



# STUDENT SHEET

## ECOLOGICAL RELATIONSHIPS

### OBJECTIVES:

Justify that the symbiotic relationship that freshwater mussels have with the fish in their lives is either that of parasitism, mutualism, or commensalism based on the information given. Analyze and interpret the information.

### MATERIALS:

Research folders with mussel information and information about the vocabulary words associated with symbiosis. For example: America's Mussels: Silent Sentinels.

### Section 1: What is Symbiosis?

**Directions:** Work individually, in pairs, or in small groups, depending on instructions from your teacher, and come up with answers to the following questions:

1. Do all living organisms need each other in some way to survive?
2. What interactions could be included as examples?
3. What is the close association between and among living things?
4. Are all relationships equally advantageous to the parties involved?
5. Are some relationships more beneficial to one organism over the other?



## Section 2: identifying different types of symbiosis

**Directions:** Answer the questions on the next page by referring to the information given in Model 1. Note: You will determine the name of each relationship later. For this part of class, leave the last column blank.

Model 1 - Symbiosis

| Organism 1 | Organism 2                   | Description of the relationship   | Symbiotic Relationship |
|------------|------------------------------|---|------------------------|
| Dog        | Flea                         | The flea feeds on blood from the dog. There is no benefit to the dog and the itching and bites may lead to infection.   |                        |
| Fungus     | Algae                        | The photosynthetic algae provide food for the fungus, which in turn provides a suitable living environment for the algae.   |                        |
| Termite    | Cellulose digesting bacteria | The bacteria in the gut of the termite breakdown and feed on some of the cellulose taken in by the termite. The termite would be unable to digest cellulose without these bacteria and they gain an additional source of nutrition from the surplus digested cellulose. |                        |
| Shark      | Remora                       | The Remora fish swim alongside the shark and take scraps of food that the shark drops during feeding. The shark does not eat the Remora and appears unaffected by its presence.   |                        |
| Cattle     | Cattle egret                 | The cattle egret follows herds of cattle and eats the insects that the cattle stir up as they move through the grassland. The cattle appear to be unaffected by the egrets.   |                        |
| Human      | Tapeworm                     | The tapeworm lives in the small intestines where it feeds and grows, robbing the human of essential nutrients.  |                        |



- 1) In the dog and flea relationship, is there a benefit for one of the organisms or for both? Explain your answer.
  
- 2) Is either the dog or the flea harmed by this relationship? Explain your answer.
  
- 3) Which other relationship in Model 1 is similar to that between the dog and flea? Explain your answer.
  
- 4) In the fungus and algae relationship, is there a benefit for one of the organisms or for both? Explain your answer.
  
- 5) Is either the fungus or the algae harmed by this relationship? Explain your answer.
  
- 6) Which other relationship in Model 1 is similar to that between the fungus and the algae? Explain your answer.
  
- 7) In the shark and remora relationship, is there a benefit for one of the organisms or for both? Explain your answer.
  
- 8) Is either the shark or the remora harmed by this relationship? Explain your answer.
  
- 9) Which other relationship in Model 1 is similar to that between the shark and the remora? Explain your answer.



### Section 3: Naming Symbiotic Relationships (Read This!)

**Directions:** Symbiotic relationships are identified by how they affect the organisms involved. The three types of symbiotic relationships are discussed below. After reading the following information, label each of the relationships in Model 1 as mutualism, parasitism or commensalism. Justify why you categorized the relationship as you did.

The first type of species interaction, mutualism, occurs when two species interact and both benefit. For example, Yellowstone is home to 4,600 bison, the largest land mammals in North America. Bison have a mutualistic relationship with the black-billed magpie. Pests such as ticks burrow into a bison's short, dense hair to suck the beast's blood, but hungry little magpie perch on top of the bison and eat those ticks. Thus, both the bison and the magpie benefit from close interaction with one another. Mutualism is common and important in ecosystems all over Earth: many species receive benefits from, and provide benefits to, other species. These benefits increase the survival and reproduction of both interacting species.

When they aren't perched atop bison, black-billed magpies can be found in large nests atop deciduous or evergreen trees, where they reproduce once a year. These trees, another member of the community, share a commensal relationship with the magpies. Commensalism happens when one partner benefits while the other is neither helped nor harmed--in this case, the magpie benefits from having a safe place to lay eggs, and the interaction has no effect on the tree.

Parasitism is when one species benefits and the other is harmed. A parasite lives in or on the organism it harms, its host. An important group of parasites is pathogens, which cause disease in their hosts. The bacteria that cause strep throat, tuberculosis, and pneumonia are pathogens, for example. Many organisms have evolved mechanisms to avoid being hosts, such as immune systems to help fight off parasitic diseases and infections.

DON'T FORGET TO GO BACK TO SECTION THREE AND LABEL THE RELATIONSHIPS (SEE DIRECTIONS)



#### **Section 4: Symbiosis and native freshwater mussels**

**Directions:** Read the information about freshwater mussels and their life cycles.

Although their lives appear boring, their reproductive strategies are quite fascinating. After the male has dispersed sperm that is carried by currents to the female where fertilization occurs, the fertilized eggs are transformed into a larval state inside the female. She then packages the larvae into an enticing lure that will attract a specific fish. When the target fish approaches, she will expel her larvae at the fish. The larvae attach to the fish's gills or fins, and hitch a ride for a few weeks while they continue their transformation into a juvenile mussel. When the transformation is complete, they drop off of the fish, and begin their life as a young adult mussel. Not only is this method of reproduction interesting to biologists and students of nature, the fact that mussels require specific species of fish to reproduce means that mussels are also good indicators of the health of their host fish populations.

Notes from reading and video clip:

**TAKE THE CHALLENGE TODAY!**  
**MNZOO.ORG/DIGITALMUSSELS**





**Section 5: What type of symbiotic relationship do mussels have with fish?**

**Directions:** With your group, choose one of the symbiotic relationships that you think describe the mussels and the fish involved in their life cycles. Justify why you categorized the relationship as you did.

You will create talking points that show the relationship between freshwater mussels and fish in their life cycles. The talking points will act as a means to communicate evidence with the rest of the class that is used to interpret the information. You should also include a written summary that provides examples that support your argument.

Type of Symbiosis: \_\_\_\_\_

Evidence:

- 
- 
- 
-