

TOUR: ANIMAL ADAPTATIONS

OBJECTIVES

Audience will understand the concept of animal adaptations and how those adaptations give them a better chance of surviving in the wild. They should be able to differentiate between physical and behavioral adaptations and understand that animals typically have adaptive behaviors that correspond to each physical adaptation. In addition, audience should understand that by observing physical adaptations of a species we can often predict/deduce many of their behaviors and habitat use.

KEY TERMS

Physical adaptations, behavioral adaptations, behavior, tools, habitat, instinct, learned, camouflage, prehensile, eye/ear location,

BEFORE YOU START

Discuss with the other docents where each of you will start. Remember that visiting a diverse selection of animals will allow you to compare and contrast their different adaptations. Do not forget about the coral reef exhibit—many of the topics for this tour can be seen/interpreted there.

GETTING STARTED

It is important that right at the beginning of your tour you establish a good understanding of the definition of adaptations. Animals depend on their physical features (parts of their bodies they use as “tools”) to enable them to survive in their habitat. They use these tools to help them obtain food, keep safe, build homes, withstand weather, attract mates, etc. These tools or physical features are called physical adaptations. Physical adaptations do not develop during an animal’s life but over many generations. The shape of a bird’s beak, the number of fingers, color of the fur, the thickness or thinness of the fur, the shape of the nose or ears are all examples of physical adaptations which help different animals to survive.

Note: During this discussion, make sure it is a discussion. Ask your audience questions, have them give examples of physical adaptations and as they do, have them also determine how that adaptation may help the animal survive better in the wild. Whatever exhibit you are standing next to, have them point out some physical adaptations on that particular animal.

Helpful hint: For younger audiences, having them repeat new terms like “adaptation” as a group a 2–3 times helps them retain the term more readily. After you have established a good understanding of physical adaptations, then you should introduce the concept of behavioral adaptations. Behavior is any activity an animal does with its body. Behavioral adaptations are actions an animal takes (behaviors) that help it survive. Give examples: a wolf trotting with its nose to the

ground—this behavior allows them to find prey, by using two of its physical adaptations—a great sense of smell (long nose filled with scent receptors) and a body with special legs and shoulders that is built for covering great distances without tiring. After you give them a couple of examples, ask your audience to give a few of their own. As they give examples of behavioral adaptations, help them determine some of the physical adaptations (tools) that are used during those behaviors.

Helpful hint: If you cover eye/ear placement of prey/predators early on in your tour, you can have the audience tell you whether or not each mammal you visit is a prey animal or predator by using just that information.

PPZ ANIMALS

Following is a list of some of the animal exhibits along with some suggestions which point out a few of the many ways in which you can use the animals to highlight and illustrate the concepts and terms listed above. Remember, these are only a few suggestions. Be sure to consult the animal data sheets for more detailed information on their various adaptations.

Arctic fox: Note placement of eyes and ears; seasonal variation in color of fur, thickness of winter fur, camouflage. Behavioral adaptations: Curling up body with thick tail in front of their face when its extremely cold; when food is really scarce in the winter, they have been known to scavenge polar bear kills.

North American river otter: Note placement of eyes and ears; webbed feet, tail used as rudder, dense under fur which traps air for insulation—these adaptations allow otters to be experts at catching fish.

Bald eagle: Note placement of eyes; incredible eyesight for detecting at great distances (prey can be spotted over 1 mile away); will scavenge, especially in the winter when food is scarce; will also migrate (a few miles or a thousand) in the winter to find ice-free water; will occasionally steal fish from osprey, another raptor—which is even better at catching fish than the eagle; large, wide wings are designed for gliding and soaring—an energy efficient way to search for food

Gray wolf: Note placement of eyes and ears; wolves are social (pack) and hunt their (which are often much larger that they are) as a well-coordinated team; like most large predators, they have “feast or famine biology”—kills may be several days apart and they can take advantage of hunting success by consuming very large amount of meat, up to 20 pounds! Wolves locate prey with their incredible sense of smell—up to a thousand times better than ours. Bodies are built to travel long distances (smooth, energy efficient trot) they can cover 50+ miles in one day!

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Farm yard: Yaks, goats and reindeer/caribou are ruminants, an adaptation for digesting hard to digest foods; caribou make long migrations twice each year to find food on the tundra, extra large hooves help prevent them from sinking in deep snow and/or wet, spongy tundra of the summer.

Kangaroo/wallaby: Pouch is used to keep joeys safe; large hind legs give them ability to leap great distances: long, large tail serves as support and balance

Camels: Note placement of eyes and ears; discuss the camel's hump (if you ask what is in the hump, most people will say "water") and fat storage—humps are much larger in the fall and winter; camels are ruminants; camel bodies are very efficient in their use and conservation of water; camels can drink up to 30 gallons of water once they do come across some in the desert. Camels can defend themselves from predators by biting and kicking—unlike horses and donkeys, they can kick in all four directions.

Eagle owls: Describe some of the many adaptations they have which are used in procuring food—night vision, great hearing, silent flight, powerful feet, sharp talons, hooked beak, etc.

Patagonian maras: Note placement of eyes and ears; like rabbits, these animals, produce two types of fecal pellets: soft ones which are re-ingested (to get more nutrition from their poorly digested food; eating of feces is called coprophagy); and firm pellets which are not re-ingested; use cryptic camouflage. Note: You can talk about predators of the maras (jaguars, eagles) and lead into a discussion of the differences in adaptations between predators and their prey.

Spider monkeys: Their prehensile tail allows their hands to be free to pick fruit and grab insects. Being social gives them multiple eyes and noses to find food and to detect predators.

Magellanic penguins: Exhibit counter-shading; insulate bodies with down and fat, webbed feet, wings modified into flippers; talk about the parents taking turns with incubation and feeding of the young.

PRIMATE BUILDING

Mandrills: Their bright colors on faces and rumps used for communication; males have large canines for defense and intimidation of male rivals; social groups (troupe) allow for predator detection and defense

Big cats: Note placement of eyes and ears; extremely powerful jaws and legs; sprinters, not endurance; retractable claws; spend most of their day resting, conserving energy; have very elastic stomachs and can consume large amounts of meat when they make a kill.

Lions: are only social large cats (pride), often hunt extremely large prey; utilize cryptic camouflage contrast this with the disruptive coloration of zebras, one of their prey.

Amur tigers and snow leopards: Have fur with color patterns than can function as either cryptic or disruptive depending on the color of the habitat; both are solitary; have extra heavy winter coats.

BIRD/REPTILE BUILDING:

Birds: discuss differences in bills, gizzards and use of grit, crops and food storage; placement of eyes, type of feet, length of legs; types, shapes and colors of feathers

Snakes: Loosely hinged jaw for swallowing large prey; either constrictors, swallow prey while still alive (garter snakes), or are venomous; tongue is used for taste/smell; some have heat sensing pits (Massassauga rattlesnake), cryptic camouflage.

Lizards: Cryptic camouflage; tongue used for taste/smell; have eyelids; have ears

Amphibians: All of our species are carnivorous; poison dart frogs use bright colors to warn predators, frogs' tongues attach at the front of their mouths and are sticky—the tongue is flicked out to capture insects and other small prey. Zoo diet: Varies with species: meal worms, crickets, wax worms, fish.

BACK YARD GARDENS:

Snakes: Relevance of camouflage; hiding places to escape predators, ambush prey; habitat for prey species—insects, rodents, etc.; nesting; sun/shade for thermoregulation.

Birds: Sources of food: nectar (hummingbirds), insects, seeds; nest sites (both natural and man-made); escape cover from predators; shelter from wind and precipitation; camouflage; sexual dimorphism; territories.

Mammals: Food—vegetation for herbivores/omnivores and prey for carnivores/omnivores; escape cover; shelter—vegetation, brush piles, wood chuck burrows; nesting/birthing areas; camouflage (e.g., mice and rabbits)

MIDDLE/HIGH SCHOOL

In addition to more depth and detail with the above topics, you can add discussion of the following terms and concepts: natural selection, evolution, simultaneous calving, coprophagy, ruminants.

Natural selection: the gradual, nonrandom process by biological traits which become either more or less common in a as a function of differential reproduction of their bearers. It is a key mechanism of evolution—"survival of the fittest." One way to help them understand natural selection—have them give examples of domestication in animals selective breeding in plants. Then give examples of some of our zoo animals.

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Evolution: Evolution is any change across successive generations in the heritable characteristics of biological populations. Think of it as natural selection on a large scale and over a longer period of time. Due to environmental pressures, natural selection is a continuous process and thus species are constantly evolving. Fossil records and genetic research provide the scientific basis of evolution.

Carnassial teeth: These large, pointy teeth are upper and lower teeth (either molars or premolars and molars) modified in such a way as to allow enlarged and often self-sharpening edges to pass by each other in a shearing manner. In some carnivores, such as the cats, the carnassial teeth are well-developed. Other carnivores, such as the bears, In others, are less-developed and have become adapted to an omnivorous or even herbivorous diet.

Simultaneous/synchronized calving: A strategy utilized by several species of large ungulates in which most of the population gives birth within a very short period of time. In the Serengeti in Africa, 500,000 wildebeest calves are born within a 2–3 week period. In northern Canada and Alaska, 80–90 percent of all caribou calves are born within a 10-day period in early June. The synchronization serves two important functions: it reduces the chance that an individual calf will be killed by predators and calving almost always coincides with the peak abundance of nutritious plants.

Coprophagy: This is a behavioral digestive process seen in rabbits, hares, guinea pigs, most rodents and several other mammal species. Literally translated, coprophagy means “feces ingestion.” However, in the species mentioned above it involves the production of special “soft pellets” in the cecum, which maintains cultures of beneficial bacteria. These soft pellets have twice the protein, and half of the fiber of the typical hard fecal pellet. They also contain high levels of vitamin K and B vitamins and are usually immediately ingested after being expelled.

Ruminants: Ruminants have a fore-stomach with four chambers. These are the rumen, reticulum, omasum, and abomasum. In the first two chambers, the rumen and the reticulum, the food is mixed with saliva and separates into layers of solid and liquid material. Solids clump together to form the cud (or bolus). The cud is then regurgitated, chewed slowly to completely mix it with saliva and to break down the particle size. Plant fibers, is primarily broken down in these chambers by microbes (bacteria, protozoa, and fungi). Ruminating mammals include cattle, goats, sheep, giraffes, American bison, European bison, yaks, water buffalo, deer, camels, alpacas, llamas, wildebeest, antelope, and pronghorn.