NATURALIST OUTREACH PRACTICUM

Backyard Predator-Prey Interactions

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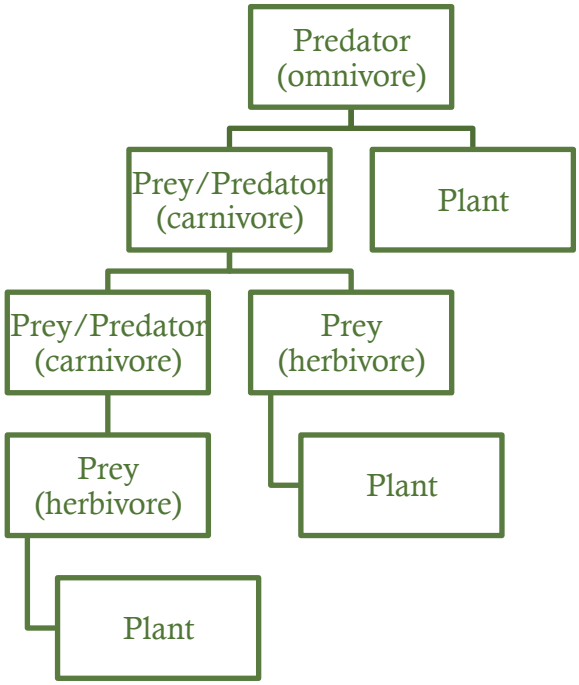
Parts of a Food Web



Definitions

Carnivore: an organism that eats other organisms.
Herbivore: an organism that eats plants.
Omnivore: an organism that eats both plants and other organisms.

Predator: an organism that eats other organisms; includes both carnivores and omnivores.
Prey: an organism that is eaten by another organism; can be carnivores, herbivores, or omnivores.
* Prey can also be a predator and a predator can also be prey!

Examples of Predator and Prey Species in Your Backyard:

Predators

- Eastern Coyote
- Raccoon
- Red Fox
- Great Horned Owl
- Ladybird Beetle
- Preying Mantis
- Bullfrog
- Ants
- Spiders
- Eastern American Toad

Prey

- Rabbits
- Mice
- White-tailed Deer
- Many insects
- Frogs
- Birds
- Salamanders
- Turtles
- Spiders

How do predators capture prey?

Sit-and-Wait or Ambush Predators

These predators stay very still, often **camouflaged** into their background, and wait for the prey to come near enough that they can ambush them.
Example: Praying Mantis

Hunters

Hunters stalk their prey and outrun or outsmart them in order to successfully capture them.
Examples: Ladybug, Bobcat, Coyote, Great Horned Owl

Team-work/Mass Foraging

Social species work in teams, enabling them to take turns tiring out an animal or bombard prey with a persistent simultaneous attack.
Examples: Ant, Coyote

Trapping

Some species are able to use inanimate materials to trap prey by building structures like a web or digging a trap in the ground for prey to fall into.
Example: Spider

How do prey avoid predators?

How to Avoid Detection

Camouflage is the main method of avoiding detection, when organisms are able to blend into their environment to avoid being seen by predators. Examples: Rabbit, Praying Mantis

How to Avoid Attack

Some species use **aposematic** signals or warning signals such as bright coloring, scents, or sounds suggesting that they are poisonous or dangerous to predators. **Batesian mimicry**, or imitation of the colors of a poisonous or dangerous species is one example of aposematic signaling.
Examples: Wasp, Black and Yellow Garden Spider, Ladybug

How to Avoid Capture

Other species have strong **sight, smell, or hearing** to detect predators quickly and avoid them by running or hiding. Similar to predators, they may also use **strength in numbers** to confuse or fight off predators.
Examples: Deer, Rabbit, Ant

How to Avoid Being Eaten

Once prey is captured, they may have one last chance for survival: avoid being killed and eaten. This may be by way of defenses on their body, such as **spikes or hard armor**.
Example: Turtle

Mammal Skulls: Predator or Prey?

Eyes in front, likes to hunt.
Eyes on the side, likes to hide.

Predators have forward-facing eyes, which provide them binocular vision or the use of both eyes at once. This enables them to have great depth perception and sharper focus.

Prey on the other hand have eye sockets on the sides of their head, which enables them to have better peripheral vision to spot predators before they get too close.

Carnivore Teeth

Carnivores have large, sharp canines to grab prey and hold onto them. They also have jagged incisors, pre-molars, and molars to tear, bite, and chew meat.

Herbivore Teeth

Herbivores may lack canines or have very reduced ones compared to carnivores and omnivores. They have a noticeable space between their incisors and molars. Their molars are used for chewing and grinding plant material, so they are much flatter and smoother than those of carnivores.

Omnivore Teeth

Omnivores have some characteristics of both: they have canines similar to but often smaller than carnivores, and also have molars that are more similar in shape to those of herbivores, but perhaps slightly more jagged.

Predator/Prey Activities!

Game 1:

- Any age, 5-10 minutes

This game shows:

- Predators often have more than one method of catching prey, while prey often have more than one method of avoiding predators
- Predators can be prey

Preparations: Prepare a T-chart with two columns – predators and prey – and a box for each characteristic of predators and prey, i.e. hunters, trappers, ambushers, mass foragers for predators and those that avoid being seen, those that avoid being attacked, those that avoid being captured, and those that avoid being eaten (different defenses) for prey. Small pictures of selected predators and prey with a method to attach them to the chart are also necessary (Velcro is useful here).

1. Students are broken up (can be on their own, in pairs, or in groups depending on the number of students and number of pictures) and given one organism's picture
2. The students must decide where the picture goes on the chart and why. They place them one by one. Wait until everyone has gone to discuss.
3. Discuss which organism went where and why. Where else could that organism fit in? Is it both predator and prey?

Examples of the backs of card necklaces:

Black and Yellow Garden Spider *Argiope aurantia* **What do I eat?** Insects.	Bobcat *Felis Rufus* **What do I eat?** Rabbits, mice, squirrels, other small animals.	White-tailed Deer *Odocoileus virginianus* **What do I eat?** Bark, buds, leaves, fruits, berries, plants.

Game 2:

(http://srel.uga.edu/kidsdoscience/kidsdoscience-predator-game.htm)

- 1st – 5th grade; 15 minutes

This game shows:

- Generalist predators have a higher chance of survival
- Prey species using camouflage have a higher chance of survival
- Depending on the predators and prey you choose, may show predators can be prey as well

Preparations: You will need (laminated) cards necklaces with predators on them as well as what they eat, and (laminated) cutouts of prey species – one third of which are brightly colored, others are camouflaged. The prey species are taped around the room, some more visible than others.

1. Students get card necklaces with predator on them and prey species that they should be looking for
2. Students have five minutes to get as many prey species as they need – if they don't, they are sent to the "compost pile"
3. Discuss what happened!

* Can use predator/prey species provided on the website or make up own! Can be as broad or specific as desired.

Why are predator-prey interactions important?

The balance in any ecosystem is highly dependent on these interactions. Herbivores eat plants in the area, predators eat the herbivores, something else eats those predators, and so on. Predators keep the herbivores in check so that they do not decimate the plant population in the area. If the predators become too abundant, they reduce the prey populations, which are the food supply for those predators. Either they must switch to another food supply or the predator population will be reduced because of the lack of food supplies.

Predators most often are **generalists**, meaning they can eat a variety of animals in the area. If they only ate one, and that one became scarce or extinct, the population of predators that depends on that prey species would suffer.

Specialist predators do exist however, but they are often in competition against one another or another species for the food that they rely on. When an unwanted species or an invasive species is introduced to an area, specialist predators that only eat that species are extremely helpful – they won't disrupt the rest of the ecosystem that already exists there! If a predator of the new specialist predator exists in the ecosystem, that new species may be in danger of being depleted before it takes out the unwanted prey. These kinds of considerations are important when thinking about predator-prey interactions in ecosystems!

Here's a game to demonstrate some of these concepts:

Game 3:
This is a similar game to the second that I made up to demonstrate the interconnections between predators and prey in an ecosystem, as well as what happens when the balance is thrown off (an option in lieu of game 2).
Preparations: Again, you will need (laminated) card necklaces of predators/prey species as well as what they eat for students to wear and a large space for movement.

1. Students get card necklaces with predator and/or prey species on them.
2. They must look at their cards to find out what they eat.
3. Predators go to one side of the room, prey to the other, and both in the middle to identify if there is confusion in the group. Students say what species they are so that it is easier to find those that they eat.
4. Students have five minutes to go and find those prey species that they eat and put one hand on their shoulder, and then find other prey species to eat and do the same.
5. Discuss what happened. Competition between predators, predators that were eaten enable their prey to live on, etc.
6. Round two: remove those predator/prey who died out (were eaten).
7. Another five minutes of play.
8. Discuss. What changed? New competition, generalist predators survive better,

Other Resources

On the Web:

What When How: Information on how predators catch prey
http://what-when-how.com/insects/praying-mantid-insects/

National Geographic: Lots of information on specific predator/prey species
http://animals.nationalgeographic.com/animals/?source=NavAniHome

Books:

Elbroch, Mark. Animal Skulls. 1st ed. Mechanicsburg, PA: Stackpole Books, 2006. Print.

Kays, Roland, and Don Wilson. Mammals of North America. 2nd ed. United Kingdom: Princeton University Press, 2009. Print.

Searfoss, Glenn. Skulls and Bones. 1st ed. Mechanicsburg, PA: Stackpole Books, 1995. Print.

Teacher resource for skull lessons: http://www.azdrybones.com/book.htm

White, Richard, S. Animal Skulls: A Guide for Teachers, Naturalists, and Interpreters. Tuscon, AZ: International Wildlife Museum, 2002. Print.

Photo Resources:

Cotton-tailed Rabbit: Photo by Joel Sartore
http://animals.nationalgeographic.com/animals/mammals/cottontail-rabbit/?source=A-to-Z

Bobcat: Photo by Norbert Rosing
http://animals.nationalgeographic.com/animals/mammals/bobcat/?source=A-to-Z

White-tailed Deer: Photo by Jim Richardson
http://animals.nationalgeographic.com/animals/mammals/white-tailed-deer/?source=A-to-Z

Praying Mantis: Photo by Tim Laman
http://animals.nationalgeographic.com/animals/bugs/praying-mantis/?source=A-to-Z

Ladybug/Ladybird Beetle: Photo by Raul Touzon
http://animals.nationalgeographic.com/animals/bugs/ladybug/?source=A-to-Z

Red-tailed Hawk: Photo by Rich Reid
http://animals.nationalgeographic.com/animals

Coyote: Photo by Michael S. Quinton
http://animals.nationalgeographic.com/animals/mammals/coyote/?source=A-to-Z

Black and Yellow Garden Spider: Mark Moran
http://www.fcps.edu/islandcreekes/ecology/black_and_yellow_argiope.htm