

Selected Macroinvertebrates

Categories:

STONEFLIES

http://sites.state.pa.us/PA_Exec/Fish_Boat/anglerboater/1999/sep0ct99/stonefly.jpg

Photo

Description: Stonefly nymphs look similar to Mayfly nymphs and are often confused with them. Stonefly nymphs have two long tails or cerci (sir-key), whereas Mayfly nymphs have three long tails. The cerci are sense organs but also help the insect to move. Stonefly nymphs have tubes of thread-like gills on their underside, wing pads and antennae (feelers). Each leg has two claws that are used to cling to rocks or sticks. Their bodies are streamlined so they don't get swept away by the water current. They are multicolored with black, brown, tan and yellow, and have two tail filaments.



Habitat: Stonefly nymphs live under stones in fast-flowing streams that are colder than 25 degrees Celsius. Mountain streams are a good habitat for them. You may also find the nymphs on top of stones, or on the submerged wood and leaf litter in streams. The clean, cool, running water that they are found in indicates good water quality. Stonefly nymphs require well oxygenated water. Nymphs are restricted to fresh water. Adults can be found along the edges of streams on vegetation or attracted to lights.

Size: Most stonefly adults are $\frac{1}{2}$ - 1" long.

Life Cycle: Stoneflies have an incomplete metamorphosis. Mating takes place on the ground or on vegetation. Females may carry eggs on their abdomen before

laying them. Eggs are deposited into the water in many ways: in flight, on the water's edge or even by crawling below the surface. Nymphs develop in the water and may take from three months to one year or more. Thereafter, they move to the edge of streams and crawl out on rocks or vegetation and molt into adults. Adults appear in winter or spring, depending on the specific species of Stonefly.

Food chain relations: Most Stonefly nymphs eat dead plants and algae, therefore they are scavengers (detritivores) which contribute to the breakdown of leaf litter and plant material in the stream. Other stonefly species (predators) stalk their prey and are carnivorous (eating other animals) feeding on mayfly nymphs and other insect larvae. Nymphs will feed on organic and vegetable matter found in the stream substrate.

Pollution tolerance: Pollution tolerance: Very sensitive, rating 10.
Stonefly nymphs are very sensitive to low levels of oxygen in water. They prefer cool water as it dissolves oxygen more easily than warm water.

FUN FACTS:

- * Some take up to three years to develop into adults.

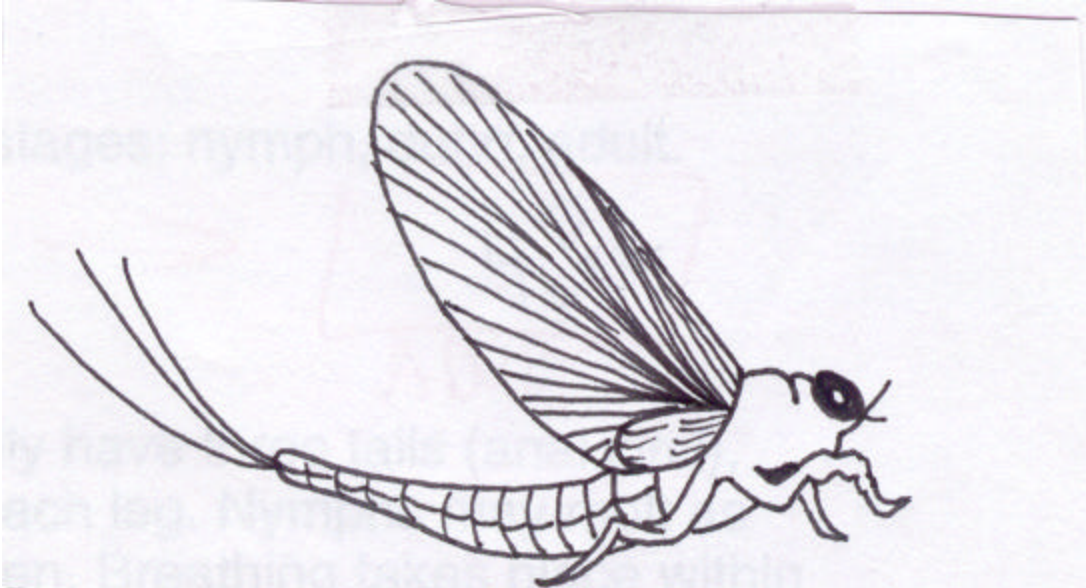
- * Adult Stoneflies live only for a week to a month, and females live longer than males.

Mayflies

[http://people.westminstercollege.edu/faculty/tharrison/CityCreek/Aquatic Invertebrates/mayfly%20page%201.jpg](http://people.westminstercollege.edu/faculty/tharrison/CityCreek/Aquatic%20Invertebrates/mayfly%20page%201.jpg)

Photo

Description: The adult Mayfly, is fragile, soft-bodied, long and three long, many-jointed, threadlike tails. The head is large with round prominent eyes. Forelegs are long and muscular. They have a single claw on each leg, short antennae and sometimes, wing pads. Front wings are large, triangular, with veins. Wings are held upright and together over the body when the mayfly is not moving. Mayfly adults are delicate looking insects with nearly transparent wings. As nymphs, they walk on the sediment, and occasionally swim. They often hide under rocks. As adults, they can fly.



Habitat: Mayfly nymphs are only found in very clean water containing lots of oxygen. The mayfly is found in streams or small ponds. They could be found under exposed rock surfaces. The rock could be buried in the soft bottom.

Size: Different mayfly species range from about 1/4 to 1-inch long

Life Cycle: Eggs laid on the water surface gradually sink to the bottom and, after a few days or several months, hatch into tiny aquatic nymphs well adapted for living at the bottom of quiet bodies of water or rapidly flowing streams. Mayfly nymphs grow into mayflies that look like the fly above. You can see them in spring, they only live for a day, just enough time to lay their eggs in water. Mayflies are often used by Anglers as bait for trout.

Food chain relations: The adults do not feed, and only live for a day or so. The mayfly nymph is most often found in clear streams. Its shape is flattened to resist the force of fast currents. These nymphs generally feed on detritus, or decaying matter, and algae. They are eaten by water spiders, newts, damselfly and dragonfly nymphs, frog and newt tadpoles in the nymph stage, and by dragonflies, birds and fish in the adult phase.

Pollution tolerance: Mayflies are only found in very clean water containing lots of oxygen. They absorb oxygen from the water through their gills structures attached to the sides of the stomach.

Fun Facts:

Adults generally do not eat, and live for only a few days.

- * larvae lives in the water for a few months or a few years
 - * it then leaves the water, sheds its skin, and becomes a winged, sub-adult. It is the only macroinvertebrate that goes through this stage
- * Mayfly Nymphs can take from three weeks to two years to become adults.

Water Penny

<http://pathfinderscience.net/stream/img/waterpenny.jpg>

Photo

Description

The water penny is a beetle. Its body is in the same shape as a penny when it's a larva. The water penny has a round, flat, symmetrical, circular body. The color is either tan, brown, or black. It is one of the most distinctive of aquatic insects



Habitat: They live in cold, fresh running water and are normally found stuck to rocks or leaves. They are normally found in North America. They are very sensitive to polluted water.

Size: Measures 1/4 inch in length

Life Cycle: Water pennies have a complete metamorphosis. In the first stage, the larva resemble circular encrustations on rocks; sucker-like; colored green, black, and usually tan or brown; and their length is usually no more than 1/2 inch. Adult females crawl into water and deposit eggs on undersides of stones. The adult water pennies are typically beetle shaped-body; resemble an extremely large riffle beetle (not truly aquatic; can be found on emergent rocks in riffles).

Food chain relations: The water penny eats a few things. It is an herbivore, which means plant eater, primarily plant debris such as algae and diatoms. Trout like to eat them.

Pollution tolerance: Water pennies indicate ample supply of oxygen, and fast flow of water, indicating that the body of water is healthy.

Damselflies

<http://www.habitas.org.uk/dragonflyireland/images/anatomy3.jpg>

Photo

Description: The male of the most common variety in the interior is blue while the female is more of a slate color. For the nymph, a fairly large and bulbous head sits on a tubular shaped body. The tail is three feathery looking appendages. In the early stages of life, the body parts are not very distinct and the nymph looks more like a walking stick. When getting ready to hatch, the damselfly nymph is usually darker in color. It is often a dirty olive green to a brown color. Damselfly Nymphs have slender bodies, with three long tail-like gills at the end. The adult has four wings. They have extendable jaws that fold up under the head (like Dragonfly Nymphs), and legs close behind their head. Large compound eyes (eyes made from lots of smaller eyes) give them excellent vision large bulbous eyes. They have six long segmented legs.



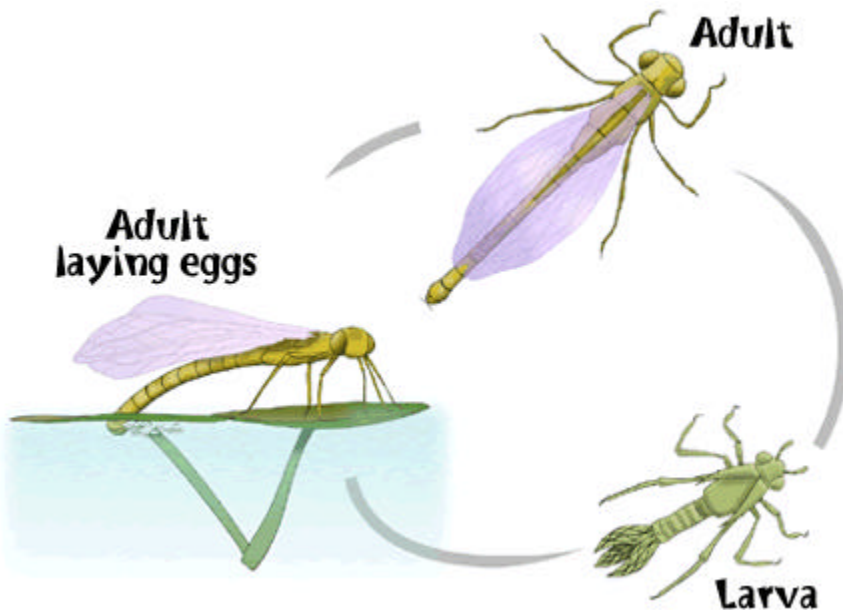
Habitat: Damselfly nymphs are hatched in shallow water and tend to stay in the shallow water among weed beds where food is plentiful. They may be found in running water but seen to prefer the marshes, ponds and lakes. Damselfly Nymphs live on plants, among stones and leaf litter at the bottom of ponds or slow-flowing rivers.

Size: The damselfly nymph gets up to about 25 mm long (one inch) when ready to hatch into an adult.

Life Cycle: Most damselflies complete a life cycle in one year but specific species take two years. The adults mate over the shallow water, sometimes in flight but

often while clinging to the exposed portions of weed beds or shoreline vegetation. Immediately after mating, the female will crawl down the vegetation, and lay her eggs on the submerged portion of the vegetation in the water. Once the eggs are laid she will crawl back up the vegetation and repeat the process. The eggs then sink to mature and hatch. The newly hatched damselfly is just a smaller version of the later immature stages. Thus they are simply called 'nymphs' until they actually hatch into adults.

http://www.amonline.net.au/wild_kids/images/freshwater/damselfly_illus.gif



Food chain relations: Damselfly Nymphs are predators and feed mostly on other insects in the water, but they also can be cannibals, eating each other. Some larger species have been known to feed on small fish. They catch their food with a toothed lower lip (*labium*) that is usually folded under the insect's head. When a small insect comes near, the nymph will shoot out its lower lip to grab its prey. The lip is then pulled back and feeding begins.

Pollution tolerance: Damselfly Nymphs are sensitive to habitat disturbance but relatively tolerant to pollution. They need aquatic or riparian vegetation in the waterways where they live.

FUN FACTS:

As adults, dragonflies and damselflies are often mistaken for each other

Some species of damselfly live underwater only a few months

They keep the population of mosquitoes and flies under control.

More than eight-tenths of their brain is devoted to analyzing visual information.

Dragon Flies

<http://www.habitas.org.uk/dragonflyireland/images/anatomy1.jpg> Photo

Description: The dragonfly has a three-part body: a head, a thorax, and a long, thin, segmented abdomen. The dragonfly has 2 large compound eyes that take up most of the head. On the short *thorax* there are three pairs of jointed legs and two pairs of long, delicate wings. The legs of a dragonfly nymph are fairly dominant in dragonflies when compared to most other aquatic life. Adults develop two pair of wings and the abdomen lengthens and narrows for flight. Mouthparts are adapted for biting and for scooping prey from the air.



Habitat: Dragonfly Nymphs live on plants, among stones, leaf litter, or at the bottom of ponds and slow-flowing rivers. Since they are highly predacious, the dragonfly nymphs will stay near available food sources. These are generally found on the shoals or the shoal drop-offs into deeper water. When not feeding they tend to hide under submerged logs and rocks or among the bottom vegetation.

Life cycle: Adults mate in flight and can often be seen flying in tandem. The fertilized female lays her eggs into woody vegetation or in some cases over open water or burrowed into the lake bottom. The eggs hatch and the dragonfly nymphs are just a smaller version of adult dragonfly. These nymphs live and grow in the lake and molt their shells 10 to 12 times before they are ready to hatch into adults. The nymphs crawl onto the shore or shore line vegetation to hatch into adults. The adults live for a few weeks to several months before mating. Most dragonflies take one to two years to complete a generation but this can be as long as four years. This longer life cycle requires that most hibernate in the lakes during the winter months.

Hibernation is usually done in the deeper water and this brings about spring and fall migrations to and from the shallow waters.

Size: 18-49 mm long.

Food chain relations: ∴. They eat mosquitoes, insects and are eaten by a wide variety of birds, amphibians, spiders, other insects and even bats. Some of the larger species have been known to feed on small fish and tadpoles. Sometimes, they can be cannibals and eat each other. They catch their food with a toothed lower lip (*labium*) that is usually folded under the head. When a small insect comes near, the nymph will shoot out its lower lip to grab it, faster than most prey can react. The lip is then pulled back to the waiting mouth and feeding begins.

Pollution tolerance: Dragonflies are found in slower moving streams and in ponds, often reflecting waters with lower dissolved oxygen levels. They usually prefer pollution free water that is well oxygenated but certain species will live in the more stagnant ponds.

FUN FACTS:

Nymph It breathes by sucking water into its abdomen to move water over its internal gills. Once it has absorbed enough oxygen, the nymph squeezes the water out rapidly so it does not have to come up for air like most pond insects. This also helps jet propel them forwards in the water.

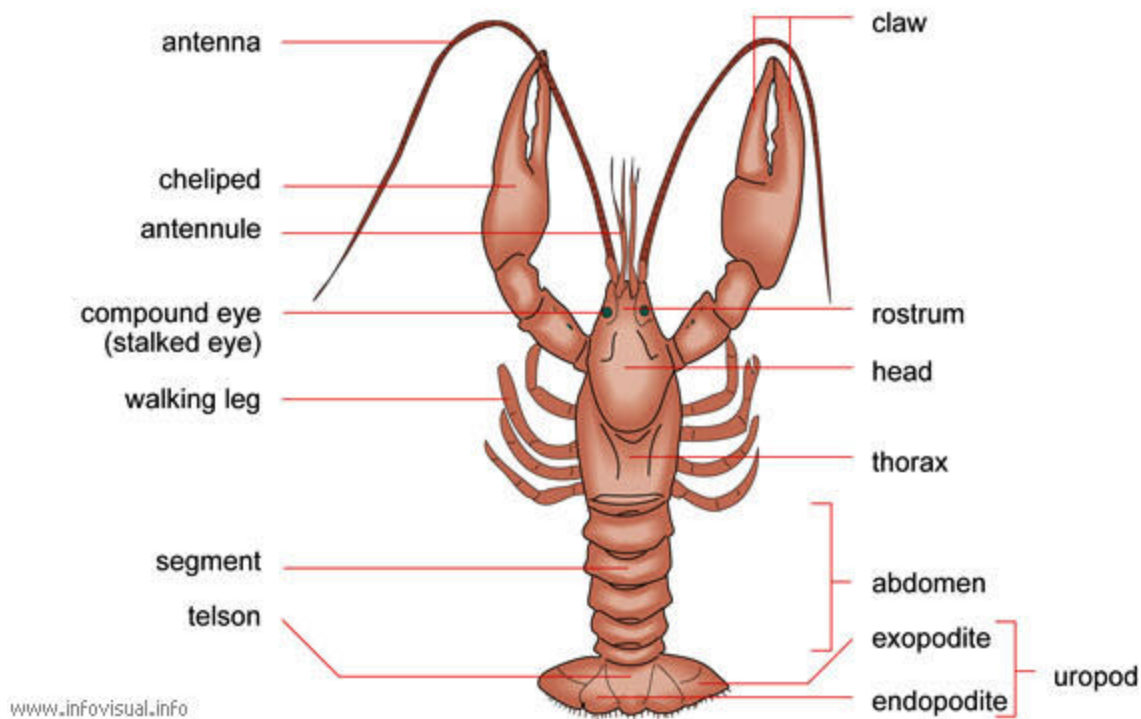
Male dragonflies are known for their territorial behavior. An individual will stake out an area that he continuously patrols as he awaits a passing female. He will chase other males from the area

Crayfish

http://www.infovisual.info/02/024_en.html Photo

Description: The crayfish has a joined head and thorax, or midsection, and a segmented body. In physical appearance it looks to be a smaller version of a lobster. The head has two pairs of sensory antennae and a pair of eyes on movable stalks. Crayfish also own one pair of claws which it extends in front of its body while moving. These strong pinchers are specialized for cutting, capturing food, attack, and defense. The crayfish also has several pairs of specialized food handling 'legs,' bailers to cycle water over the gills, and five pairs of swimmerets which are under the abdomen. All of these 'legs' can be regenerated if broken off. Crayfish have a hard outside skeleton. This jointed exoskeleton provides protection and allows movement, but limits the growth of the animal. As a result, the crayfish regularly gets too big for its skeleton, sheds it, and grows a new larger one. This is called molting and occurs six to ten times during the first year of rapid growth, but less often during the second year. For a few days following each molt, crayfish have soft exoskeletons and are more vulnerable to predators.

MORPHOLOGY OF A CRAYFISH



Habitat: Crayfish live in streams, rivers, swamps, ponds, and other freshwater habitats. Most crayfish are strictly aquatic but some live in semi-aquatic

environments. The semi-aquatic crayfish burrow into the soil to get to water (so that they can breathe).

Size: Crayfish are usually about 7.5 cm (3 inches) long.

Life cycle:

Most crayfish live short lives, usually less than two years. Therefore, rapid, high-volume reproduction is important for the continuation of the species. The fertilized eggs are attached to the female's swimmerets on the underside of her jointed abdomen. There the 10 to 800 eggs change from dark to translucent as they develop. The eggs hatch in 2 to 20 weeks, depending on water temperature. The newly-hatched crayfish stay attached to their mother until shortly after their second molt.

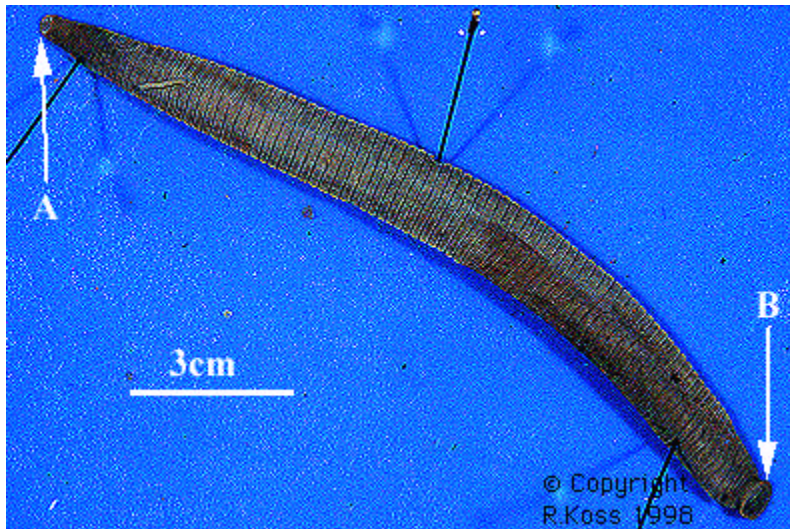
Food chain relations: They are most active at night, when they feed largely on snails, algae, insect larvae, worms, and tadpoles; some eat vegetation (various water plants). A dead fish, worms, corn, and salmon eggs are also favorites of the crayfish. The natural predators of the Crayfish include alligators, burbot (a type of cod), chicken turtle, painted turtle, desman (a type of otter), grackle (a type of a bird), types of fish (like eel, trout, pike, chub, perch), herons, mink, otters, snakes, and people.

Pollution tolerance: Crayfish have a moderate level of tolerance, so they can live in waters that are somewhat polluted.

Leeches

Photo: <http://www.biology.ualberta.ca/courses.hp/zool250/Labs/Lab09/Leech.GIF>

Description: The bodies of all leeches are divided into the same number of segments (34), with a powerful clinging sucker at each end (although the anterior, or front, sucker can be very small). Their color can be green, black, brown or grey, some with patterns of bright colors of yellow and red. Leeches usually have three jaws and make a Y-shaped incision.



Habitat: Most leeches are freshwater animals, but many terrestrial and marine species occur. Land leeches are common on the ground or in low foliage in wet rain forests. In drier forests they may be found on the ground in seepage moistened places. . Leeches are most common in warm, protected shallows where there is little disturbance from currents. In dry weather, some species burrow in the soil where they can survive for many months even in a total lack of environmental water

Size: leeches can vary in size from about 7 mm long to as much as 200 mm when extended. Their average length up is between two and five inches.

Food chain relations: Some species feed on blood, others eat detritus, decaying plant and animal debris. Some feed on the blood of humans and other mammals, while others feed on fish, frogs, turtles or birds. They generally attach themselves to their meal with their anterior sucker, and some have an antenna they insert into their prey from their mouth. Others may use strong jaws to cut into through the tissues of their prey. A third type of leech doesn't have jaws, so it must feed by swallowing small prey items whole. After feeding the leech retires to a dark spot to digest its meal. Digestion is slow and this enables the leech to survive during very long fasting periods (up to several months).

Pollution tolerance: An abundance of leeches are generally considered indicators of very poor water quality, especially in running waters. Leeches are usually rare in calcium-poor waters. They cannot tolerate high turbidity.

FUN FACTS:

For over 2000 years, leeches were needlessly applied for many ailments as an adjunct to blood letting. Their use in Europe peaked between 1830 and 1850, but subsequent shortages led to a decline in their use. Today there is a real clinical application in that they are of great value to plastic surgeons when venous congestion of skin and muscle flaps is a problem

. Today there are actually clinical applications of leeches. For example, in 1985 microsurgions in a Boston hospital used leeches when they had to reattach a little boy's ear that had been bitten off by a dog! ([Click here for the story.](#))
Out of 63 freshwater leeches, about 25% are predacious, not parasitic

Midgefly

<http://www.watersheds.org/artstream/images/critters/midgefly.jpg> Photo

Description The Midgefly has a small worm-like body. One pair of tiny, fleshy legs below the head and one pair on the back end. A thin dark line (digestive tract) can be seen inside the body. They have a distinct, often dark head. The abdomen has 7 or 8 body segments. Once mature, they appear like a mosquito with a feathery antenna.



Habitat: Midgeflies are bottom dwellers. Midgeflies usually live in the bottom of lakes, ponds, or streams, as long as they can get a food supply. However, their food source is generally most abundant on or near *shoals* and this is where their numbers peak. The preferred food seems to be Blue-Green Algae.

Size: Some may be up to 1/2 an inch, but they're usually 1/4 of an inch in length.

Life Cycle: Most females lay eggs singularly or in strings while skimming over the water surface, while other species lay eggs directly on vegetation or bottom substrates. The larva grow and develop into the pupa stage. When fully developed, the pupa wiggle their way to the lake surface. It often takes several minutes for the pupa to get through the "surface tension" of the water before it can hatch. The process of breaking open the pupal skin, the adult crawling out, drying its wings, and flying away is usually accomplished in less than a minute. Once hatched, the adults may live from a few hours to a couple of months before mating and dying.

Food chain relations: Midgeflies are omnivores. This means that they eat both plants and animals. They eat algae and organic debris and others feed on other insect larvae.

Pollution tolerance: They are somewhat sensitive to pollution, and some are pollution sensitive. Many midges, such as the blood worm *Chironomus*, are indicators of poor water quality and tolerant of pollution.

Aquatic Worms

<http://lakes.chebucto.org/ZOOBENTH/oligo.jpg>

Photo

Description: Aquatic worms resemble earth worms, but more slender; segmented; color is reddish, brown, or grey. They have a circular, thin, segmented body. They can possibly be up to five inches. They have short bristles or hairs that help them to move. (These hairs are usually not visible to the human eye.)



Habitat: Aquatic worms crawl around on top of, or inside, the mud at the bottom. They eat the mud and any small bits of plant or animal matter they find. The aquatic worm can be found in streams with silt and organic debris. Many aquatic worms can take very low dissolved oxygen and can be found in large numbers in polluted streams.

Size: reach lengths of up to 3 inches.

Food chain relations: Like earth worms, aquatic worms ingest large quantities of mud and filter out organic debris. They are a favorite food for young fish, aquatic insects,

leeches, crayfish, tadpoles, turtles, and ducks. These worms coil up when they feel threatened

Pollution tolerance: Aquatic worms in high numbers are considered indicators of very poor water quality. They can tolerate amazingly low dissolved oxygen levels as well as very low water quality levels.

FUN FACTS:

Aquatic worms breathe through their body walls. They can also regenerate, or grow back, body segments which are damaged or lost.

Aquatic worms usually live one to two years.

Best sites:

Good for general information on macro invertebrates and all the factors that affect macro invertebrates. Has good pictures and is easy to understand:

<http://www.waterwatch.org.au/library/module-3/introduction.html>

Gives a great comparison between closely related insects such as the dragonfly and the damselfly:

<http://mason.gmu.edu/~jarcisze/StreamMonitoring/Handbook/Macroinvertebrates.html>

A very good comprehensive site for biographies of the insects. All put together and color coordinated:

<http://dep.state.ct.us/wtr/volunmon/rbvcards.pdf>