

Stream Bugs and Food

The Bug Food Chain

Benthic macroinvertebrates are not only good indicators for biologists who are studying stream health, but they also actively play a very important role in the stream ecosystem. In order to understand the role benthic macroinvertebrates play in the stream ecosystem, it is helpful to understand more about food chains.

Producers and Consumers. We can think in general terms of a food chain consisting of three main groupings, or trophic levels: plants, herbivores, and carnivores. Plants are at the "bottom" of the food chain—they are able to make their own food by using the energy from the sun (they are *autotrophic*). Because they produce their own food, they are called *Producers*. All other living things that can't make their own food must consume the producers, so they are called *consumers* (and are *heterotrophic*). Consumers are higher up the food chain (at a higher trophic level) and are either herbivores (they directly consume the producers) or carnivores (they eat other consumers). Macroinvertebrates are heterotrophic and may be both herbivores and carnivores.

Herbivores. Because benthic macroinvertebrates eat and are eaten, they are smack-dab in the middle of the food chain, a position that is critical in a healthy stream ecosystem. Herbivorous stream bugs consume plants and algae (these bugs are the scrapers and shredders).

Carnivores. The benthic macroinvertebrates that eat small fish, small amphibians, and other stream bugs are the carnivores. These predaceous macroinvertebrates are the predators.

Detritivores. To confuse matters slightly, there is another group in addition to the herbivores and carnivores. Detritivores are sort of a combination of herbivores and carnivores. Detritivores shred and eat leaves and other organic matter that contain nourishing fungi, algae, and bacteria. They absorb the nutrients as they break down the material into smaller sizes that other bugs utilize. Detritivores are the shredders and collectors.

Nutrient Cycle. Stream bugs may get eaten by other macroinvertebrates and fish that depend upon them for food. For example, both juvenile and adult salmon eat macroinvertebrates. And not only do other consumers need them for food, but when the bugs die, they decay and leave nutrients behind that flow back into the food chain.

So without the stream bugs, organic materials won't be processed, nutrients won't get recycled back into the system, and many consumers won't have any food—in short, the system degrades until it is unhealthy or dead, then most bugs couldn't live there even if they wanted to.

Bug Feeding Strategies

If you have read the section above on stream bug food chains, you know that benthic macroinvertebrates are part of an integrated feeding relationship with plants, animals, and each other. Each type of eater has a specific and important role in the food chain. Each bug also has a specific place in the stream ecosystem, and this is largely governed by the way it feeds. The

mouth parts of benthic macroinvertebrates vary among the different species and determine how the bugs get their food (and therefore what kinds of food they can eat). Scientists group bugs with similar feeding strategies into *functional feeding groups*.

Because different types of food are found in distinct areas of a stream, bugs with similar feeding techniques will likely be found together in the appropriate area. For instance, in forested areas where debris from the trees enters the water, there will likely be more shredders because there are more things for them to shred! Common kinds of functional feeding groups include the following:

Scrapers obtain food by scraping algae and diatoms off rocks and other hard substrates in the stream channel. Scrapers are most commonly found in parts of streams where sunlight can reach the bottom to allow algal growth. Often, sunny parts of streams are faster parts, so many scrapers have evolved mechanisms that allow them to stay attached to rocks in fast currents. It is also helpful if the layer of algae is not so thick that the bugs can't get a grip on the surface. Scrapers may include snails, certain mayfly larvae, and limpets.



Shredders feed on leaves, twigs, and other pieces of organic matter that fall into a stream. They need lots of trees overhead (a dense canopy cover) to supply the materials, and the stream must be slow-moving so the materials don't get washed away. Shredders chew up the debris into smaller particles, which can then be eaten by Collectors. Shredders include stonefly larvae and scuds. The caddisfly larvae pictured above is another example of a shredder.



Collectors eat fine organic matter such as leaf fragments, bacteria, stream bed deposits, and waste products from other organisms. There are two categories of collectors: filtering and gathering. Filtering collectors feed by filtering food out of passing water with hair-like fans or by spinning a fine net. Gathering collectors feed by gathering food from the bottom. Collectors may be found in all types of stream reaches but are typically most common in lower reaches because that is where fine sediments generally accumulate. Collectors include worms, blackfly larvae like the one pictured, and many mayfly and caddisfly larvae and midges.



Predators eat other invertebrates and even fish. Predators may actually be found anywhere in the stream ecosystem, but they are less numerous compared to other feeder types. There must be enough prey critters to support predators, or they will not be present at all. Predatory organisms include the larvae of dragonflies, damselflies, dobsonflies, adult beetles and some beetle larvae, some midge larvae, and some crane flies.

Name: _____

Date: _____ Period: _____

Stream Bugs and Food

Article questions

1. What is the difference between producers and consumers?
2. What do scrapers and shredders eat?
3. What do predaceous macroinvertebrates eat?
4. What do collectors eat?
5. Give two examples of predaceous macroinvertebrates.