

Encounter/Outreach - 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 what you would like to take. Remember that taking a diverse selection of animals, artifacts and biofacts will better allow you to compare and contrast their different adaptations.

Getting Started: It is important that right at the beginning of your presentation 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, feathers or skin, 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. Another suggestion is to have one of the students pick a wild animal (any species). Then have others 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, ie: 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 presentation, you can have the audience tell you whether or not each mammal you show is a prey animal or predator by using just that information.

Following is a list of some outreach animals, artifacts and biofacts along with some suggestions which point out a few of the many ways in which you can use them 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.

PELTS:

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

Eastern Grey Wolf: Note placement of eyes and ears; wolves are social (pack) and hunt their (which are often much larger than 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!

Amur tiger and snow leopard: Have fur with color patterns that can function as either **cryptic** or **disruptive** depending on the color of the habitat; both are solitary; have extra heavy winter coats. 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; eyes in front...

Zebra: Stripes have several possible **adaptive** functions: 1) visual cues and identification; 2) **camouflage** – since lions are thought to be colorblind, stripes blend in with tall grasses: 3) **Disruptive coloration** –the kaleidoscope-like swirling of stripes when a herd takes off may confuse predators; 4) **Disruptive coloration** –the stripes serve to confuse the visual system of the disease-spreading tsetse fly. Eyes on side...

Fur seal: Have fur that exhibits **counter-shading**. Discuss situations where this **camouflage** is effective against sharks—their number one predator. Other adaptations: Blubber for insulation and food reserves; front and hind limbs modified into flippers.

Caribou: **Cryptic camouflage**; hollow hair in winter coat –insulates very well; it’s a **ruminant** – has a four part stomach that utilizes microbes to help digest food. Eyes on the side...

Education Animals: Note that these are just some suggestions. Every education animal has many adaptations to highlight –both physical and behavioral.

Tenrec: Small eyes, short ears, short legs with long-clawed feet –are all **adaptations** for digging up prey & living in burrows; **cryptic camouflage** –same color as rain forest leaf litter; short, sharp teeth for cracking exoskeleton of insects; spiky hair for defense: curling up into a ball when faced with a predator –stretches skin tight to make spiky hair effective and hides the unprotected face and belly.

Chinchilla: Dense fur (50-100 hairs/follicle); eyes on side...; uses latrines: dusts to clean fur

European ferret: Short legs, small eyes, small ears –for hunting in burrows; eyes in front...; carnivore teeth; as a mustelid, produces strong scent –used for communication: great sense of smell.

Yellow-naped Amazon Parrot: Heavy hooked bill: **Cryptic** green color for hiding in rain forest, but bright red and blue on tail and wings so pair can keep track of each other when flying through a sea of green leaves; eyes on side...; two toes in front/back allow for better grip of branches;

ability to **mimic** –can fool competitors or predators that there is danger nearby.

American Kestrel: Long, narrow, boomerang-shaped wings –allow high speed dives and turns: hooked beak for tearing prey; talons for catching prey.

Peregrine falcon: Long, narrow, boomerang-shaped wings –allow high speed dives and turns: hooked beak for tearing prey; talons for catching prey; gray color on back is cryptic camouflage for rocky outcroppings in likes to nest on; baffles in the nares allow for breathing during high speed dives (at nearly 200mph!)

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.

Spotted turtle: Body protected by shell; during winter can hibernate in mud on bottom of pond – slows down heart rate (5-10/minute) and absorbs oxygen through skin of throat and anus. After mating, females can store sperm for several years. Females lay eggs in sandy soil rely on sun to warm soil enough for eggs to develop.

Eastern Box turtle: Body protected by shell; during winter can hibernate in abandoned burrows in forest –slows down heart rate (5-10/minute) and absorbs oxygen through skin of throat and anus. After mating, females can store sperm for several years. Females lay eggs in sandy soil rely on sun to warm soil enough for eggs to develop.

Eastern fox snake: **Cryptic camouflage**; Kills prey by constriction; uses tongue and Jacobsen's organ to smell/taste the air; teeth are sharp and angled back toward mouth to keep prey from escaping.

Sinaloan milk snake: **Mimicry form of camouflage**; Kills prey by constriction; uses tongue and Jacobsen's organ to smell/taste the air; teeth are sharp and angled back toward mouth to keep prey from escaping; often eats other snakes, including venomous species –has some immunity to snake venom.

Blue-tongued skink: Uses tongue and Jacobsen's organ to smell/taste the air; teeth are sharp and angled back toward mouth to keep prey from escaping; stores fat in tail during rainy season (abundant food) and uses fat reserves if needed during dry season.

Reptiles in general: Are cold-blooded and thermo-regulate by sunning, finding shade, using burrows; in/out of water.

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 is 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.

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 (premolar and first molar), found in many carnivorous mammals, are used for shearing flesh and bone in a scissor or shear-like way. Many

modern carnivorans, e.g. lions, eat meat from other vertebrates or invertebrates and have well-developed carnassial teeth. In others, the carnassial teeth have become adapted to an herbivorous or to an omnivorous, mixed diet of meat and vegetable. The premolars and molars of modern bears are modified to grind vegetable matter.

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% of all caribou calves are born within a ten 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 the 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.