

# Animal Behavior

## Ethology

The focus of ethology is observing animal behavior under natural conditions; animal behavior is how an animal responds to the environment that surrounds it and to conditions within its body. Considering the natural behaviors of different species is especially important in zoos. It enables the keeper to encourage the performance of naturally occurring behaviors and also the discontinuance of undesirable behaviors.

Not every species behaves in the same way; a certain behavior exhibited by one species may mean one thing and a different species may exhibit that same behavior but it might mean something totally different. A great example of this is when NASA sent a chimpanzee into space; Ham was the first Hominidae launched into space, on 31 January 1961. News photos following Ham's successful flight showed a "smiling" chimpanzee among his human peers at NASA. But in reality, this "smile" expression of humans was actually a nervous/terrified reaction to his space flight.

Animal Behavior is important in understanding and managing threatened species and saving them from extinction. For good management of animals at the Zoo it is important to know:

- Where and why animals choose shelter
- When and what animals eat
- How and when animals reproduce
- Why animals live alone or in social groups
- How animals communicate with each other

Not all species exhibit the same behaviors, so it is important to know what are the natural behaviors of species when interpreting for the public.

# Animal Behavior

- All behaviors exist and persist over generations if the benefits derived from the behavior outweigh the detrimental costs of the behavior.
- Behaviors exist because they meet certain basic needs
- Adaptations are based on individual needs and must always benefit the individual



Ethologists ask how animals behave and why they behave as they do. All behaviors exist and persist over generations only if they give an animal a chance to pass on their genes successfully; benefits must outweigh costs of the behavior.

Animal behavior includes all the ways animals interact with other organisms and their physical environment.

The reason a species exhibits specific behaviors is based on one of more 4 basic needs; **survival value**, it is something needed to increase the survival rate of the species; **causation**, it happens as a result of something else being in place that leads to it; **development**, the behavior has been taught to each generation; and **evolutionary history**, it is something that has been improved upon through time.

Adaptations are based on individual needs, even if an animal is social; behaviors must always benefit the individual somehow, even if it is not always clear that is happening. Depending on what sense organs an animal has, it may react to temperature, light, sound, touch, taste, and smell. In addition, an animal responds to various stimuli from inside its body. Mating behavior, for example, depends almost entirely on the presence of various hormones in the body. Drives for food, water, and oxygen are triggered largely by events inside the body.

When observing animal behavior ask: (Note: these questions are based on Niko Tinbergen's work)

1. What is the function of the behavior? (survival value).
2. What makes an individual show a certain behavior? (causation)
3. How did an individual develop the ability to show this behavior? (development of behavior)
4. How did this behavior evolve? (evolution)

Optimal behavior of an animal would be to find sufficient food, find mates, and successfully rear offspring all while avoiding predators.

## Innate Versus Learned Behavior

- Innate behaviors are inherited genetically
- Learned behaviors are taught to each successive generation.
- Variations of innate and learned behaviors may exist within a population.



Charles Darwin showed how natural selection would favor various behavioral patterns for survival and reproduction. Some behaviors are "innate" or inherited. They are instinctive or hardwired. Other behaviors are learned and must be practiced.

In the 1970s, Konrad Lorenz was one of the pioneers in ethology and working with geese, he rediscovered the principle of imprinting. The picture here of Konrad Lorenz and his geese demonstrates this principle. Normally a gosling would follow its mother after birth but if the eggs were hatched using an incubator, the goslings would follow the first large object they found.

Primates live in social groups and parenting is mostly learned. Females are exposed to babies and to parenting before they become parents themselves.

Salmon returning to their spawning grounds is an innate behavior. They did not learn this from their parents.

Whooping cranes following their annual migration route is a learned behavior. Young birds would not under natural circumstances make their first trip alone.

The song of the brown-headed cowbird is innate. The cowbird is a nest parasite and lays its eggs in other birds' nests. Young cannot learn the species-specific song from a parent because the parents that raise them are a different species. Other birds learn their song from their male parent. Whether a song is learned or innate in birds varies from species to species.

Some anti-predator behavior is innate; an organism must be able to identify predatory threats and employ effective strategies to avoid detection by predators.

Innate versus learned brings up the debate of 'Nature versus Nurture'. Is a behavioral trait in our genes or is it learned? Expression of a trait that has a genetic basis depends on the environment; both genes and environment influence behaviors and most behaviors are influenced by more than one gene. So when looking at behaviors in a population you will see variations on a continuous scale among a population.

## Playing

- The young must practice skills they will need for survival in adulthood.
- Play is almost exclusive to mammals due to the more complex development of their nervous system.



Young mammals practice skills needed for adulthood by playing. Mammalian young are usually slow to leave the nest, which allows for a longer period of time for the parents to teach skills that are necessary for survival. Play allows animals to practice foraging skills and how to catch and hold moving objects. These are critical skills for lions and tigers in having a successful hunt.

Predators practice pouncing, biting and wrestling with their siblings and parents before the skills become critical for survival. Young hoofed mammals jump and run, perfecting moves that will someday help them avoid being a meal. These playful movements can help develop motor skills, which can be life-saving when avoiding predators.

Social play is most commonly found in young animals; they tumble around and fight without harming each other. Social play is crucial to the development of social skills that are key to success in both competitive and cooperative interactions. Animals play to practice their social behavior and how to act in response to others under different contexts.

## Competition for Resources

- All animals compete for finite resources.
- The benefits derived from the resource must always outweigh the risks taken to gain the resource.
- Animals adapt behaviors that make them successful competitors.



Animals must compete for finite resources with other species and within their own species. They must be successful competitors if the species and the individual within the species are to survive. The value of the resource must always outweigh the risk taken to gain that resource.

In order to improve their survival and reproductive success, some animals will establish a territory and restrict access to its resources, whether those resources be food or access to receptive females. The animal will advertise that it owns the area and, if necessary, chase others away. Animals will defend a territory, food source, its mate and babies, only if keeping the resource is worth the risk to themselves. The energy used to defend could be used for finding food and watching out for predators.

Other animals will take less beneficial resources to avoid fighting or using too much energy. The strategy that a species adopts for gaining resources gives them the best chance of survival.

## Social Dynamics



- There are both advantages and disadvantages to animals living in groups.
- The size of a group is limited by the number of resources available to support that group.

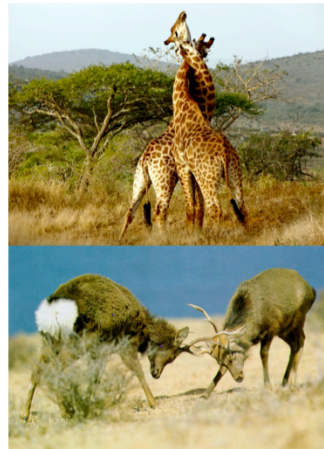
There are both advantages and disadvantages to animals living in groups. The primary advantage to herd behavior is the risk to individuals from predators decreases as the number of individuals living together increases. Predators are challenged when forced to identify and separate a single animal from a group awhile the chances of being singled out are diminished. Other advantages to living in groups include: more vigilance in predator detection, ability to capture certain prey, more individuals searching for food decreases time finding it, cooperation in rearing offspring, warmth, and protection. For example, lions are confused by the zebra stripes when the herd is together. The cats are unable to distinguish one zebra from another until one gets separated from the herd. Meerkats are able to protect their colony because one meerkat always stands guard ready to alert the others if there is a predator nearby. Observe Francois Langurs behavior when there is a newborn in the exhibit. How many other monkeys are tending the baby? Why is this behavior advantageous?

Disadvantages include: sharing resources, being lower in “pecking order,” groups can actually attract predators, dominance struggles may result in injuries, and disease may spread quickly though a group.

Groups have an optimal size where the available resources are sufficient to support the members of a group. Living in a group becomes a disadvantage when the balance between resources and the number of animals in the group is upset. In this situation, group members die until a new balance is achieved. Sometimes the imbalance comes from nature and sometimes it is caused by man.

## Social Dynamics

- Animals fight for a variety of reasons.
- Fighting to cause injury or death usually only occurs over mating.
- Less critical fighting involves ritualistic displays of dominance, strength and control of territory. valuable resources such as territory or access to females is less critical and usually results in ritualistic displays of dominance or contests of strength
- Fighting insures that the only the fittest survive to breed.



Males differ in reproductive success either because of their ability to attract females or because of their ability to compete with other males for mates. Fighting within a species can occur for several reasons. Generally animals fight over the right to mate, for control of territory and its resources, and for dominance.

Animals use a range of behaviors to intimidate intruders and defend their territories, that may or may not including fighting. This may include release of scents such as pheromones, urine and dung piles; it may also include visual marking of territory by marking trees such as cats. Rhinos like to create dung piles. As they walk their territory passing a dung heap they will urinate on it letting other rhino's know of their presence in the territory.

Not all fighting results in serious injury or death. Fighting to cause injury or death usually when it involves the ability pass one's genes onto the next generation. Usually males are fighting for the right to mate with the females. Male lions will fight other males to establish the right to mate with all of the females in a pride. This may result in a new male killing all existing cubs. The death of the cubs causes the females into estrus thereby allowing the new dominant male to mate and pass his genes onto the next generation.

A ritualized display is a display that can be used to dispute for mates, territory, and food through symbolic gestures instead of battles to the death. These behaviors provide specific information to others, usually members of its own species. Examples of this include the giraffe, where their dominance hierarchy is set up early in life and they engage in symbolic "necking" where the two males wrap their necks around each other. Rarely do giraffes engage in potentially lethal fights. Another example is rhinoceros' who forms dung middens (or piles) to mark his territory. The rhinos gather information such as age, sex, general health, and reproductive status of other rhinos from chemicals in the dung. Information gathered from the middens diminishes the need for rhinos in the same area to fight to establish each other's status.

Ringtail lemurs have "stink fights" whereby they rub their scent on their tails then proceed to bash another Ringtail lemur with their tail spreading their own scent on their opponent.

Much of this fighting insures that only the strongest and healthiest members of the species are able to breed insuring the survival of the species.

# Mating Systems

- Mating systems can either be **monogamous**, one partner, or **polygamous**, many partners.
- Monogamous couples tend to share in the care of the offspring.
- The system that maximizes reproductive success based on constraints such as life span, gestation, litter size, parental care will be the one used.
- Animals that live longer with long gestations tend to be more monogamous and devote time to parental care. Animals with short lifespans and short gestations tend to be promiscuous to get their genes represented quickly.



**Monogamy** is when a male and female form a pair, either for just the breeding season or long term, and many times share in care of the offspring. Examples of monogamous species at the zoo are howler monkeys, siamangs and penguins. Male and female Megellanic penguins will alternate leaving the nest to bring food back to their hungry chicks. In the case of pied tamarins, the alpha or dominant female typically produces twins and can conceive again shortly after giving birth. For that reason, the male primarily takes over the care of the young with some assistance from subservient females thereby reducing the burden on the pregnant female.

Most of our zoo animals have multiple partners in the wild. **Polygamy** is the mating of a male individual with two or more partners in a breeding season. The term **Polyandry** refers a female with multiple partners. Often when the female has multiple males, the males are responsible for care of the offspring. The opposite is true when the male has multiple partners. When langurs have a very young offspring in the exhibit, observe how the females compete to hold and nurture the baby. While male lions have little to do with rearing their cubs, lionesses will frequently nurse a cub other than their own. In the animal kingdom multiple group members caring for young is in the minority.

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## Social Groupings

- Solitary
- Pair
- Family
- Harem
- Matriarchy
- Lek or Arena



An animal is considered **solitary** if the adult male and female live alone and meet only in the breeding season. The female deals with the young without the help of the male, or in certain cases the male rears the young without the help of the female. Some of our zoo animals are solitary including the cats (except lions), the bears, red panda, anteater, and the komodo dragon.

A **pair** is defined as the male and female forming a strong attachment to one another and living together as a bonded pair. 90% of the birds form pairs and share the parental duties equally. In our zoo, siamangs, wrinkled hornbills, coscoroba swans and macaws exhibit pair bonding.

The **family** is an extension of the pair to include their juvenile and adult offspring. For example, in the case of the kookaburra, the previous seasons' offspring will often stay within the family group, helping to raise the next year's brood. The tamarins are another example of a species that lives in a family group of two to eight individuals typically including a breeding pair, one or two generations of offspring, and possibly other relatives.

**Dominance hierarchies** arise when individuals in a group are organized into social rankings that arises from aggressive competition for limited resources and mating opportunities. Rather than fight each time they meet, a social order is set up with a dominant animal and its subordinates. An alpha individual is the dominant individual. Alphas can be male or females and you can have an alpha male and an alpha female in a group, depending on the species. Many zoo animals exhibit this behavior. Chimpanzees and wolves have dominance hierarchies among the sexes where the male is dominant, whereas in meerkats and with most lemurs the female is the dominant sex in the overall group.

A large number of mammalian groupings consist of one dominant male and a **harem** of females. The size of the harem varies from species to species. Our western lowland gorillas exhibit this behavior.

A **matriarchy** is a social organizational form in which the mother or oldest female heads the family; the females stay together at the center of society, with the males on the outside. Hippos exhibit this grouping.

Some species have developed an all-male grouping of a special kind. In various bird species, the males all cluster together in the breeding season on a special patch of ground called a **lek** or **arena**. There each displays as vividly as he can. The females visit the arena and select the male of their choice, mate with him and then leave to rear the

# Communication



- Communication is a critical aspect of all social dynamics.
- Many different messages need to be clearly communicated and understood in the animal world.
- How animals convey these messages to each other involves complex signals utilizing visual, auditory, olfactory, chemical, and tactile cues; most of the time a combination of these messages act to get the meaning across.

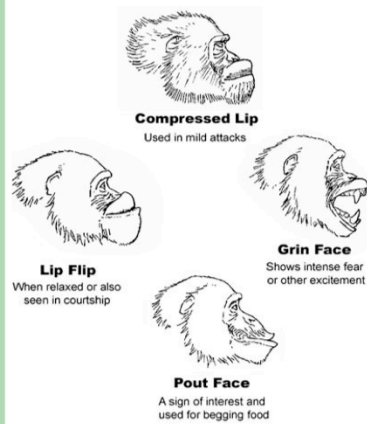
One of the most critical aspects of all social dynamics is communication; communication involves the transmission of signals through the environment between a 'sender' and a 'receiver'. Communication is important whether it is for sexual reasons and mate attraction, within a group in establishing group dynamics, between individuals meeting or even between predators and prey.

Signals alter the behavior of others and have evolved because of that effect. Animal signals are shaped by their physical, biological and social environments. Hundreds of things need to be clearly defined in the animal world such as, who are the leaders and who is subordinate, who is ready to mate and with whom, who may be dangerous, what is another individual's state of mind state, who belongs to the group, and that danger is immanent.

The function of communication may be manifold. It may be for sexual advertisement and mate attraction. Communication between parents and offspring is equally important; begging and recognition might provide parental care. Sharing environmental information might include predator alarms, or food locations but might be essential for an individuals survival. Communication is also used in territory defense and conflict resolution as well as integrating with other individuals socially via contact calls. Lastly, communication is important in protecting yourself from unwanted attention such as in predator defense by using warning coloration.

How animals convey these messages to each other involves complex signals and possibly a variety of senses; the signals may be visual, auditory, olfactory (chemical), electric fields or touch ( tactile cues ) such as grooming in primates. Most of the time a combination of these messages act to get the meaning across. Through communication, animals may influence the behavior of other animals.

## Mammal Societies



- Mammals form many complex societies where communication is critical
- Many mammals communicate by scent, deposited by glands on the face, feet or in waste, which tells other mammals about their reproductive status, territory, or to keep the group together
- Many mammals use vocalizations to advertise territory, give warning calls, or to keep the group together
- Body and tail postures, and facial expressions also play a large role in communication within species.

Mammals form many complex societies where communication is critical. These communication channels may include odor, sound, vision and touch. Many mammals communicate by scent, deposited by glands on the face, feet or in waste, which tells other mammals about their reproductive status, territory, or to keep the group together. The **pheromones** that they secrete trigger a social response in members of the same species and are important in mammals. They are released in response to stress, alarm, danger, and sexual fertility. In the ungulates and especially cat species, the animal may curl back its upper lips exposing its front teeth, inhale and then often hold this position for several seconds. The behavior facilitates the transfer of pheromones and other scents into the **vomer nasal organ (VMO or Jacobson organ)** located above the roof of the mouth.

Many mammals have vocalizations that achieve the same thing; they advertise territory, warning calls, gathering of the group together. These sounds can be high frequency or low frequency depending on the environment. The howler monkeys and elephants communicate in a low frequency in order to communicate over long distances. In contrast, animals with small home ranges communicate in a higher frequency sound, which serves to maintain contact among group members without attracting predators from a distance.

Body and tail postures, and facial expressions also play a large role in communication within species. Visual sign-posts are a mode of advertising a territory; these may be fecal deposits or dung heaps, or marks on the vegetation or ground. Visual marking of territory is often combined with other modes of animal communication. Animals use a range of behaviors to intimidate intruders and defend their territories; these may or may not including fighting. They set up dominance hierarchies.

In most primates and some sociable carnivores, grooming is an important social activity and functions not only to remove parasites but also in maintaining social bonds.

## Rhythms of Life



- Animals' lives are affected by rhythmic changes including daily, yearly, seasonal, moon phases, and resource cycling
- **Circadian rhythm** are patterns within a 24 hour day
- Seasonal rhythms which impact species are based on the changing position of the earth in relation to the sun.

Many of the activities of an organism occur in more or less rhythmic patterns during its life. Some, such as food gathering, rest, sanitation, and, in higher animals, play, usually occur every day. Others may be seasonal, such as reproduction or the hibernating to avoid the extreme conditions of winter.

**Circadian rhythm** is a biological process which is dictated by the daily 24 hour pattern of sunrise and sunset. Circadian rhythm governs when an organism is most or least physically active. Activity that occurs during the daylight hours is **diurnal** activity, at night is **nocturnal** activity, and twilight (either dawn or dusk) is **crepuscular** activity. Plants that close and open in 24 hour patterns also have a circadian rhythm. **Cathermal** activity are irregular bursts of activity throughout a 24 hour period.

Seasonality is very important as far as resource availability. Winter months have scarce resources, while in summer resources are abundant. The same can be said for dry vs. wet seasons. Plants can go dormant during harsh periods, and animals can **hibernate** or **estivate** until the return of resources.

**Hibernation** is a characteristic of temperate zone animals during periods of relatively low temperature and limited or inaccessible water due to snow and ice or scarce food sources. Many physiological changes occur during hibernation. The body temperature of true hibernators such as chipmunks and ground squirrels may drop below 40° and metabolism slows way down. These true hibernators must awaken every few days, raise their body temperatures to summer levels, eat stored food, and pass waste. In contrast, bears are not true hibernators and den up; a bear drops his body temperature to about 88° while respiration and metabolism also slow. This allows bears to react to danger quicker and allows the mother bears to respond to her cubs should they need care. The bears at the zoo do not hibernate because food and water are always available.

**Note: Brumation** is the hibernation-like state that ectothermic animals (reptiles and amphibians) utilize during very cold weather.

# Migrations

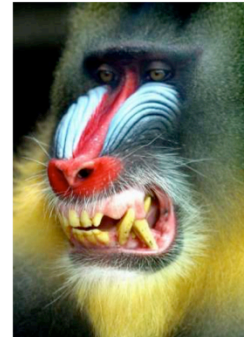


- Migrations over long distances are coordinated by rhythms, usually seasonal;
- Many animals will go from higher elevations to lower in montane habitats with the onset of winter
- Herds on the savanna will migrate overland to follow the growth of vegetation
- The birthing patterns of many species is based on migration patterns.

Migrations over long distances are coordinated by rhythms, usually seasonal; birds, whales, and some insects migrate with the onset of changing weather patterns. Many animals will go from higher elevations to lower in montane habitats with the onset of winter. Herds on the savanna will migrate overland to follow the growth of vegetation and the water. The zebras usually go first as they prefer the tall coarse grasses. The wildebeest and gazelle follow after as they prefer the now exposed shorter more succulent blades. For many species birthing is synced with migration patterns to insure that the young are born where food is most plentiful. Salmon migrate up rivers to their spawning grounds.

## Animal's Sensory World

- An animals senses differ from our own
- Honeybees and birds are able to see UV light
- Sharks have electroreceptors
- Snakes have infrared thermal sensors
- Reptiles have photoreceptors
- **Jacobson's Organ** enhance smell in many animals



One of the complications in interpreting animal behavior is that animal senses differ from our own. Be careful when attributing human qualities to nonhumans. **Anthropomorphism** can help connect a visitor to an animal, but at the same time it can be misleading. Try to avoid placing human emotions on the animals; we know animals have feelings but don't know what these feelings are. This is the case with HAM the chimpanzee who was sent into space. Upon his return they opened the capsule and he appeared to be grinning but HAM was actually petrified. Grinning is considered a threat in many primates. Around primates you should not show your teeth. They get agitated and stressed. The important point here is that behavior varies quite a lot from species to species and you shouldn't be quick to attribute human qualities to these behaviors. An animal's motivation for doing something may not be the same as our own. To summarize, you can draw on human experiences to think about animal behavior. But you should avoid attributing human emotional experiences to explain the behavior of animals.

Animals that live in the same environment may respond to the same situation differently. Each species is unique. Their behavioral responses will be based on the specific needs of that individual or species.

Animals have a different sensory world than we do. Birds use the direction of the sun or the stars and even under cloudy skies they use Earth's magnetic field to navigate. Honeybees and other insects see ultraviolet light to locate the patterns in flowers. Birds also see in UV light. Sharks navigate by electroreceptors. Pythons and rattlesnakes have heat-sensing infrared pits that help them to locate prey. Reptiles have a **parietal eye** or **pineal eye** that is able to detect changes in light.

**Jacobson's Organ** is an olfactory system seen in amphibians, reptiles, and mammals and is useful in communicating chemical messages, such as readiness for sexual activity, between members of the same species. The organ helps reptiles such as snakes & the Komodo dragon to

## Enrichment at the Zoo

- **Enrichment** can take many forms. Any stimulus which evokes an animal's interest in a positive way can be considered enriching
- **Enrichment** promotes species-appropriate behaviors and enhances overall well-being
- Guest, animal and keeper all benefit



**Enrichment** is defined by the AZA Behavior Advisory Group (1999) as “a dynamic process which structures and changes an animal’s environment in a way that provides behavioral choices to animals and draws out their species-appropriate behaviors and abilities and enhances their welfare.” Formulating a structured enrichment program facilitates efficient animal maintenance and health care, reduces animal stress and abnormal behaviors, and enhances the visitor’s experience by providing the opportunity to observe natural behaviors.

Enrichment might be foods or feeding strategies, sensory (tactile, auditory, olfactory), environmental (exhibit features, substrates, mixed species), social, manipulative items/toys, or training. Notice items such as mirrors, balls, boxes, platforms, waterfalls, pools in various exhibits. Mixed species exhibits are a form of enrichment too.

At the zoo, the care of an animal should maximize species-specific behaviors and minimize stress induced behaviors.

Enrichment increases natural behaviors, reduces/eliminates abnormal behavior and stress, increases exploration and use of space, and provides challenges. Invite zoo visitors to look at an exhibit and see how many enrichments they can find in the exhibit. Ask them what the relationship is between the enrichment and the animal’s natural behavior.

The Zoo Docents have contributed to animal enrichment through their fundraising activities. The button making sales have allowed the docents to make large donations to the animal divisions. This include hammocks for the gorillas and black bears, an ice making machine for the carnivores, balls and toys for hoofstock and birds, as well as the raised platform in Grotto D of the cat exhibit.

# Domestication



- Animals and humans have been linked since the first human evolved
- Humans have used animals for a variety of purposes
- Domesticated animals have become dependent on man over a long period of time.
- Wild animals are a result of natural selection but domestic animals are a result of selective breeding.

Animals can be mainly divided into two categories, wild and domestic. Wild animals live without direct influence from the human, whereas domestic animals live under the care of humans. Wild animals are a result of natural selection whereas domestic animals are a result of selective breeding. Domestication should not be confused with taming. Taming is the conditioned behavioral modification of a wild-born animal when its natural avoidance of humans is reduced and it accepts the presence of humans, but domestication is the permanent genetic modification of a bred lineage that leads to an inherited predisposition toward humans. Animals and humans have been linked since the first human species evolved. Over time, humans have used animals as food, beasts of burden, companions, clothing, recreation, scientific subjects, medicine, and even revered them as gods. Domestic animals fall into three categories, companions, livestock, and working animals. There are only few species that have become completely domesticated such as dogs, chicken, or cattle. Humans control their behaviors, feeding, and other biological requirements.

The specific economic application of domesticated animals did not appear at once. The ancestors of modern wolves probably hung around camps, eventually accompanying hunters and then acting as guard animals. Over the course of time, wolves evolved to become the domesticated animals we call dogs. Like their wolf ancestors, dogs probably accompanied hunters and helped them hunt wild animals and guarded human settlements warning the inhabitants of possible danger. At the same time, they were eaten by humans, which was probably their main importance during the first stages of domestication.

Sheep and goats were also eaten in the initial stages of domestication but later became valuable for producing the commodities of milk and wool.

The domestication of animals is having a huge impact on human's ecological footprint. Meat and dairy are among the largest contributors to the world's growing carbon footprint. Much of the world's agricultural land is devoted to growing food for domesticated animals rather than people. Cats and dogs consume food which is mostly meat which has a greater footprint on our environment than plants. In addition, the very large number of feral cats and dogs around the world are responsible for predation on native species, both animal and plant and can be responsible for the spread of diseases.

## Key Behavior Concepts

- Animal behaviors exist because they benefit the animal's survival and make them successful competitors.
- Animals have a different sensory world than humans; avoid attributing human emotional experiences to explain the behavior of animals
- Communication among animals is essential and takes many different forms.
- Understanding an animal's natural behavior can help in the caring of these animals at the zoo and interpreting a behavior for the public.

Corresponds with pages 20-25 of the Zoology Study Guide and Enrichment Study Guide in the Docent Notebook.

## Key Behavior Vocabulary

- Ethology
- Dominance hierarchy
- Harem, matriarchy, lek
- Diurnal, nocturnal, crepuscular, cathermal
- Hibernation, estivation, brumation
- Monogomy, polygomy, polyandry
- Anthropomorphism
- Flehmen response, Jacobson Organ, pheromones
- Enrichment
- Migration
- Domestication

Definitions:

**Anthropomorphism:** attributing human qualities to nonhumans.

**Brumation:** hibernation-like state that ectothermic animals utilize during very cold weather.

**Cathermal:** irregular bursts of activity throughout a 24 hour period.

**Crepuscular:** relating to activity occurring during the twilight hours, of dawn or dusk.

**Domestication:** the process of altering an animal's natural behaviors to serve the purposes of man.

**Diurnal:** relating to activity occurring during the daylight hours.

**Dominance hierarchy:** organization of individuals into social rankings that arises from aggressive competition for limited resources and mating opportunities.

**Enrichment:** a dynamic process for enhancing animal environments to encourage an animal's natural behavior in the wild.

**Estivation:** to spend the hot or dry months in a sleep-like state with a reduction in body temperature, heart rate, and breathing.

**Ethology:** the study of animal behavior.

**Flehmen response:** specialized sniffing behavior many animals use to transfer of pheromones and other scents into the Jacobson organ. Particularly characteristic of cats.

**Harem:** a group of females controlled by one male, usual of polygamous animals.

**Hibernation:** a period of dormancy and inactivity, varying in length depending on the organism and occurring in cold seasons; metabolic processes are greatly slowed and, in mammals, body temperature may drop.

**Matriarchy:** an organized group in which females are dominant.

**Migration:** seasonal movement of animals from one region to another.

**Nocturnal:** relating to activity occurring during the night hours.

**Monogomy:** Couples mate for life,

**Pheromones:** chemicals secreted into the environment to ward off predators or to attract the opposite sex of the same species.

**Polyandry:** A female has multiple male partners

**Polygomy:** a male has multiple female partners

**Vomeranasa organ (VMO or Jacobson organ):** an auxiliary olfactory sense organ that is found in many animals that functions to the interpretation of pheromones and estrous scents.