

# Symbiosis

## Introduction

Close living arrangements between two different species is called symbiosis. The word comes from the Greek word meaning “state of living together.” Usually the two organisms are in close physical contact, with one living on or in the other. In some cases, however, the relationship is less intimate. Symbiosis is classified into: mutualism (once called symbiosis), commensalism, and parasitism. These relationships range from mutually beneficial to harmful, or even fatal, for one of the species.



Figure 1: A wrasse (*Labroides*) gets food by picking external parasites from a larger fish. The transaction is mutualistic because both animals benefit.

## Mutualism

In mutualism both partners benefit from the relationship. One of the best-known mutualistic relationships is the one between nitrogen-fixing *Rhizobium* bacteria and several leguminous plants such as beans, peas, peanuts, and alfalfa.

Human beings, animals, and most plants need nitrogen to survive but cannot metabolize it from the air. *Rhizobium* bacteria, which live in the soil, enter the roots of legumes and produce nodules, or enlargements, in which they absorb nitrogen from the air and convert it into ammonia. This compound is then converted into some organic form, such as amino acids, which is shared by the bacteria and the host plant. By eating such leguminous plants, other organisms obtain a rich source of nitrogen-bearing compounds. The bacteria, in turn, benefit from the relationship by absorbing from the host plant nutrients that they cannot manufacture themselves. Lichens, which consist of fungi and algae, are another well-known example of mutualism. Algae

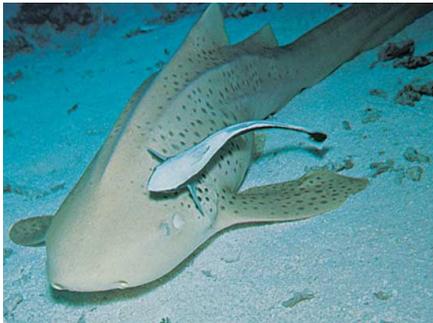


Figure 2: Acacia ants have a mutualistic relationship with the bullhorn acacia (or swollen thorn acacia) tree in which they live. The tree provides food and shelter to the ants, and the ants defend the tree against animals that want to eat it.

receive shelter and a moist environment by dwelling within the fungi. In turn, the algae provide the fungi with food through photosynthesis.

Mutualistic relationships between animals and plants or microorganisms also exist. Some plants must be pollinated by insects, who obtain food from the plant in the form of pollen or nectar. Many animals, including human beings, have protozoans and bacteria living in their intestinal tracts that break down cellulose and other substances. The resulting compounds are used by both the host and the microorganisms. In other cases, mutualism can exist between two animal species. African tick birds, for example, obtain a steady food supply by cleaning parasites from the skin of giraffes, zebras, and other game animals.

### ***Commensalism***



*Figure 3: In a commensal relationship, one organism benefits while the other is unaffected. By attaching itself to a leopard shark, a remora is carried along on the shark's power.*

A relationship in which one member benefits while the other is neither helped nor harmed is known as commensalism. For example, the remora fish can attach itself to a shark, whale, or large turtle and be carried from meal to meal, feeding on scraps scattered by its host. The remora neither harms nor helps the host. Spined and barbed seeds also form commensal relationships with animals and humans. By attaching themselves to fur, feathers, or clothing, the seeds can be carried long distances before they are dislodged. In this manner, some plants may be transported across continents and oceans.

### ***Parasitism***

In parasitism one member of the relationship benefits while the other is harmed. Nearly all species of plants and animals are subject to parasitism by at least one species of parasite and usually by several. Parasites generally absorb food from their hosts but may also receive water, minerals, and shelter.

Most parasites are pathogens that cause diseases in plants and animals. Parasites are responsible for such diseases as typhoid fever, cholera, malaria, smallpox, polio, and influenza in humans. Plant diseases include wheat rust, corn leaf blight, corn smut, and Dutch elm disease. If a host dies prematurely from disease,



however, the pathogen is also at risk of dying. As a result, many parasites and their hosts have evolved a form of mutual tolerance; nevertheless, the host is still harmed in some way.

Parasites can be transferred from one host to another through the air, contaminated water or food, feces, biting insects, and sexual contact between hosts. They have complicated life cycles that may involve passing through more than one host. The snail fluke, commonly found in areas of poor sanitation, may start its life as a zygote in its first host, the water snail. After partially maturing, the fluke leaves the snail and enters the water. Humans drinking or wading in the water will be infected with the parasite, which can cause snail fever. The fluke matures in its human host and begins its reproductive cycle, producing thousands of new eggs.

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