

MACROINVERTEBRATES

There is a whole world of life in healthy streams, rivers and lakes. Some of the tiny animals living in the water are **benthic**, meaning they live in the bottom of the waterbody. Some are **macroinvertebrates** because they are large and easy to see (macro) and because they have no backbone (invertebrate). The most common of these creatures include insects, clams, snails, crayfish, and worms. Some live their whole lives in the water, and others leave the water as adults to feed and reproduce.

Macroinvertebrates are important as food to other creatures living in the water. Some are considered by scientists to be **indicator species** and are a way of telling whether or not a river or lake is polluted. In rivers, some macroinvertebrates live attached to rocks and plants where there is fast-flowing water. They are good indicators of water quality because they do not move around and are easy to collect. The moving water gives them food and oxygen. If the water is **polluted**, there is less food and oxygen for the **aquatic macroinvertebrates**. If the water has **pollutant-intolerant macroinvertebrate species** in it, that is a good indication that the water is clean and of high quality. If there are mostly **pollutant-tolerant macroinvertebrates** in the water, there is a chance that the water is polluted and only those types of species can survive.

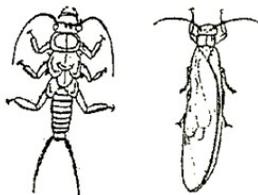
In lakes, where there is not fast-flowing water, the dynamics are slightly different. Indicator species in rivers are not necessarily as "telling" as in lakes, where the waters are relatively still.

METAMORPHOSIS

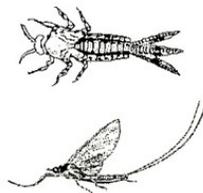
Most macroinvertebrates, especially insects, look completely different as young than as adults. Many go through several changes in looks before adulthood. This cycle of changes is called **metamorphosis**.

Simple Metamorphosis

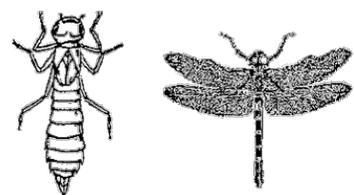
Juvenile (young) insects look much like what they will look like as adults. Insect eggs hatch to become **nymphs**. Nymphs may look a lot like what the adult insect will look like.



STONEFLY



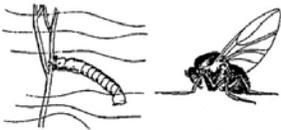
MAYFLY



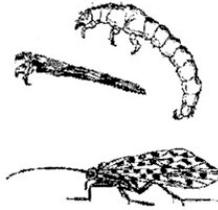
DRAGONFLY

Complex Metamorphosis in Aquatic Insects

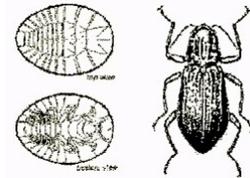
Juvenile insects that undergo **complex metamorphosis** look very much **UNLIKE** their adult counterparts. They will undergo many changes before taking an adult form. There are 4 stages in this change: **egg** > **larvae** > **pupae** > **adult**. Usually, none of the juvenile (young) stages look like adults.



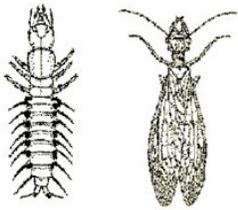
BLACKFLY



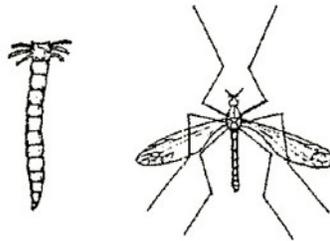
CADDISFLY



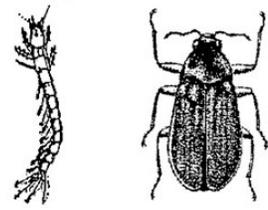
WATER PENNY



DOBSONFLY



CRANEFLY



RIFFLE BEETLE