats, sandy islands, and inter-tidal zones.

**Size:** Height 4-5 ft; Weight 6-7 lbs; Wingspan 55-65”

**Young:** 1 egg

**Incubation:** 28-31 days

**Diet (wild):** Aquatic insects, larvae, and microscopic algae.

**Diet (zoo):** Pre-made flamingo diet

**Life spans (wild):** 20 years

**Life spans (captivity):** 44 years

**Status:** Threatened

**Threats:** People eat the eggs and are thought of as a delicacy. They also suffer from habitat destruction due to mining for minerals and the introduction of fish into lakes.

**Anatomy/Physiology:** They have a pinkish white plumage with black feathers underneath the wings. They have long pink legs which lock into place allowing for one-legged stance. The beak is adapted for pumping and filtering food from the water.

**Social/Family units:** They are very social birds and gather in large breeding colonies. They are seldom in groups less than 20 individuals.

**Habits:** They spend about 15% to 30% of their time during the day preening, which is more than most other waterfowl. Flamingos lower their necks and tilt their heads slightly upside-down, allowing their bills to hang upside down facing backward in the water when feeding.

**Communication:** They have a nasal honking, grunting or growling. They are generally noisy birds, they also communicate through visual displays including the wing salute as well as the head-flag.

**Defensive/Aggressive behavior:** They remain in large groups; which increases the possibility of predator detection and decreases the chance of an individual being attacked.

**Prey items:** Aquatic insects, larvae, algae

**Predators:** Marabou Stork, Tawny Eagle, Lappet-faced and White-headed Vultures, pythons, and feral pigs.
**Locomotion:** They are capable of long distance migration. They have been clocked flying at speeds up to 31-37 mph.

**Activity:** Breeding birds feed day or night. Non-breeding birds feed at night and spend day sleeping or engaged in comfort activities. Migration takes place mainly at night.

**Any interesting story/fact:** The majority of lakes where flamingos live have extremely high concentrations of salt. Chilean flamingos are scarce or absent in lakes with fish, but are found in large number in lakes where there are no fish to compete for food.
Ring-Tailed Lemur
*Lemur catta*

**Range:** Southern and southwestern Madagascar and a small population on the southeastern plateau of the Andringita Mountains

**Habitat:** They prefer gallery forests and Euphorbia Bush habitat, but they also live in many other types of forests. In the Berenty Reserve in southern Madagascar, Ring-tailed lemurs inhabit 3 different types of forest: the Ankoba Forest with Pithosolobium trees and a few tamarinds, figs and Melia; the Malaza forest with Tamarindus indicus, tall figs, Celtis, and Creteva - the subcanopy has lots of peppers and sometimes capers; and the spiny forest with Alaudia and Euphorbia, which look like cacti.

**Size:** Body length: 15-17 in; Tail length: 21-24 in; Weight: 5-8 lbs

**Young:** If they are healthy and well fed they will have twins

**Gestation:** 4 - 4 1/2 months.

**Diet (wild):** Herbivore: plants, leaves, flowers, fruit, even sap and bark, occasionally insects

**Diet (zoo):** Monkey biscuits, fruits, and vegetables

**Lifespan (wild):** Unknown

**Lifespan (captivity):** Up to 27 years.

**Status:** Threatened; IUCN/SSC Primate Specialist Group's Lemurs of Madagascar: An Action Plan for Their Conservation gave the species a "High Priority" rating (5)

**Threats:** Habitat loss due to fires, overgrazing by livestock, and tree cutting for charcoal production

**Anatomy / Physiology:** They have gray or rosy brown backs with lighter gray hind legs and stomach. They have a white face with black triangular markings around their eyes and black noses. They have a long tail that is black and white with a ringed pattern. They have the face of a fox and monkey-like hands and feet. They have opposable thumbs and opposable big toes.

**Social / Family units:** They are social and live in groups of 3-20 individuals. The females are the dominant sex. The males will move from troop to troop during mating season.

**Habits:** Even though the males are submissive, they are active socially. During the mating season they will practice infanticide, which is killing the offspring of a female. Females on the other hand are usually friendly towards the offspring of other females.
Groups of females switch infants, baby-sit, form play groups and even allow infants other than their own to nurse. They in an arid habitat, so they quench their thirst with juicy fruits. They sit on their haunches holding fruit in their hands and they delicately bite off pieces with the back teeth so the juice runs into their mouths and not on the fur.

**Communication:** They are one of the most vocal primates. They make grunting sounds, they bark, and they purr and mew like house cats. They also use their tails for 2 types of communication. First the black and white is a striking visual signal. Second, during ritualistic fights they will rub secretions from scent glands on their arms on the tail and wave it above their opponent’s head. The smelliest lemur wins.

**Defensive / Aggressive behavior:** They will wave their tails at intruders during mating season. When danger approaches they will make a loud call to alert the others. This call also maintains distance between troops.

**Predators:** Human hunting.

**Locomotion:** When on the forest floor they move quadrupedally,

**Activity:** Diurnal

**Interesting story / facts:** They also interact socially while feeding and sunbathing. They will sunbathe during the early morning hours before feeding. They will sit up right with their front legs resting on their hind legs, exposing their stomachs to the sun.

They are the only member of the lemur family that does not spend all of its time in the trees. In the wild, they spend about 15% of the daytime on the ground. In captivity they spend significantly more time on the ground, probably because they know they are safe.
White Faced Saki  
*Pithecia pithecia*

**Range:** Southern and Eastern Venezuela, Guianas, Northern Brazil.

**Habitat:** Tropical rainforests, prefer un-flooded areas, and are found up to 2300 feet.

**Size:**  
- **Male:** Body Length: 13.8-18.7 in; Tail Length: 12.3-19.9 in; Weight: 3.5 lbs  
- **Female:** Body Length: 11.7-16.6 in; Tail Length: 10-21.3 in; Weight: 3 lbs

**Young:** Give birth to only one offspring.

**Gestation:** 163-167 days.

**Diet (wild):** Omnivore: fruit, berries, honey, leaves, flowers, small mammals and small birds

**Diet (zoo):** Monkey biscuits, primate diet, fruits, and vegetables

**Lifespan (wild):** 15 years average.

**Lifespan (captivity):** up to 35

**Status:** Vulnerable, CITES Appendix II

**Threats:** Hunting for food and capturing them for pets

**Anatomy / Physiology:** Their coat color is black and it is thick, course, shaggy and long. The male has black muzzle surrounded by creamy-white hairs. Te female has a bright stripe of hair from beneath each eye to corner of mouth or chin. Their nose is flask-shaped with widely separated nostrils. Their legs are much longer than their arms. Their hands are prehensile and the thumbs are pseudo-opposable. Their lower front teeth are specialized for opening nuts and tough fruits in order to obtain the large nutritious seeds hidden within. This allows them to eat unripe fruit not palatable to most primates.

**Social / Family units:** They live in family groups of an adult male and female with their offspring.

**Habits:** Their young cling to the mother’s belly and later to her back. They are independent after 6 months. They tend to stay in the trees very rarely come to the ground. They sleep coiled up on branches like a cat.

**Communication:** They are silent in captivity but emit loud and penetrating call in wild. They have squeaks, whistles & trills, barks & grunts, and roars.

**Predators:** Large cats and birds of prey
**Locomotion:** They move on all fours and they are occasionally seen to running upright on horizontal branches. They are good climbers and can make long downward leaps in trees.

**Activity:** Diurnal

**Interesting story / facts:** In Guyana, their rapid hopping has earned them the name “Flying Jacks”. They do not have a prehensile tail. They spend most of their time 10-50 ft up in the trees. The long, thick coat of this monkey helps keep it dry from the heavy rains.