

PREDATOR & PREY: ADAPTATIONS

Royal Saskatchewan Museum



Saskatchewan
Ministry of
Parks, Culture
and Sport

PREDATOR & PREY: ADAPTATIONS

For further information please contact:

Public Programs
Royal Saskatchewan Museum
2445 Albert Street
Regina, Saskatchewan
S4P 4W7
Email: education@royalsaskmuseum.ca
Website: www.royalsaskmuseum.ca

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Illustrations by Paul Geraghty

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This booklet has been produced for teachers and students researching the natural history of Saskatchewan.

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Vocabulary

Adaptation: A gradual, but continuous process of change from one generation of a species to the next.

Antlers: A bony outgrowth or horn, usually branched, on the head of various members of the deer family.

Camouflage: Concealment by disguise or protective colouring.

Carnivore: A flesh-eating animal.

Defence: Protecting oneself from harm.

Ecosystem: A community, together with its environment, functioning as a unit.

Food chain: A community of organisms where each member is eaten in turn by another member.

Herbivore: An animal that feeds mainly on plants.

Omnivore: An animal that feeds on both plants and other animals.

Predator: An animal that hunts and seizes other animals for food.

Prey: An animal that is hunted and eaten by a predator.

Scavenger: An animal that feeds on dead or decaying matter.

Stalk: To track prey in a secretive manner.

Talon: The claw of a bird of prey.

Trophic level: A group of organisms that occupies the same position in the food chain.

Background Information

Predator/prey relations are vital in maintaining a healthy ecosystem. The environment depends on the balance between the skills of the predator and the defence of its prey. Each side must adapt to its changing environment in order to survive. If the prey can move, the predator must adapt and move faster. If animals do not adapt they are eaten or they starve.

Food Chain

A food chain is a picture or model that illustrates the flow of energy in an environment. It is arranged in steps or levels called trophic levels. The base of the food chain, or the first trophic level, is plants. Plants are referred to as producers because they are able to produce their own food. They do this by capturing and storing the sun's energy and using it to convert inorganic compounds into organic compounds. This process is called photosynthesis, the method in which plants use water, carbon dioxide, and sunlight energy to make sugar. This stored energy is vital to the food chain because it is in a form that can be passed on to anything that consumes it, giving the consumer energy.

Consumers are all organisms that cannot make their own food; they obtain food by eating other organisms such as plants and/or other animals. Consumers are placed in one of three categories:

- 1) Herbivores: Plant eaters.
- 2) Carnivores: Eat other animals.
- 3) Omnivores: Eat both plants and animals.

Herbivores are classed as primary consumers and are at the second trophic level. Carnivores that prey on herbivores are secondary consumers at the third trophic level. Those animals that prey on other carnivores are tertiary consumers found at the fourth trophic level. At the end of the food chain are the decomposers. Decomposers are the bacteria and fungi that break down the bodies of dead animals and plants. The nutrients that come from this decomposition become part of the soil that is re-used by new plants that are found at the beginning of the food chain.

The transfer of energy in an environment is also illustrated through a food web diagram. A food web is made up of smaller food chains which are interconnected. It is a complicated system of relationships between plants, animals, and energy.

Prey Defence

Prey animals must constantly be on the lookout for their predators. In order to survive, they must escape from or defend themselves against those animals trying to eat them. The main principle of feeding is to find and catch food for yourself, while not being caught as food by another animal. Many prey animals have developed different adaptations to protect themselves from becoming another animal's dinner. Camouflage, highly developed senses, warning signals, and different defensive weapons and behaviours are all used by prey animals for survival.

Camouflage

Camouflage is an adaptation in which a species evolves to resemble its background. It is the technique used by many animals of resembling and blending in with their surroundings. It is a kind of colouring, body shape, and/or behaviour which animals use to confuse, distract, startle, or hide. It is used by both sides in the battle for survival. Prey animals use camouflage to remain undetected by their predators; predators use camouflage to sneak up, unseen, by their prey.



White-tailed Jack Rabbit

There are three basic kinds of camouflage: colour resemblance, counter shading, and disruptive colouration.

1. Colour resemblance: An animal's colour resembles its natural environment. This helps the animal to not be seen while still in plain view. Some animals such as the Snowshoe Hare and Ptarmigan adapt seasonally. Come winter, their colour changes to white, which helps them blend in with the snow. In the spring, as the snow melts and grass and shrubs start to emerge, their colour changes back to brown, to blend in with the surrounding environment. If they did not change to white in the winter, they would be easily spotted against the white snow, and many would not make it to the next spring.

2. Counter Shading: Camouflage designed to hide an animal's three-dimensional form. Animals such as the Canada Goose, mice, and the White-tailed Deer use counter shading. They are lighter on their bellies and darker on their backs. When seen from a distance, the two colours blend together, making it difficult to pick out the animal's outline from surrounding patterns.

3. Disruptive Colouration: Markings that disguise the animal among its surroundings. It leads the eye away from its shape and into the background. It makes the shape of the animal harder to pick out from the other shapes around it. Animals that have patterns of spots, stripes, or uneven patches use this method of camouflage. The deer fawn uses disruptive colouration when it is lying still in the grass. Its spotted coat looks like patches of sunlight falling on the forest floor.

Senses

Prey animals often rely on escape as their form of protection. Therefore, they must have a well-developed sense of sight, hearing, and smell so they can detect the presence of a predator in enough time to escape.

Sight: Prey animals need all-around vision to see advancing predators. Therefore, their eyes are located on the sides of their head, which gives them a wide field of vision. They are able to look in either direction and are sensitive to the slightest movements.

Hearing: A well-developed sense of hearing is essential for the survival of prey animals. Many can hear a predator approaching long before they can see it. They can pick out the direction the sound is coming from, enabling them to escape in the direction heading away from the predator.

Smell: An animal's sense of smell is much more developed than a human's. Prey animals can detect an approaching predator from a great distance. They are then able to send a signal, warning other animals of the lurking danger.

Warning Signals

Warning signals are used to scare away predators and to warn other animals. Many will call out with a warning call. Others may warn each other by a visual cue like raising a tail. Some animals are poisonous, taste bad, or have a painful bite or sting. Many of these animals are brightly coloured with bold patterns. These colours serve as a warning signal to predators. After one bad experience with a prey's sting, spray, or poison, a predator will usually learn to recognise the colours and leave it alone.

Alarms: Prey animals sometimes make a lot of noise when they are attacked, hoping to scare the predator away or at least warn others of the danger. Alarm calls are especially important for protecting young. If a predator threatens offspring that are being tended by their parents, at least one of the watchful adults will immediately sound the alarm.



Pronghorn

Visual signals: While many animals make sounds to warn each other, others signal each other visually. For example, when one animal senses an approaching predator, it might flash a bright patch of colour or hold its tail straight up, which are signals that can be easily seen by others. These signals tell others that danger is near, giving them a chance to escape.

White-tailed Deer

The White-tailed Deer uses a couple of methods to warn of approaching danger. When it senses a predator, it gives a low sneezing-type whistle to alert the herd. As the deer is fleeing, it lifts its tail to reveal its white backside. This signal can be seen at a great distance, warning those who are further away.

Skunk

A skunk is most commonly associated with its bad smell; however, many warning signals are given prior to emitting its horrible smell. When a skunk feels threatened, it will thump the ground with its foot, snap its teeth, and raise its body hairs. If the enemy continues to threaten, the skunk will lift its tail and spray the attacker with its signature scent.

Beaver

When a beaver is threatened by a predator, it will slap its tail on the water, creating a loud cracking sound. This alerts other beavers in the pond; they will respond by slapping their tails, then diving underwater to safety.

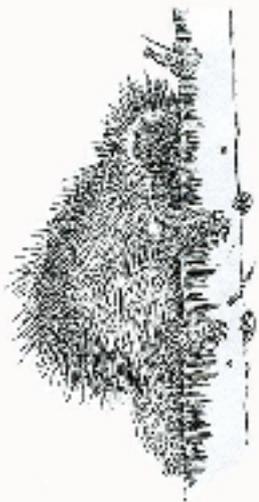
Rattlesnake

The rattlesnake acquired its name from the way in which it warns its enemies. When threatened, the rattlesnake shakes the rattles on the tip of its tail. If the enemy persists, the rattlesnake will coil up and prepare to strike.

Prairie Dog

Prairie Dogs live in colonies and appoint the young as guards, stationed on top of their burrows, and on the outskirts to the prairie-dog town, to keep an eye out for predators. When anything of danger is spotted, the “guard” throws its head back and gives a short, nasal yap. This warns the colony who all dive into their burrows for safety.

Defensive Weapons



Prey animals have adaptations to fight or avoid their predators. Many prey animals are very fast and will run or fly away from their attacker. They have specialized features which give them incredible speed. Other animals will fight back using special adaptations to cause harm to their attacker.

Special weapons: When an animal is under attack, it will defend itself with all the weapons it has: arms, legs, wings, hooves, teeth, claws, antlers, etc. Some animals have further adapted to defending themselves and have developed other forms of defence. Porcupines have quills with barbed hooks on the ends. If a predator gets too close, the porcupine can release the quills into its predator, making it draw back in pain as the porcupine escapes.

Porcupine

Chemical Defence: Some animals and insects use chemical defence. When attacked, some may spit, spray, or squirt chemicals which can cause pain or discomfort to the predator. Many snakes have venom, which when injected into the skin, can stun, numb, or paralyse the attacker. Skunks use an odour to protect themselves. They produce a strong liquid called musk. Musk is made and stored in glands near the tail. When another animal comes too close, the skunk raises its tail and sprays musk from its glands. While the intruder is reeling from the powerful odour, the skunk runs away.

Speed: Many animals rely on running away as their best defence. Animals such as deer and pronghorn have hind legs built for speed. They can usually outrun a predator. If the animal is very young or sick, however, it is unable to run very fast and is usually caught.

Behavioural Adaptations

Prey animals adapt not only physically, but behaviourally as well. Their behaviour is governed by instinct and is altered to suit their environment and unique defensive situations. Some animals trick their predators into thinking they are hurt or dangerous. Others will congregate into large groups or have highly adapted forms of hiding from their attackers.

Bluffing: Bluffing is used by some animals to fool their predators into thinking they are dangerous, already dead, or hurt. Some may copy the behaviour of a dangerous animal or have specialised body parts that look dangerous; this is called mimicry. Mimicry is mainly used by insects. The Viceroy Butterfly has a black and orange wing pattern that closely matches the Monarch Butterfly's pattern. The Monarch is a bad-tasting insect that most birds will not eat. Birds which see the Viceroy will leave it alone, thinking it is a Monarch.

Some animals, like the Killdeer, will pretend to be hurt in order to draw the predator's attention away from the nest. The predator will divert its attention to the mother Killdeer and follow it until the Killdeer thinks the predator is far enough away from the nest; then she will fly away, leaving the predator without a meal. Other animals, like the opossum, will play dead. It will lie down becoming stiff and hang out its tongue, appearing to be dead. Many animals will not eat something that is already dead so they leave the opossum alone.

Living in Groups: Many animals live in groups, which means that there are more eyes and ears to look out for predators. If one senses danger, the entire group is alerted and can run for safety or dive into a protective shelter. Living in groups means animals can feed without constantly having to watch for predators. In a group, animals will take turns watching for approaching predators while the rest of the group feeds. Staying together also makes it more confusing for the predator. It makes it difficult to focus on and attack only one animal; usually the animal that wanders away from the group gets caught.

Hiding: Some animals do not have speed, special weapons, or methods of bluffing to rely on, so they simply hide from their predators. The ground squirrel hides in tunnels it digs underground. These tunnels usually have two doors in case the predator is able to get through door number one.



Vole

Population Control

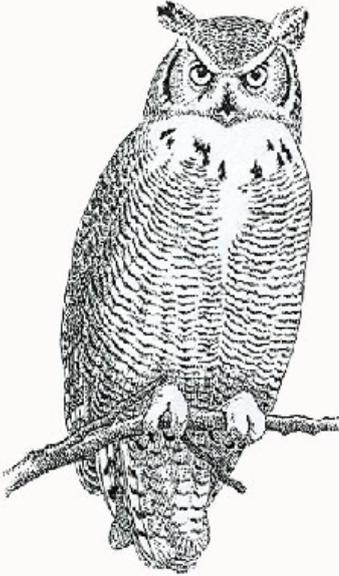
Despite the many defences and forms of protection prey animals have, many are still caught and eaten by their predators. To ensure that their species does not die out, prey animals produce more offspring than predators can eat. The survival of a species depends on how often it reproduces; this is called population control. Animals that are caught often, such as rabbits, produce many offspring. Therefore, the easier an animal is to catch, the more offspring it will have.

Predator Hunting Adaptations

Predation is an essential part of the balance of the environment. Predators usually choose the easiest meal, so they target the elderly, sick, or very young. This makes the remaining prey population stronger and healthier. Predation is also important in keeping the herbivore populations under control. The number of herbivores is much higher than the number of carnivores. If the herbivore population is not kept under control, populations would soon exceed the capacity of the habitat to sustain them, resulting in extreme damage to natural foliage. In order to survive, predators must be able to outsmart their prey and use to their advantage their keen senses, physical adaptations such as sharp teeth and claws, as well as various hunting strategies.

Senses

Predators have finely tuned senses of smell, vision, and hearing and tend to be very curious about all of their surroundings.



Great Horned Owl

Vision: Unlike prey animals, whose eyes are placed on the sides of their head, predators' eyes are placed towards the front of their head, giving them three-dimensional, binocular vision. Eyes placed on the front of the head may give predators a more limited view of the world around them than prey animals, but it does make it easier to judge distance and see small details from further away. In addition to binocular vision, hunting animals also have big eyes. This helps them pick up light signals easily and they are therefore able to spot quick movements.

Smell: Although predators rely heavily on their vision to find prey, they also have a well adapted sense of smell. Some predatory animals such as the wolf, fox, and coyote rely more on their sense of smell than their vision. These animals have a longer snout which provides more room for complex nasal passages which house chemically sensitive cells. Foxes, for example, are so sensitive to smells that they are able to smell prey lying two feet under soil or snow.

Reptiles also have an acute sense of smell; however, they detect scents in a different manner. By sticking out their tongues many reptiles can pick up scents in the air. Lizards and snakes will flick their tongue into the air, then press the tongue to the roof of their mouth. The Jacobson's organ, a special organ found on the roof of a reptile's mouth, allows the reptile to smell what is in the air. This allows them to detect any food nearby.

Hearing: Like prey animals, many predatory animals also have a keen sense of hearing. They are capable of swivelling their ears forward or back to pinpoint where a particular sound is coming from.

Bats have extremely sensitive hearing; their large ears are their primary means of locating prey. Bats make high-pitched squeaks that are above the upper limit of human hearing (termed *ultrasonic*). When the sound waves hit something they bounce back like an echo. The bat hears the echoes and can tell where the object is. This process, called *echolocation*, enables bats to find food at night without bumping into anything. Bats have such sensitive hearing that not only can they find tiny insects, but they can also tell if it's a favourite variety of insect.

Hunting Strategies

Predatory animals have developed various methods of tracking down and killing their prey. Some strategies require more effort such as chasing, while others require patience and cooperation.

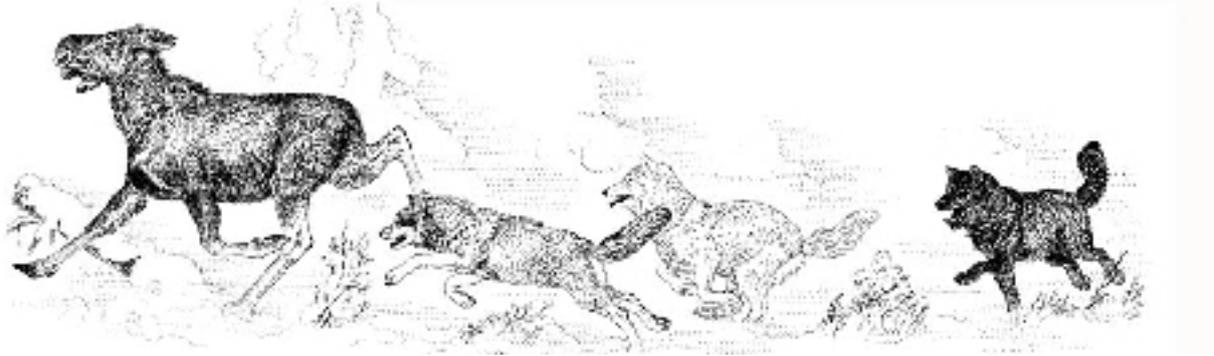
Stalking: Animals that stalk their prey have developed special features which ensure that they can sneak up on their prey undetected. Cats have soft padded paws with retractable claws which help them walk silently. Owls have soft, jagged, comb-like wing edges which allow them to fly silently. Animals that stalk also have to have quick reflexes. Once they get close enough to their prey they have to act quickly to ensure that their dinner is caught.

Sit and Wait: The sit and wait strategy requires little energy; however, it does require lots of patience. Animals who use this hunting strategy usually employ some form of camouflage. They blend in with their surroundings and wait for their prey to come within striking distance.

The Great Blue Heron will stand in shallow waters for hours waiting for small fish and frogs to come near enough to spear with its bill. The Heron's long legs resemble tall spindly water plants and therefore do not scare the fish away. The Heron will stand motionless and wait until its dinner swims up to it. It then uses its long sharp bill to spear its prey and then tosses the dead prey into the air and catches it with its mouth.

Group Hunting: Some predatory animals hunt in groups, taking advantage of their numbers to take down animals much larger than themselves. This method of hunting is often seen in wolf packs which have a highly organized method of team hunting. Sometimes the wolf pack will chase the prey in relays, taking turns until the prey tires out. Wolves will also travel in long, spread out lines, outflanking the prey and even driving it towards the other pack members lying in ambush.

Moose and Grey Wolves



Physical Adaptations

In addition to hunting strategies predatory animals have also adapted to their life of hunting by developing various physical features which aid them in capturing and eating their prey.

Teeth and claws: Predatory animals are equipped with long, sharp claws and teeth specialised for tearing, shearing, and cutting flesh. Their teeth and claws ensure that once the prey is caught the predator is able to kill it as well as eat it. Birds of prey, such as hawks, eagles, and falcons have long curved claws on their feet called talons. Their talons allow these birds to swoop down and easily grasp prey such as slippery fish and squirming rabbits. Their long curved beaks are also very sharp and strong which aids them in ripping apart their dinner.

Cat claws are unique in that they are retractable. They can move swiftly and silently with their claws pulled into their paws, but as soon as they pounce on their meal their razor sharp claws spring out of their paws and tear at the prey.

Jaws: Most predatory animals have very strong jaws which enable them to hold onto their prey as well as to crush through meat and bone. Their jaws also move up and down, instead of side to side like prey animals, which better enables predators to cut through flesh.

Snakes' jaws have adapted in order to swallow food whole. Their jaw can become unhinged at the rear so it can drop far down allowing more room in the mouth to fit the meal. Many snakes can swallow an animal that is three times larger than their body diameter.

Strength: Many predatory animals are very strong. This enables them to easily take down animals which are larger than themselves. Cougars are very muscular and are able to take down small deer. The shrew may be tiny but it is very aggressive and strong for its size. It will attack and kill animals and insects which are bigger than it is.

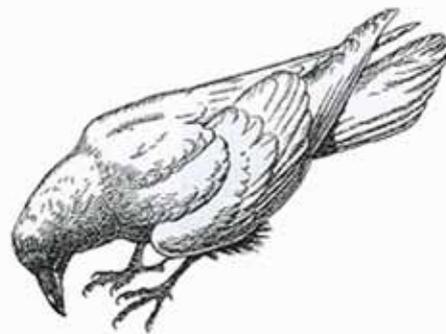


Osprey

Special features: Many animals have specialised body parts which help them catch and eat their food. Frogs have long tongues to help them catch insects and Great Blue Herons have long sharp beaks to help them spear fish. Otters have webbed feet and special oils which make their fur waterproof and enables them to easily swim and catch food. These special features have all been adapted to suit specific environments and feeding conditions. They give the predator a greater chance of catching food and surviving another day.

Intelligence

Predatory animals have larger brains than prey animals; their intelligence helps them to outsmart their dinner. Crows and Ravens are among the most intelligent birds. They have their own language and are able to communicate very efficiently with one another. They can even imitate a number of sounds such as whistles, cat meows, and machine noise.



Raven

The Fisher is also intelligent; it has figured out a way to capture and eat the porcupine. The Fisher’s quick reflexes allow it to flip the Porcupine onto its back without being pricked by quills. Once the Porcupine’s belly is exposed, the Fisher bites into the unprotected underside and eats its prey.

Predator-Prey Comparison Chart

Prey	Predators
Eyes on the sides of the head	Eyes face forward
Peripheral vision	Binocular vision
Wide field of vision	Narrow view
Teeth adapted for grinding	Sharp teeth for tearing
Jaw moves from side to side	Jaw moves up and down
Small brain	Larger brain

Omnivores

Omnivores are animals which eat both plant and animal material. Because they are not picky about what they eat, they usually don’t have specialised skills or body parts for eating any particular kind of food. They have generalised teeth and digestive systems for eating both plants and animals. Their teeth are designed to grind plants and crack seeds, as well as to catch insects or to cut through meat. Because they don’t have to rely solely on hunting, omnivores are usually slower, less agile, and have duller senses than carnivores. Their abilities, however, may still be more acute than those of many herbivores.

Because omnivores will eat any kind of food, they can adapt easily to changes in the environment. Many omnivores can therefore be found in cities; they can adapt and thrive easily in urban landscapes because there is always food to be found. Raccoons, skunks, and bears are common omnivores in Saskatchewan. Humans, of course, are also omnivores.

