

Water Bug Hunt

Macroinvertebrate Study

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Goal: *To introduce students to the small creatures that call the bottom of a lake, river, stream or pond home- macroinvertebrates! Students will go in search of these organisms and learn how their presence or absence indicate how healthy a body of water is.*

Background:

- **Macroinvertebrates** are large enough to see with the naked eye (macro) and have no backbone (invertebrate). They are big-no-backbone-bugs.
- **Benthic macroinvertebrates** live in the benthos or bottom of a body of water and include insect larvae, crustaceans, mollusks and worms.

The presence or absence of macro-invertebrates in an aquatic ecosystem is an indicator of the overall health of the ecosystem. Different organisms can tolerate different levels of pollution. Some are very sensitive to pollution and their presence tells us that the water quality is good. Other organisms are pollution tolerant and their abundance usually signifies poor water quality.

- Macroinvertebrates are an important part of the food web in an aquatic ecosystem. Many larger species depend on them as a source of food.
 - The lake sturgeon, a threatened fish species in Michigan is a bottom dwelling species that relies on the presence of macro-invertebrates as a food source.
 - Most species of the sunfish (Largemouth bass, smallmouth bass, bluegill...) family feed on crayfish, larval and adult insects and snails.
 - Members of the pike family feed as juveniles on insect larvae and crayfish.
- Macroinvertebrates also serve an important ecological function by digesting organic material and recycling nutrients making them available to plants and animals.

This program will allow students to identify a variety of macroinvertebrates. Students will be able to determine the overall quality of the water body being sampled after identifying the organisms they find.

Materials:

- Pond nets
- Hand held magnifying lenses
- Magnifying bug viewers/ small plastic jars
- Plastic aquariums/ buckets
- Macroinvertebrate Identification Guide (provided)
- Macroinvertebrate Data Sheet (provided)

- Pencils
- Clipboards
- Plastic spoons
- Small trays

If a lake, river, stream or pond is not easily accessible:

Go out ahead of time and collect samples from a lake, river, stream or pond bottom.

- This requires a pond net and bucket with water to place the organisms in.
- Samples should be taken from the stream, lake, river or pond bottom and placed into the bucket filled with water.
- Identify as many of the organisms as possible prior to the program using the Macroinvertebrate Identification Guide.
- Organisms should then be placed into the small aquarium with water for students to view. Be sure to keep as much sediment as possible out of the water in the aquarium to keep the water clear.
- Assist students in identifying each organism. Discuss with students how they were able to identify the organism. What characteristics helped them? Is it a pollution sensitive organism, a less sensitive organism or tolerant organism?
- Students should record the organisms they identify on the Macroinvertebrate Data Sheet.

If a river, lake, stream or pond is accessible for students:

- Take students to the lake, river, stream or pond where the study will be conducted.
- Discuss rules and safety for participating in the program.
- Give each group of students a pond net, identification materials, data sheet, spoons, aquarium/bucket, hand lens and small plastic jars/bug viewer.
- Explain that samples should be taken from the bottom of the water body or loose, submerged vegetation.
- Remind students to take very special care not to harm the organisms. They will be returning the organisms back to the body of water after the study has concluded.
- Students should place sediment and vegetation into a small tray to work through it looking for organisms using the plastic spoons. After removing the materials from the pond, have students take a moment to let the materials “COME ALIVE” as the organisms start to move around! This will help students to find the organisms.
- Students can remove the organisms individually with the spoons and place them in the plastic aquarium filled with water or the small plastic jars.
- Gather identification sheets at end of the allotted time period.
- Write results on large sheet of paper or dry erase board.
- Tally results for all of the groups.

Discuss results with students:

- *Were there a lot of pollution sensitive organisms?*

- This would indicate that the aquatic ecosystem is of good water quality.
- Fishfly Larva, Snipefly Larva, Dobsonfly Larva, Caddisfly Larva, Mayfly Nymph, Stonefly Nymph
- ***Were there a lot of less sensitive organisms?***
 - This indicates that the water quality is neither really good nor really bad but is somewhere in the middle. This is good because it tells us that the water quality is not too degraded but also tells us that there are some problems that exist.
 - Alderfly Larva, Flatworms, Crane-fly Larva, Damselfly Nymph, Dragonfly Nymph, Aquatic Sowbug, Freshwater Scud, Aquatic Snails, Water Mites
- ***Were there a lot of pollution tolerant organisms?***
 - This indicates that the water quality is poor and degraded. What could be the cause of the water being degraded?
 - Blackfly Larva, Horse/Deerfly Larva, Midge Larva, Backswimmer, Giant Water Bug, Water Penny, Water Boatman, Waterstrider, Whirligig Beetle, Whirligig Beetle Larva, Riffle Beetle, Aquatic Worms, Leech, Crayfish

Discussion:

- How could a lake, river, stream or pond become degraded?
- There are many ways in which water quality can be degraded. Excess fertilizer and nutrients entering a water body, erosion, chemical and oil spills, pesticides...discuss these possibilities with students. Ask them how these things could have entered the water body and what steps can be taken to keep them from entering the water.

Non-Point Source Pollution vs. Point Source Pollution

- ***Non-point source (NPS) pollution*** is pollution whose source cannot be identified. You cannot go to a specific point and verify that is the point where the pollution came from. This is the accumulation of erosion, oil leaks from cars and equipment, pesticide runoff, animal waste, excess fertilizer and nutrients running off from lawns and farms. Non-point source pollution contributes more to the degradation of our aquatic ecosystems than any other source.
- ***Point source pollution*** – Pollution whose source can be identified such as a pipe coming from a factory that is directly emptying into a water body.

Potential problems in an aquatic ecosystem that could affect the presence or absence of certain macroinvertebrates:

Erosion: When sediments and soil leave the earth's surface (*erosion*) and enter a water body, they decrease the water clarity and increase its cloudiness or *turbidity*.

- Many fish species such as the pike depend on eyesight to find their food. If the water is cloudy with sediments that have washed into the water body, it will be more difficult for them to find food.

- Many species of fish lay their eggs on the bottom of a lake or river. If the water is turbid, eventually that sediment will settle on the lake or river bottom. This could smother the eggs and keep them from getting oxygen.
- Sunlight is necessary for *photosynthesis* to occur. Photosynthesis is the process by which plants convert light energy into chemical energy that is useable by biological systems. If the water is cloudy with sediments, it is very difficult for the light to reach the plants and for photosynthesis to take place.
- Question:
 - How can we as humans reduce erosion?
 - If you live on a lake or river, having plants on the shoreline will help reduce erosion from occurring. The roots of plants help to stabilize the soil thus reducing erosion.

Low oxygen content

Plants and animals need oxygen to live. If there is not enough oxygen in the water, organisms will not survive.

- How does the oxygen level in a water body decrease? As plants decompose, they use up oxygen. If a water body has a lot of algae (caused by too many nutrients, often the result of excess fertilizer being applied to lawns and farms) when that algae dies it will consume a lot of oxygen, thus depleting the supply available to other aquatic organisms.

Extension

How can students protect the lakes, rivers, streams and ponds in their community?

Macroinvertebrate Data Sheet

Date:

School:

Body of Water:

Aquatic organism	Number Found	Sensitivity to Pollution
Aquatic Sow Bug		
Aquatic Worm		
Backswimmer		
Black Fly		
Brook Stickleback Fish		
Caddisfly		
Clam and Mussel		
Common Net Spinning Caddisfly		
Crane Fly		
Crayfish		
Damselfly and Dragonfly		
Dobson Fly/Hellgrammites		
Fairy Shrimp		
Giant Water bug		
Gilled Snail		
Leech		
Lunged Snail		
Mayfly		
Midge Fly		
Nematode		
Riffle Beetle		

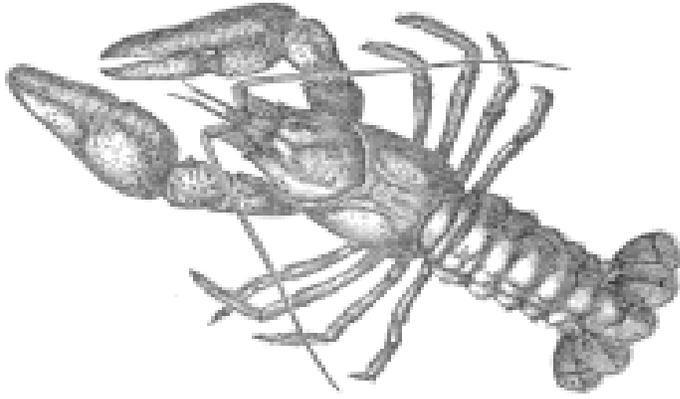
Macroinvertebrate Data Sheet

Aquatic organism	Number Found	Sensitivity to Pollution
Scud		
Stonefly		
Water Boatmen		
Water Penny		
Water Scavenger Beetle		
Water Scorpion		
Water Snipe Fly		
Water Strider		
Whirligig Beetle		
Other Organisms:		



MACROINVERTEBRATE IDENTIFICATION GUIDE

Crayfish



Crayfish live in streams, rivers, ponds and other freshwater habitats.

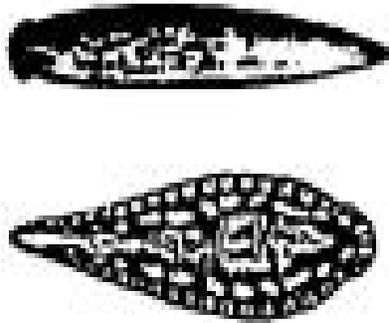
It eats plants, animals and dead organisms.

Many animals including, trout, pike, chub, perch, herons, mink, otters, snakes and people feast on crayfish.

* They have a hard shell that acts like armor protecting and supporting their body.

* As the crayfish grow, they lose their shell and grow a new one. They eat their old shell.

Leech



Leeches are found in calm, shallow, warm waters where the bottom is covered in debris. They lurk under logs and rocks.

Leeches are predators and scavengers. Some have the ability to externally suck blood from other animals!

Many types of fish eat leeches.

* Leeches do not like light and avoid it.

- Leeches survive the drying up of ponds by burrowing into the bottom mud.

Water scavenger beetle



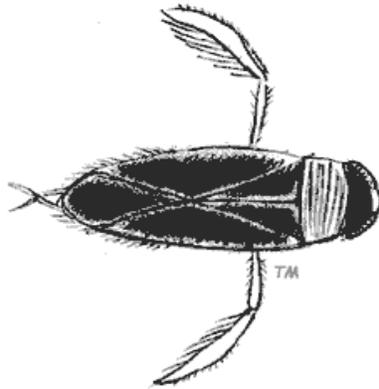
Water scavenger beetles hang out along pond and lake edges.

They eat decaying plant material.

They are eaten by birds and fish.

* Sometimes they are called a silver beetle because when they dive air coats their back and gives them a silver look.

Water Boatman



Can be seen in ponds and along the edges of lakes, and sometimes in the brackish water of estuaries.

They mostly eat algae and minute aquatic animals although some eat mosquito larvae and small aquatic animals.

Larger aquatic organisms such as fish feed on water boatman.

* Unlike many aquatic bugs, they will not bite people.

* The eggs from these bugs are used in Mexico for flour.

Flatworm



Flatworms are found under rocks in streams and ponds.

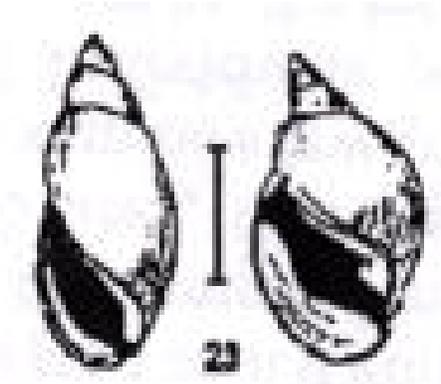
They feed on small animals that are dead or alive.

* They are also known as planarian.

* They can be cut in two and each piece will grow into a new worm!

* When they see food they shoot a tube out from their throat to hold their prey down.

Pond snail



Pond snails are found on rocks and edges of ponds.

Snails graze on algae.

Fish, newts and birds love to eat pond snails.

* Has a shell that hides the snail and protects them from predators.

* Has a special “muscular foot” that helps them glide smoothly over surfaces.

Scud



You can find scuds near plants in the water.

They are scavengers of plant and animal debris in ponds and lakes.

They are eaten by fish that feed among plants or off the bottom.

* They resemble freshwater shrimp.

* They are also called side swimmers.

Backswimmer



Backswimmers are found in freshwater habitats.

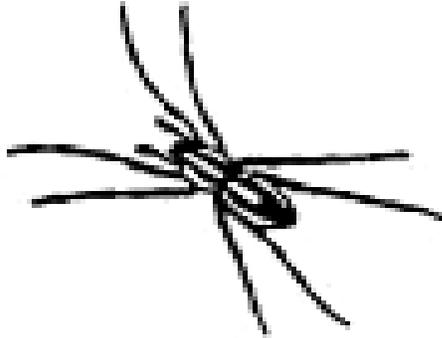
Are scavengers and also feed on plant matter.

* They swim upside down on their backs just under the surface of the water.

* They have a boat shape back and paddle like legs.

* They can deliver a burning sting through its beak.

Fisher Spider



It lives on or near fresh water.

Eats mainly insects but has been known also to catch small fish and tadpoles.

*After catching its prey, the spider bites and injects a poison that dissolves the body. The spider then sucks out the juices like a type of animal slurpy.

* They are too small to hurt you.

Whirligig beetle



Whirligig beetle is found in freshwater habitats.

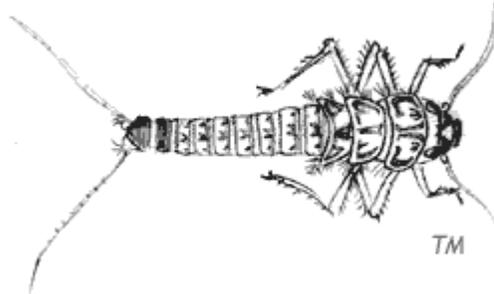
They scavenge the ponds for food.

* Many give off a strong odor when caught.

* They whirl around the surface the water. This movement makes ripples across the water that allows them to sense any creatures nearby.

* They don't like cold so in the winter, they hibernate in the mud.

Stone Fly Nymph



Found in cool, fast water and rapids that have stony or rocky bottoms.

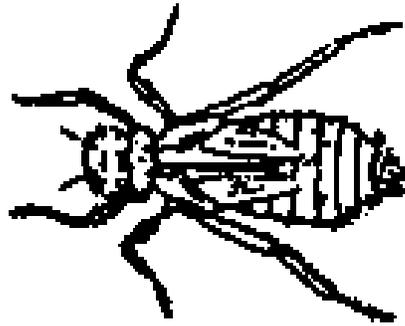
They eat small invertebrate animals, decaying plant material, organic matter, algae and bacteria.

They are an important source of food the trout and other fish.

* They cannot swim.

* They can molt their skins up to 30 times.

Dragonfly Nymph



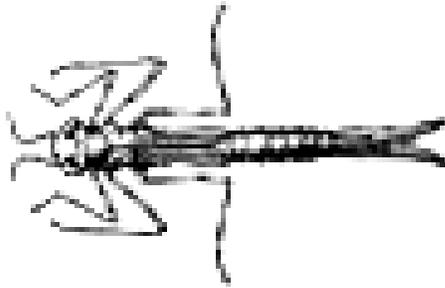
Nymphs feed on insect larvae, worms, small crustaceans, or even small fishes.

They are an important food source for many fish.

Nymphs grow up to be dragonflies, who can eat up to 100 mosquitoes a day.

* These awkward-looking creatures have large chewing mouthparts covered by a scooplike lip.

Damselfly Nymph



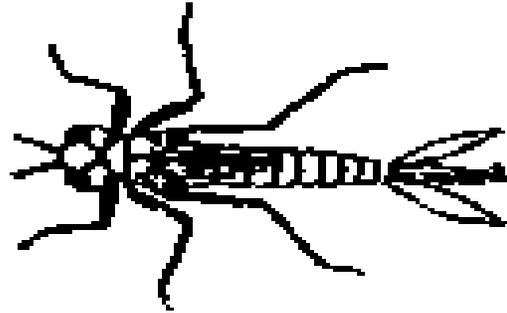
Nymphs live on plants, among stones and leaf litter at the bottom of ponds or slow-flowing rivers.

They are predators and feed mostly on other insects in the water, but they also eat each other.

* More than eight-tenths of their brain is devoted to analyzing what they see.

* Damselfly Nymphs help keep the mosquitoes and fly population under control.

Mayfly Nymph



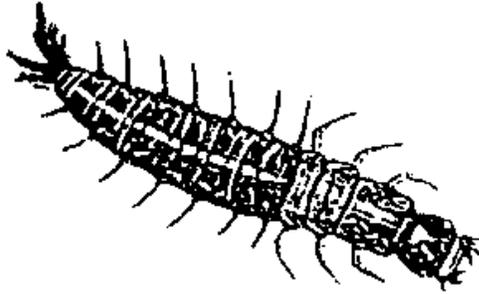
They are found in very clean water containing lots of oxygen.

Their diet is made up of plants and algae.

Water spiders like to eat them for supper.

* Mayfly nymphs grow into mayflies. You can see them in the spring, they only live long enough to lay their eggs.

Dobsonfly Larva



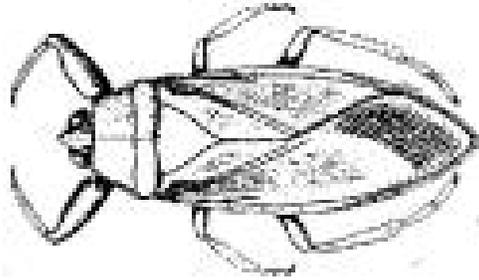
They can usually be found under rocks year around in clean, fast-flowing streams. They require very clean, unpolluted water to live.

They are important in the food web of ponds and lakes.

* Most adult Dobson flies do not feed at all.

- They are slow moving but look out, because they can bite!

Giant Water Bug



They feed on insects or even on tadpoles and small fishes, killing their prey with a poison as they bite.

Largest of the true bugs.

- * In some species the male carries the eggs on his back.
- * They are attracted to light.