

Teacher background information

An ecosystem consists of producers, consumers, decomposers and detritivores living in an environment. An ecosystem is open with inputs, internal transfers and outputs of energy and nutrients. In an ecosystem, there is a one-way flow of energy into it and out of it and recycling of organic matter.

Primary producers are called autotrophs and consumers are called heterotrophs. Primary producers convert solar energy into chemical energy. For example: photosynthesis in plants.

Heterotrophs can be classified into a number of groups:

- **Carnivores** eat animals. For example: lions, sharks.
- **Herbivores** eat algae and plants. For example: elephants, cows.
- **Omnivores** eat a variety of food sources. For example: humans.
- **Decomposers** obtain energy and nutrients from organic remains and waste. For example: some fungi and bacteria. Decomposers secrete enzymes that break down organic matter and then their individual cells absorb break down products.
- **Detritivores** ingest small particles of decomposing or dead organisms or their organic products. For example: snails, slugs and the larvae of certain flies (blow fly maggots).

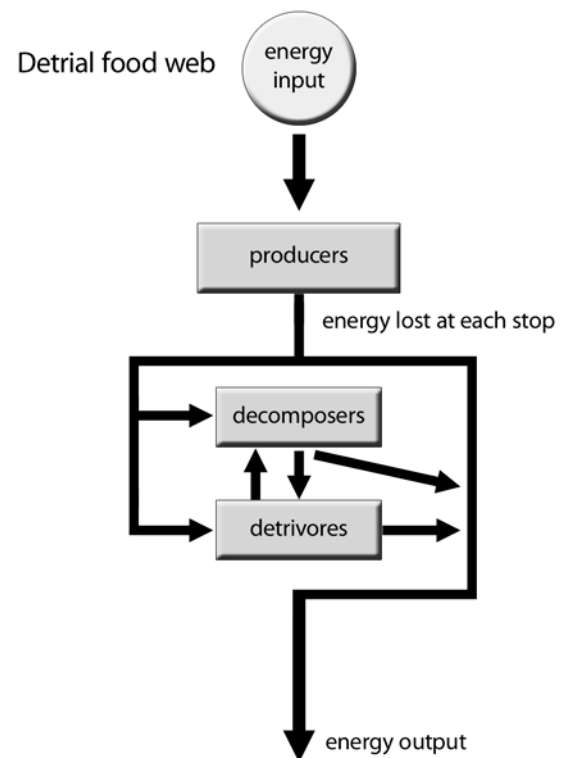


Figure 1: Detrital food web



FORENSIC ENTOMOLOGY

Ecosystems and the decomposition process

Detritivores [de-tri-t-vores]

Fly larvae (maggots) are detritivores. They consume detritus, which is dead organic matter, and redistribute the material returning it to the soil. Organic matter includes animal carcasses, leaf litter and faeces. Detritus feeders include snails and crabs in an aquatic environment. One of the main differences between detritivores and decomposers is that detritivores are more complex organisms. Bacteria and fungi are the most important decomposers.

Corpses begin to decompose shortly after death. Decomposition can be simplified to two stages. In the first stage, vapors are produced and in the second stage, fluids form and the flesh begins to decompose. The study of decomposition is called taphonomy.

When the flesh begins to break down, foul smelling compounds are formed. Cadaverine and putrescine (biogenic amines) are both formed from the breakdown of protein in dead organisms. Insects have olfactory organs on the antenna (head) and near the mouth. On each antenna are over 1000 olfactory receptor neurons (ORNs) that are extremely sensitive to odors in very low concentrations.

Decomposers and detritivores accelerate the natural decomposition process, a chemical reaction in which a compound is broken down into simpler compounds or elements. Often an element appears in forms that are not readily usable by organisms. Such elements need to be chemically processed through the body of a decomposer or detritivore. This processing involves chemical reactions in which the substance is transformed into a more usable version. Without detritivores and decomposers, organic matter would be piled up on the ground from the past years.

The decomposition of a living organism can be described as taking place in four stages:

Table 1: The stages of decomposition.

Stage	Features	Time after death	Inhabited by
Fresh	Immediate, no odour	1-3 days	Eggs
Bloat	Swelling, bloat, leaking fluids, odour	2-7 days	Larval stages
Decay	Strong odour, putrefaction	1-3 weeks	All stages
Dry	Dry skin and bones	>1-3 months	Empty pupae, beetles

The rate of decomposition is affected by a number of factors including temperature, oxygen availability, cause of death, burial, humidity, clothing and the extent that scavengers and insects have access to the body. The most important variable is a body's accessibility to insects, particularly flies.

By processing chemical compounds from organic matter, decomposers and detritivores deposit nutrients in the soil.



Maggots in medicine

Medics have known about the healing power of maggots for hundreds of years. As early as the 16th Century, doctors in Europe discovered that if a soldier had a wound that was infested with maggots, that wound usually healed quite well and the soldier was less likely to die of his injury.

During the American Civil War, army surgeons deliberately put blow fly maggots into infected wounds. The maggots ate away the infected tissue in the wound.

William Baer, an American doctor, treated soldiers in World War I who had lain, unattended, on a battlefield for a week. The wounds on their stomachs were infested with hundreds of maggots. These soldiers recovered better than soldiers who'd been treated in the military hospital.

Maggot therapy, as it became known, was used extensively in hospitals to treat wounds. However, maggot therapy was discarded when antibiotics were invented. More recently, maggot therapy has been re-introduced into hospitals as an alternative treatment for infection. About 5,000 laboratory-grown and disinfected maggots are delivered to hospitals across America every week.

Certain types of maggots eat only the diseased flesh and leave behind the flesh that isn't infected. When maggots are used in hospitals, they have been especially bred for the purpose. They are disease free and clean.

Maggot therapy is a great alternative for people who can't use antibiotics. Antibiotics won't reach tissue that has a poor blood supply and bacteria are capable of developing a resistance to antibiotics. Maggots eat away the bacteria at the source of the problem.