Macroinvertebrate Research & Mock Fly-Tying

Grade Level
4-12

Subject Areas
Language Arts, Science, Visual Arts

Time
Research: 45 minutes or longer

Mock fly-tying & Presentation: 30–45 minutes

Writing: 45 minutes or longer

Vocabulary
adaptation, food chain, food web, habitat, larva, larvae, life cycle, macroinvertebrate, naiad, pupa, pupae

Summary

Students research macroinvertebrates that trout eat; make mock fishing flies; and give speeches and write short informative texts using knowledge gained.

Objectives

Students will...

- research and read informational text to gain information on the habitat, habits and appearance of aquatic macroinvertebrates
- identify aquatic macroinvertebrates' place in an aquatic food web
- create models of aquatic macroinvertebrates similar to fly-fishing flies
- give short speeches to communicate knowledge and steps in a process
- write clear informative texts to demonstrate their knowledge

Materials

- images and information on aquatic macroinvertebrates and their flying adult counterparts. Depending on students' abilities, students may research macroinvertebrates themselves or use the information sheets included:
  - Constructing Caddisflies - Word Count 400, Flesch-Kincaid Grade Level 4.8
  - Toothed Dragons - Word Count 410, Flesch-Kincaid Grade Level 5.7
  - Meet the Mosquito - Word Count 469, Flesch-Kincaid Grade Level 6.2
  - Marvelous Mayflies - Word Count 403, Flesch-Kincaid Grade Level 3.6
- actual fly-fishing flies
- chenille stems, yarn, feathers, beads and other craft supplies in various colors
- tape or glue
- writing materials or computer access

Background

The cold, clean rivers and streams in Idaho attract fly-anglers from across the country who come to fish for trout in a pristine environment. Fly-anglers use artificial flies as bait. Artificial flies look similar to the trout's natural diet of aquatic macroinvertebrate species. Macro means large enough to see with the naked eye and invertebrate means they have no backbone.

These animals live on rocks, logs, sediment, debris and aquatic plants during some period in their life. Macroinvertebrates include crustaceans such as crayfish, mollusks such as clams and snails, aquatic worms and the immature forms of aquatic insects such as stonefly and mayfly nymphs. Aquatic macroinvertebrates, such as insect larvae, are a large part of a trout's diet. The flying adult forms of the aquatic insects are also food for trout. Different species of macroinvertebrates have different characteristics, including body shape, exoskeleton color, feeding preferences and in-stream behaviors.

To make their fishing flies, anglers closely study the species they are imitating. They then wrap hooks with thread, yarn, feathers, and other materials of various colors to mimic the macroinvertebrate. To be successful, fly-anglers need to have knowledge of what fish eat and need knowledge of the food being eaten. Anglers need to know what the macroinvertebrates look like and their habits to trick a fish into biting their flies.

Procedure

1. Explain to students that they will be researching and creating macroinvertebrates. Share the background information on fly-fishing and show the students examples of fly-fishing flies.

2. Assign, individually or in groups, species of macroinvertebrates for the students to research. Depending on ability, students may research species on their own or use the following information sheets. Students should find pictures and information on appearance, habits, food preferences, adaptations and other interesting facts. Have students take notes on what they learn.

3. Once research is completed, tell the students they will be creating a mock fly-fishing fly of the macroinvertebrate they researched just like a fly-angler. Show students examples of fly-fishing flies and allow them to look closely at how the artificial flies are constructed—wrapping techniques, materials used to recreate body parts, etc.

4. Give the students a chenille stem and have them bend the chenille stem into a hook shape at least three inches long. Using the craft supplies available, have the students create a version of the macroinvertebrate they studied.

Evaluation

1. Once students have created their "flies" have the students give a short speech to the class. They should include the name of the macroinvertebrate they created, brief information on its appearance, adaptations and habits. They should also include a step-by-step description of the process they took to recreate the macroinvertebrate and the distinct features they added to their design to make it resemble the macroinvertebrate they studied.

2. Using their notes taken while researching, have the students write an informative text about their macroinvertebrate and its role in aquatic food chains. Students should include information on appearance, habits, food preferences, adaptations and other interesting facts.

Constructing Caddisflies

Caddisfly Adult

Can you think of an insect that lives most of its life in water and builds a home for protection? It's the caddisfly. In North America, there are over 1,200 different kinds of caddisflies; worldwide there are over 7,000! Many species of caddisflies look similar and telling them apart can be difficult.

Caddisflies are insects that have four stages in their life cycle. They lay their eggs in water. The eggs hatch, and caterpillar-like larvae crawl out. The larvae turn into pupae, and the pupae into adults. Only the adults can survive out of water.

Caddisfly larvae are builders. They make a silk from the spit in their mouths. Some caddisflies use the silk to spin webs or tunnels. These caddisflies are predators. They trap very small animals in the sticky webs. Most caddisflies are not predators. They eat dead and sometimes living plants. These caddisflies use the silk as glue. As they spin silk, they mix in sand, twigs or grass. This makes a case, or shell, around their soft bodies. The case is held in place by a pair of hooks on the tip of the insect's body. As the insect grows, it just adds onto the case. The case protects the caddisfly. It looks like a little twig or rock in the water. This camouflages the caddisfly and makes it harder for predators to see it.

Caddisfly larvae need oxygen to survive. They use the same thing fish use to get oxygen out of the water – gills. Adults do not live in water, so they do not have gills. Air enters and leaves their bodies through spiracles. Spiracles are holes in the insects' abdomens.

Caddisfly adults look very different from the larvae. They look like moths that have lost the scales on their wings. Long, silky hairs cover caddisfly wings. Adults are brown to yellowish-brown in color. They have big eyes and long antennae. When resting, caddisflies place their wings like a tent over their bodies. Caddisfly adults do not live long. Once they leave the water, most never eat again. They breed, lay their eggs and die. Adult caddisflies are nocturnal or active mostly at night. During the day, they hide in cool, moist places around riverbanks, lakes and ponds. At night, caddisflies often swarm around lights.

Caddisflies are very interesting insects. Look for their cases next time you are wading in a stream or pond.

Caddisfly Larva & Case

Toothed Dragons

Toothed dragons are flying around Idaho! Actually they are just dragonflies and damselflies. Dragonflies and damselflies are in the insect order Odonata. Odonata comes from the Greek word for "toothed." Dragonflies have chewing mouth parts that have a serrated edge; they look a bit like teeth.

Dragonflies lay their eggs in water. The eggs hatch out into something called a naiad (NI-add). The naiad gets bigger and bigger until one day it crawls out of the water. The back on the naiad splits open, and out crawls the adult! Some species stay in the naiad stage for up to five years.

By David Eickhoff from Pearl City, Hawaii, USA (Dragonfly naiad (sp.?) Uploaded by Tim1357) [CC BY 2.0 (http://creativecommons.org/licenses/by/2.0)], via Wikimedia Commons

An amazing part of a dragonfly is the mouth. They have a powerful set of mandibles that are used to chop up their prey, but the really amazing part is the labium (LAY-bee-um). It is sort of like a lower jaw. When a dragonfly is immature and living in water, it likes to eat slimy things. Tadpoles, small fish and other insects are all on the menu. To help the dragonfly grab its slimy prey, the dragonfly can shoot the labium out to almost its body length. The labium has hooks on it so the prey can be dragged back to the mouth. As adults, dragonflies eat other flying insects. The adult dragonfly's legs point forward like a basket. The basket is used to scoop insects right out of the air. Once a dragonfly has food in its grasp, dinner is served!

Have you ever sat along a pond on a summer day and watched dragonflies zip and buzz around you? Some might swoop down a little too close for your comfort! What you are witnessing is a battle over territory or space. It's the males, not the females, madly buzzing around the pond. Some dragonflies are very territorial. They will try and chase off anything that gets too close. They will chase off dragonflies, birds, and even humans!

The largest dragonfly in Idaho is the green darner. The adults can reach a size of just over three inches. This dragonfly is a strong flyer. A group of bird watchers along the eastern coast of America saw an amazing event during the fall migration of green darners. They actually saw a green darner take down a ruby-throated hummingbird. Now that's some amazing flying!

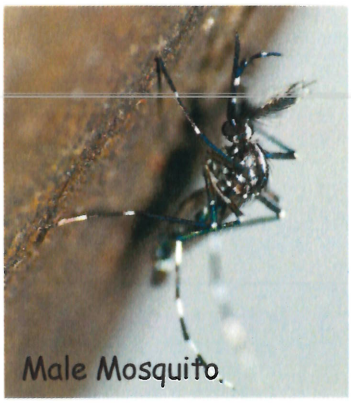
Idaho has 67 species of dragonflies and damselflies. Get outside this summer and look for them. You can find a dragonfly just about everywhere in Idaho where there is water!

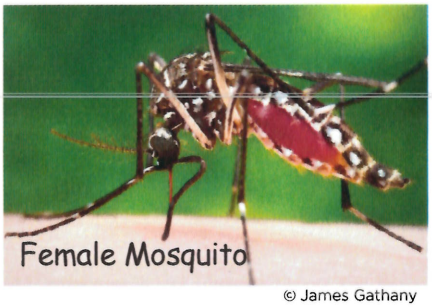
Meet the Mosquito

EEEEE - A high-pitched whine buzzing in your ear. You may hear it while sitting around a campfire or while playing in your backyard. Just mention mosquitoes, and the skin on some people starts to itch and crawl. Whether you love them, hate them or just tolerate them, one thing's for sure, mosquitoes are interesting insects.

There are about 2,700 species of mosquitoes in the world. They may live in hot tropical forests or cold northern lands. Mosquitoes can be found from sea level to over 10,000 feet above sea level. Although they may be found in many different places, all mosquitoes need water. Mosquitoes lay their eggs in water and develop and grow in water. They have four life stages: egg, larva, pupa and adult. All life stages of a mosquito, except for the adults, are aquatic.

Male and female mosquitoes do not look the same. Females are usually larger than males and have thin antennae. Males have bushy, hairy antennae. Mosquitoes have short lives. It takes between seven to 14 days for a mosquito egg to become an adult. Adult female mosquitoes can live several weeks. Males usually live less than a week.





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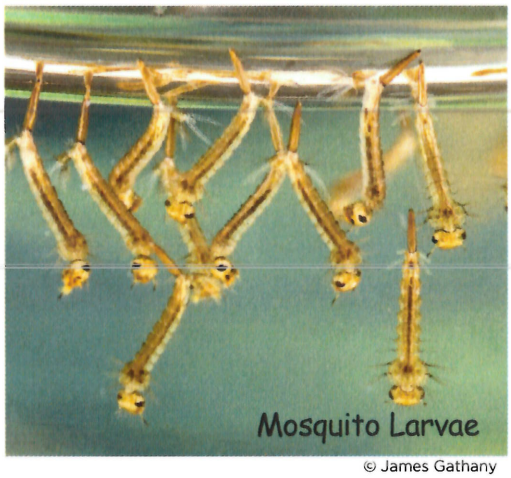

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Mosquitoes eat different things at different stages of their lives. Larvae eat plants. They also filter food from water. Both male and female adult mosquitoes eat nectar. Only female mosquitoes suck blood. They need a protein found in blood to make their eggs. Mosquitoes use their senses of sight and smell to find a blood meal. They see movement and infrared light given off by warm bodies. They can also smell chemicals, like carbon dioxide, on your breath, as well as smell chemicals on your skin. A mosquito can smell you when it is over 100 feet away! Have you ever noticed that mosquitoes seem to bite certain people more often? It's true. Everyone has a different smell. Mosquitoes do like the smell of some people over other people.

The tip of a mosquito's mouth has six needle-like parts for cutting and sucking. To suck blood, a mosquito slips the tip of its mouth into the skin. The mosquito then injects anticoagulants (an-ti-ko-AG-yu-lents) into the cut. This keeps the blood runny and thin, so the mosquito can suck up the blood. The anticoagulants are not supposed to be in your body. Your body tries to break up and get rid of the chemicals, causing an itchy bump.

Although mosquitoes may drive you crazy with their biting, they are an important part of nature. Mosquitoes are food for many animals. Some bats eat 600 mosquitoes in just one hour of hunting. Mosquitoes also help pollinate flowers when drinking nectar.

Next time you hear EEEEE, try to think of something positive about mosquitoes. They may irritate you with their biting, but they are important to have around.

CDC Organization

Marvelous Mayflies

Mayflies are classified in the order Ephemeroptera (e-fa-mer-OP-ter-a). This long, funny name comes from Greek words that mean "living a day." This is a good name for mayflies; as adults they only live for a few hours or days.

Mayfly adults are gray, brown or yellow in color. They have a slender abdomen that slants upward with two or three long "tails" at the end. Their front wings are large and shaped like a triangle. The wings look a bit like the sail on a sailboat. Their back wings are very small and often difficult to see. Some mayflies do not have back wings at all.

Adult mayflies have one thing to do as adults. They need to mate and lay eggs. Adult mayflies cannot eat. Their mouths are small and not made for eating. This is one reason why they die soon after becoming adults. Male mayflies gather in large swarms. They move in a kind of dance together looking for females. Females lay their eggs in different ways. It all depends on the type of mayfly. Some mayflies fly close to the water, dip their abdomen on the water surface and lay the eggs while flying. Other females lay their eggs in strands attached to plants and other things in the water. Some just lay their eggs and let the eggs fall where they may. The females will die as soon as their eggs are laid. The males die after mating.

Mayfly eggs may hatch very quickly. Some eggs will hatch as soon as they hit the water. Others may take a while longer. A naiad (NI-add) emerges from the egg. They have biting mouthparts. Most mayfly naiads are scavengers. They scrape algae from rocks in the water and eat whatever plants or tiny water animals they can find. The color of a naiad may be green or brown. Their color varies depending on what they eat! Naiads may stay in the water for up to four years. When they leave the water they molt. This mayfly is called a subimago. Subimagoes have cloudy or smoky wings. Think of them sort of like short-lived teenagers. They molt and then they are adults. The adult mayflies have clear wings. Mayflies are the only insects that molt after they have wings!

Mayflies really are marvelous. Look for mayflies in the spring and summer. They are not only seen in the month of May!

Aquatic Insect Word Search

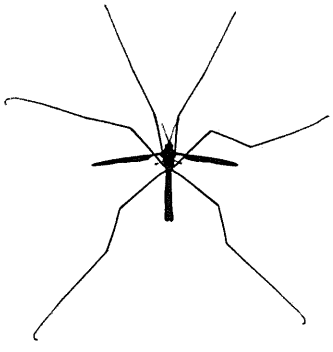
W S R Y Y Y Y M T Y W W C Y Z
W A A E E L O L L H A X R R I
I X T F M S F F F T Z X A I V
M D F E Q M R E E Y F E N F X
M V O U R E I R N Y A B E F X
T I I B D S S W L O L M F L Y
P T D L S T C F S A T I L E N
O U A G R O S O C K S S Y B N
D V I I E I N K R H C D Y E E
D L D B D F F F F P U A C E P
C E I D J L L L L N I U B T R
R Y A S Y A Y Y W Y B O N L E
K C D R A G O N F L Y Q N E T
N A M T A O B R E T A W B R A
G I A N T W A T E R B U G S W

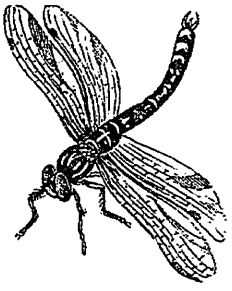
Find these aquatic insects in the puzzle.

ALDERFLY
CADDISFLY
DRAGONFLY
MAYFLY
RIFFLE BEETLE
WATER PENNY

BACKSWIMMER
CRANEFLY
FISHFLY
MIDGE FLY
STONEFLY
WATER SCORPION

BLACKFLY
DOBSONFLY
GIANT WATER BUG
MOSQUITO
WATER BOATMAN
WATER STRIDER





Presto-Change-o

Subject: Science

Objectives: Students will be able to identify insects that go through incomplete and complete metamorphosis.

Materials:

- access to research materials
- card stock copies of cube and tetrahedron for each student
- coloring and writing utensils
- glue stick or tape
- scissors

Procedure:

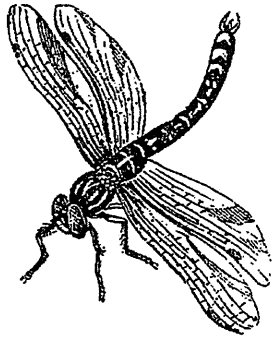
1. Review complete and incomplete metamorphosis with your students. Ask them to brainstorm lists of insects that go through each type of metamorphosis.
2. Tell students they will be researching one type of insect for both complete and incomplete metamorphosis. Have the students gather the following information: name of insect (common and scientific), complete or incomplete metamorphosis, illustration of each stage, and habitat for each stage of metamorphosis.
3. Hand out the card stock templates. The cube should be used to identify an insect that goes through a complete metamorphosis. The tetrahedron should be used for an insect that goes through an incomplete metamorphosis. Have the students write and draw the information below on the templates. Then cut out templates, fold along dotted lines and glue or tape to complete.

The boxes on the cube should contain the following:

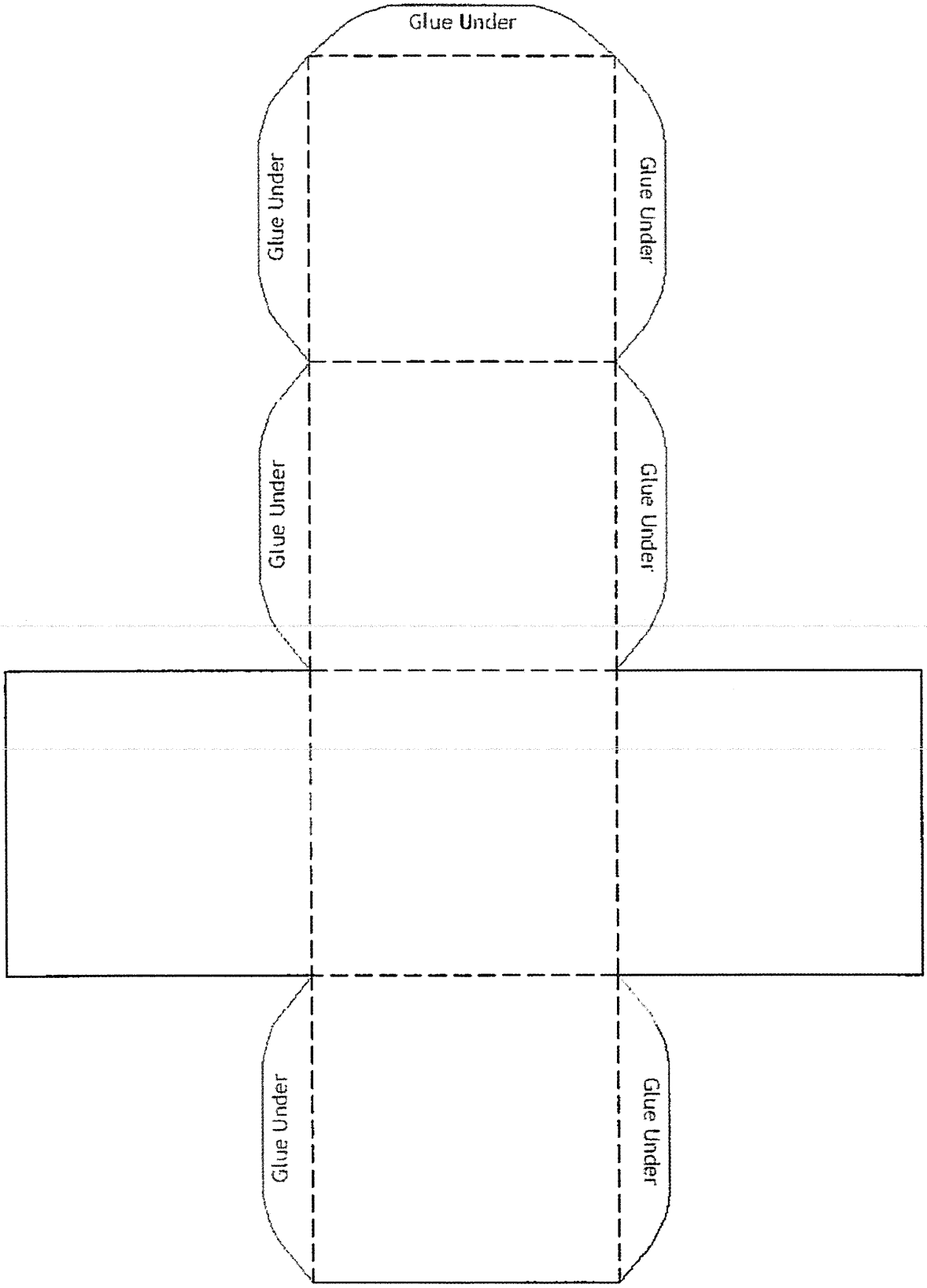
1. Name of insect
2. Stage one
3. Stage two
4. Stage three
5. Adult
6. Habit for one of the stages

The boxes on the tetrahedron should contain the following:

1. Name of insect
2. Stage one
3. Stage two
4. Stage three



Cube Model Template



http://www.mathsisfun.com/geometry/cube-model.html

Tetrahedron Model Template