Ecological Interactions

Objectives

1. Recognize a food web as a system, and describe a food web in terms of its components and its interactions.
2. Provide examples of how a healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life.
3. Design and use a simple model to test cause and effect relationships or interactions concerning the functioning of a marine food web.

**~provided by California Academy of the Sciences**

Key terms

Part I

* **biodiversity:**the variety of life on Earth or some other specified geographic region of the planet
* **carnivore:**an animal that eats meat (other animals)
* **consumer:**an organism, such as a cow or a shark, that must eat other organisms to obtain energy-rich food molecules because they cannot make the molecules themselves; consumers are also called heterotrophs
* **decomposer:**an organism that breaks down organic material over time
* **detritus:**dead and decaying matter, including animal waste
* **ecosystem:**the community of different species in a particular geographic area and all of their interactions with each other and the physical environment; ecosystems are also called ecological networks
* **scavenger (detritivore):** an animal whose diet consists of large amounts of decaying matter
* **energy:** the ability to do work or cause change
* **food chain:**a series of events in which one organism eats another and obtains energy
* **food web:** the pattern of overlapping food chains in an ecosystem
* **herbivore:**an animal that eats plants; also called a primary consumer
* **organism:**a living or formerly living thing
* **producer:**an organism, such as a plant, that can make its own energy-rich food molecules from inorganic materials and an energy source such as sunlight; producers are also called autotrophs
* **stable:**resistant to change, or able to return to a steady condition when disturbed

Part II

* **deforestation:** the action of clearing a wide area of trees
* **habitat:** the area or natural environment in which an organism or population normally lives.

Bonus terms

* **aposematism:** is the advertising by an organism of prey to potential predators that it is not worth attacking or eating. This is communicated by the prey organism using advertising signals, such as bright coloration, striking sounds, or odors
* **invertebrate:** animals without a backbone
* **arthropod:** an invertebrate animal such as an insect, spider, or crustacean (lobster, crabs, shrimp).
* **insect**: small arthropod animal that has six legs and generally one or two pairs of wings.
* **arachnid:** a small arthropod animal that has two body segments, eight legs, no wings or antennae
* **chemical defense:** a strategy employed by many animals to avoid being eaten by predators, in which they release toxins or unpleasant substances that may smell and/or taste undesirable
* **conservation:**the protection, preservation, management, or restoration of natural environments and the ecological communities that inhabit them.
* **range:** the geographic region in which a plant or animal normally lives or grows.
* **poisonous animal:** a chemically defended animal that releases its toxins through secretion, typically through its skin or some other means
* **venomous animal:** a chemically defended animal that injects its toxins through a bite, stinger or spines to its victim.

Engage (15 minutes)

1. Pass out organism cards to each table of students (ideally 3 cards per student) At least one decomposer, producer and consumer card should be given to each student at each table. Each student should then independently label the organisms with their ecological roles, and then share within groups.
2. Group think & share: 1 student from each table explains to the class why they assigned a certain role to an organism. This is a “best guess!” activity, meant to get students to think about how and why organisms play certain roles.

Explore (20 minutes)

1. **Task for the class:** Self-organize into many food chains by working in groups to organize the cards from the start of energy production at the sun to the end of the energy flow, drawing an arrow from the organism giving the energy. The tip of the arrow should be in the direction of the organism receiving the energy. (i.e. Grass🡪Rabbit) Each food chain should include at least three organisms (**teacher tip:** a producer + consumer + decomposer OR a producer + herbivore consumer + carnivore consumer). See examples below, starting at the sun:
	* sun – oak tree (producer) – aphid (consumer) – ant (consumer) – frog (consumer)
	* sun – mite (consumer) – ant (consumer) – frog (consumer) – mushroom (decomposer) – vulture (decomposer)
	* sun – maple tree (producer) – snowshoe hare (consumer) – gray wolf (consumer) – raven (detritivore)
2. Freeze and verbally review. In turn, have producers, consumers, etc. raise their hand, and have students notice the pattern. Discuss the size of the creatures, and the size of the population of said creatures. Review the transfer of matter and energy, and highlight how it starts at the suns.
3. Pass out two pieces of yarn per student and ask them to choose their role in the food web. Roles should be evenly distributed per table (you don’t want a table of all consumers, for example!) Explain that the line represents the interaction between the organisms.
4. Through discussion, walk through the following:
	* What are the component parts? (*living organisms with different roles in the food web*)
	* How are they related? (*they interact by eating each other, which translates into sharing matter and energy*)
	* What does the yarn symbolize as an interaction? What is flowing through the system? (*Sharing matter and energy.*)
	* The line doesn’t show the *direction* of energy flow. How can we model this? (*drawing an arrow)*
	* Can we find an organism that could be removed from the web, without leaving another species high-and-dry with nothing at all to eat?

Case Study:

How do different habitats change the diets and chemicals in poison dart frogs?

Animals rely on each other to get the nutrients and energy they need, but did you know that these are not the only things animals rely on each other for?

Poison dart frogs are colorful, ground-dwelling frogs, native to central and south America. They rely on arthropods, like insects and arachnids, for their nutrients and energy. Interestingly, they also rely on them for all of their toxins!

Although scientists don’t yet know exactly which arthropods the poisons come from, we are certain they cannot make the poisons themselves.

So, what happens when the environments change? See in attached powerpoint presentation!