

# Aquatic Animal Diversity Background

*Background information for The Water Pixies: The Life Cycle of Aquatic Animals and Aquatic Animal Adaptations.*

Animals have unique strategies for development that also applies to aquatic species. This great diversity in aquatic life teaches about life cycles. There are representative species of mammals, amphibians, insects, fish, and birds that live most or all of their lives in the water.

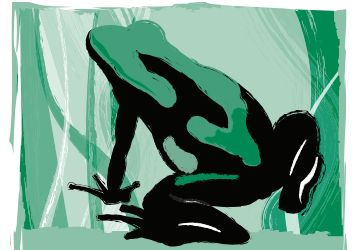
Aquatic insects exhibit two different types of life cycles. Many animals look significantly different in their early stages of development when compared to adulthood. This is often very true for aquatic insects. Many aquatic insects undergo metamorphosis, or change during growth. Some insects experience simple metamorphosis, while others undergo complete metamorphosis.

In simple metamorphosis, the insect egg develops into a nymph. Nymphs resemble adults, but they still vary considerably from their adult form. Many nymphs transform into adulthood by splitting open the exoskeleton so that the mature adult can emerge. This is true for dragonflies, damselflies, stoneflies, and mayflies.

In complete metamorphosis, eggs develop into larvae. The larvae grows through several

stages and changes into pupae. Pupae are usually encased in a protective cover for their next stage of growth. From the pupae, emerge the soft-bodied, often pale-colored adults. They differ remarkably in appearance from earlier appearance, but are not yet completely formed. Gradually the soft pale bodies develop firmness and color. In complete metamorphosis, there is little resemblance between adults and larvae. Examples of this are caddis flies, most aquatic beetles and flies, as well as butterflies.

When a habitat changes, either slowly or catastrophically, the species of animals with adaptations (that allow them many options) are the ones most likely to survive. Some species have adapted to such a narrow range of habitat conditions that they are extremely vulnerable to change. These species are usually more susceptible than other animals to death or extinction. Each animal has its own unique physical adaptations to the watery world. Here are a few examples of adaptations to look for: streamlined body shape to move easily through the water; gills for underwater breathing; sharp hooks or claws to grasp the bottom in rushing water; camouflage colors for evading predators; dense fur to retain heat; webbed feet for more efficient paddling; and oil glands to repel water.



# The Water Pixies

## THE LIFE CYCLE OF AQUATIC ANIMALS

Respect Rule: Look, Listen, Learn, and Leave Alone (until instructed).

### Overview

Hands-on exploration of the creek environment engages students in learning first hand about aquatic animal life cycles.

### Before-the-Field-Trip Activity

**Activity:** Are You Me?

**Time:** One or two 20-minute sessions in groups of 3 or 4 student each; preparation time for students to bring family pictures to class

**Materials:** Cardboard for making cards, Aquatic Animal Identification Cards, Aquatic Insect Life Cycle Stage Fact Sheet

1. Make pairs of cards of aquatic animals, such as a pair of beavers and a pair of pelicans, and so forth. One animal in the pair should be an adult; the other should be at a younger stage of development. The pairs might include adult, larva, nymph, hatching, juvenile, infant and/or egg forms of aquatic animals.
2. Ask the students to bring two pictures from home, one of an adult, the other of a child. The pictures should be pictures of the same person as an adult and as a child.
3. Divide the class into small groups of three or four students and have them stand around a table. Have the students at each table place the adult-child pictures on the table and mix them randomly. Once the adult-child pictures are mixed at each table, have the entire group shift to another table so there will not be anyone at the table where their own pictures are placed.
4. At the new table, have the group attempt to match pairs of adult/child or student/infant photos.
5. When the students at each table have completed their efforts to match the pairs, ask all of the groups to return to the table where they started this activity. Are the matches

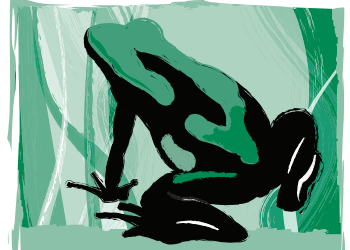
correct? Ask the students to change any pairs that are not correctly matched. Talk about how difficult or easy it was to correctly match pairs. Introduce the idea that many animals look remarkably different as adults than they appeared in younger forms. (See the Aquatic Insect Life Cycle Stage Fact Sheet.) Tell the students that they are about to learn how to match young and adult forms of many different kinds of aquatic animals.

6. Introduce the Aquatic Animal Identification Cards and divide the class into groups. Designate one group as “adult” and the other half as “young animals.” Give each student in the adult group an adult animal image. Give each student in the young animal group a young animal image. Make sure there is a corresponding match, adult or juvenile, for each card given. Instruct the students to look for their match by pairing the appropriate adult and juvenile forms.
7. When all the students have made their choices, let the group ensure that the matches are correct. Teachers may show the students the matched images on the master.
8. Have all of the students examine the correctly matched pairs. Look for the similarities and differences in how aquatic animals grow and change.

**Note:** This activity can be repeated several times by shuffling the adult and young images so that each student becomes familiar with a wider array of animals.

#### Extensions

- Research some of the habitats in which these animals live. If possible, visit some of the habitats where the animals are actually found.
- Pick a pair of images and find out more about the life cycles of the animals shown.
- Discuss and/or pantomime the concept of metamorphosis.



#### Objectives

Students will describe the life cycles of two forms of aquatic life.

#### Grade Level

2

#### Adult/Student Ratio

10 students to 1 adult

#### Where

Riparian habitat: small, shallow, streams or ponds where students can access the water safely and with minimal impact to the streamside vegetation.

#### Skills

Observing, collecting, describing, classifying, identifying, cooperative learning

#### Key Words

Adaptation  
Aquatic  
Complete metamorphosis  
Life cycle  
Macro invertebrates  
Metamorphosis

“  
When we share the outdoors with others, we receive much more than we give. Sharing intensifies our won, inner experiences. Enjoying nature with others reveals the aspects of the outdoors that we love most. Sharing nature’s serenity and joy with others, we absorb the same qualities in increased measure ourselves.”

—Joseph Cornell,  
*Listening to Nature*

## Field Trip Activity

**Activity:** Observe Aquatic Life Cycles

**Time:** 1 to 1.5 hours

**Materials:** Aquatic Animals Fact Sheets, Aquatic Animal Habitats Student Worksheet, collecting cups and nets, large collecting containers, magnifiers, water quality test kit, thermometer, stereomicroscope, *Stream Ecology Exploration Kit* (STE Lending Library)

### Preparation for Field Trip

1. Select a small, shallow, slow-moving stream or pond as the sampling site. Be sensitive to the impact students may have on stream banks and beds, spawning and nesting sites, and vegetation.
2. Have students establish ethical guidelines for their sampling activities.
3. Advise students to dress for trip: old “tennies” or water socks and shorts are best.

### At the Site

1. Remind students of their ethical guidelines for sampling. Instruct them on how to minimize the potential for damaging the habitat and encourage care in their collecting techniques. Emphasize that all wildlife is to be returned to its habitat unharmed.
2. Establish boundaries and a group signal for announcements and safety.
3. Give each student a collecting cup and net.
4. Place larger collecting containers, Aquatic Animals Fact Sheets, and magnifiers in the shade near the water.
5. Begin by having students observe the water. Identify organisms on the surface and in the depths.
6. Using the sampling equipment, instruct students to move slowly into the water, collecting as many different forms of animal life as possible. Instruct them to explore the many micro-habitats within the aquatic environment: slow-moving pools, riffles, shade, sun, under rocks, and on the surface. While they will find mostly aquatic insects, be sure to look for other types of animals as well.
7. Place small animals in the large collecting containers for all to observe. Water should always be in all the collecting containers. *In the shade*, use the magnifiers to see more

detail.

8. Using the Aquatic Animal Identification Cards, Aquatic Animals (1) (2) Fact Sheets, and the Aquatic Animal Habitats Student Worksheet, have each student or team of students identify and draw the animals they observed and where they found them.

## After-the-Field-Trip Activity

**Activity:** Create the Life Cycle

**Time:** 45 minutes

**Materials:** Materials for different art mediums

1. Have each student choose two aquatic animals they observed on the field trip.
2. Construct and describe in writing the life cycles of those animals. Use different mediums to produce the life cycle.
3. Have students review Aquatic Animals Fact Sheets for detailed information (pages 15, 16, 25–35).

## Source

Adapted with permission from  
“Are You Me,” *Project WILD Aquatic*, 1992.

## Resources

### For the Teacher

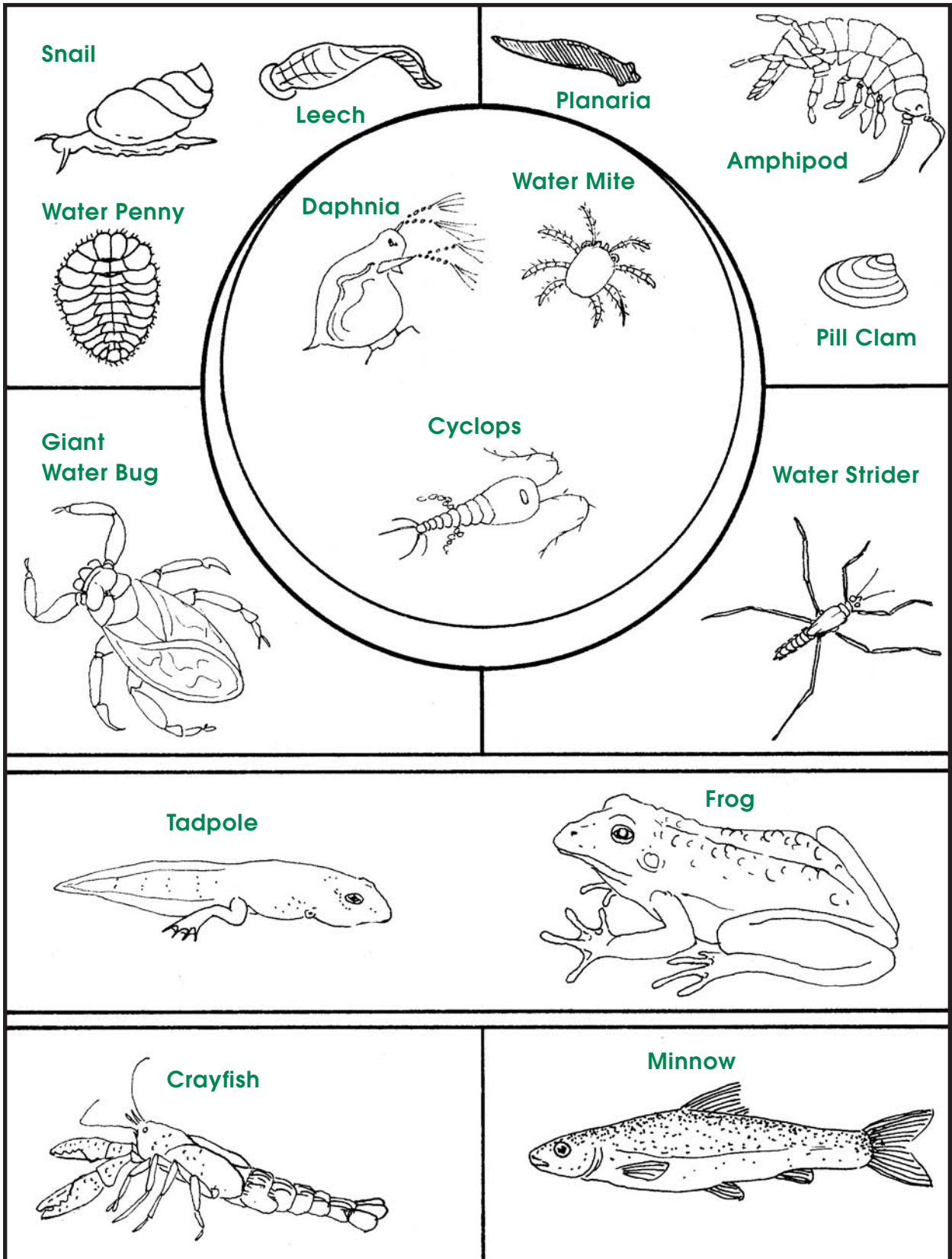
*A Beginner’s Guide to Fresh-Water Life*. Leon Hausman. Putnam’s Sons.  
*Golden Guide to Pond Life*. George K. Reid, Herbert S. Zim. Western Publishing Company.  
*Water Insects*. Sylvia Johnson. Lerner Publications.  
*A Handbook of Hatches*. Dave Hughes.  
*Dragonflies, a WILD Guide*. Berger.

### Videos

*Ecosystem of a Pond*. Chatsworth, California: AIMS Media, 1992.  
*Wonders in A Country Stream*. Los Angeles: Churchill Media, 1992.

# Aquatic Animals 1

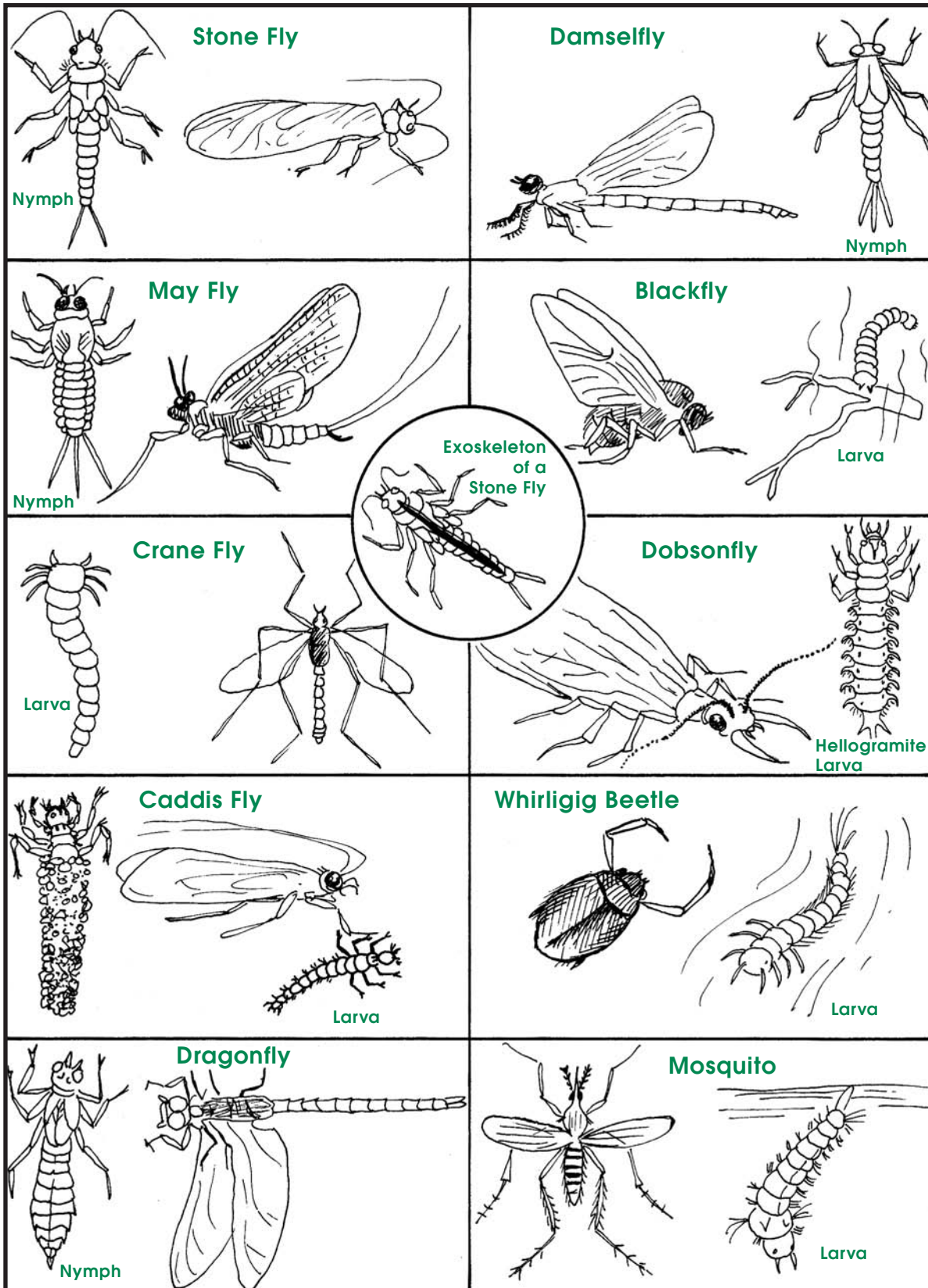
## Fact Sheet






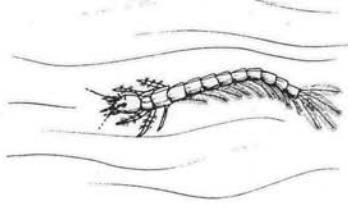

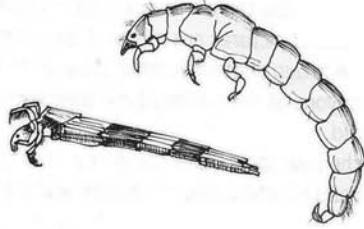
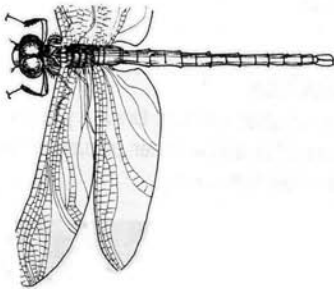
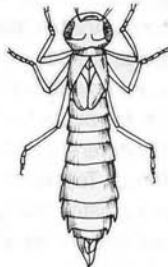
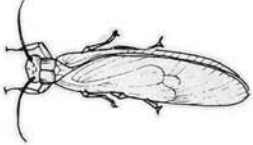
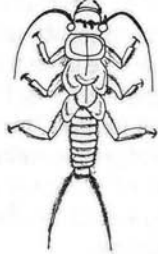
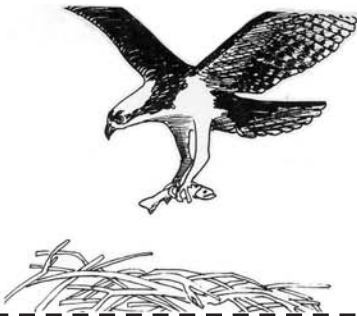

# Aquatic Animals 2

## Fact Sheet



# Aquatic Animal

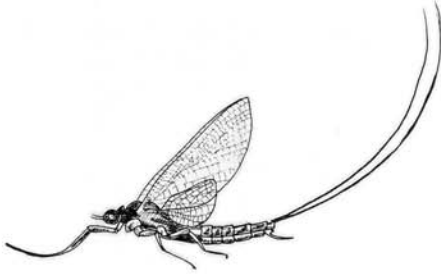
## Identification Cards

<p>Whirling Beetle</p> 	 <p>Whirling Larva</p>
<p>Caddisfly</p> 	 <p>Caddisfly Larvae</p>
<p>Dragonfly</p> 	 <p>Dragonfly Nymph</p>
<p>Stonefly</p> 	 <p>Stonefly Nymph</p>
<p>Osprey</p> 	 <p>Osprey Hatchlings</p>

# Aquatic Animal

## Identification Cards

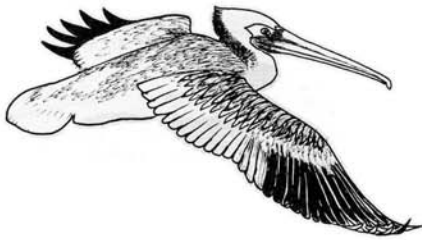
Mayfly



Mayfly Nymph



Pelican



Pelican Nest and Eggs



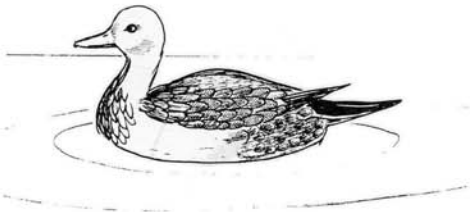
Butterfly



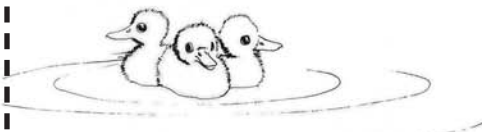
Butterfly Larvae



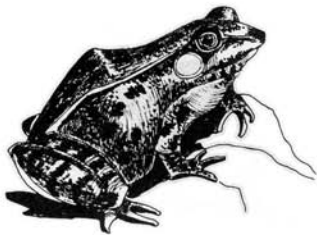
Duck



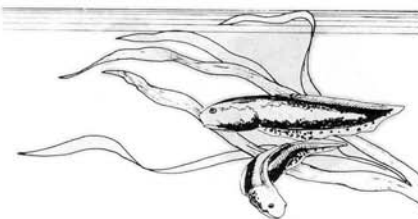
Ducklings



Frog



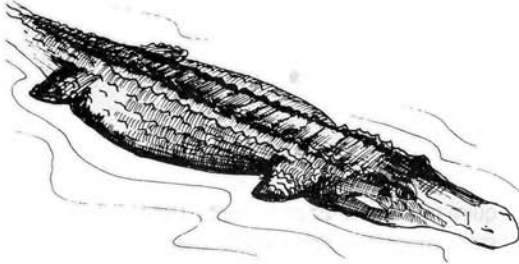
Tadpoles



# Aquatic Animal

## Identification Cards

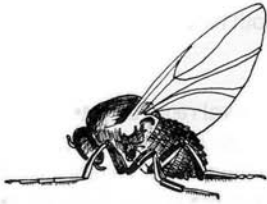
Alligator



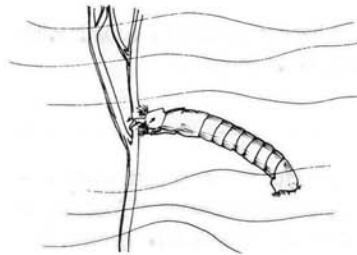
Alligator Hatchlings



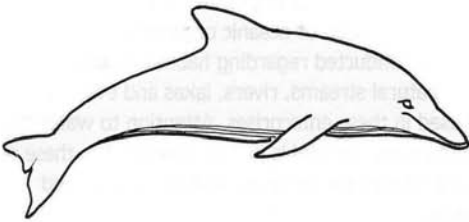
Black Fly



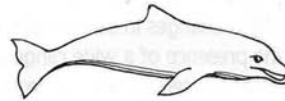
Black Fly Larva



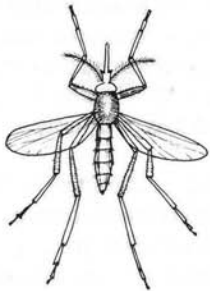
Porpoise



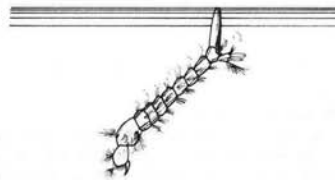
Young Porpoise



Mosquito



Mosquito Larva



Adult Beaver



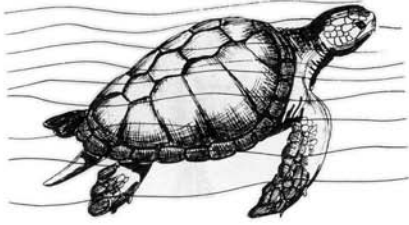
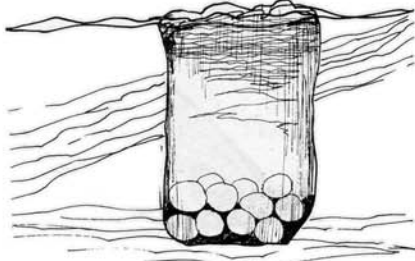

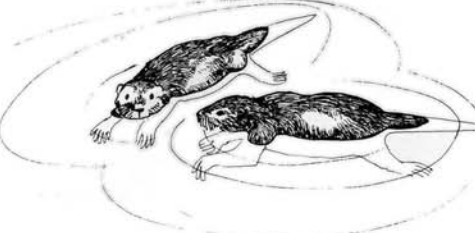
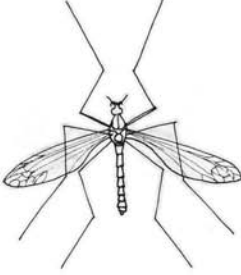

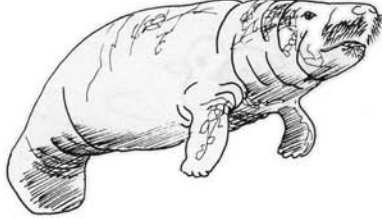

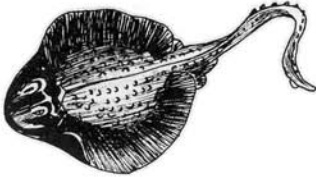
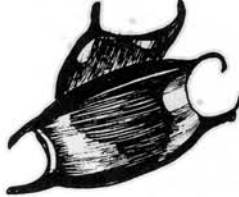
Young Beavers





# Aquatic Animal

## Identification Cards

<p>Sea Turtle</p> 	 <p>Sea Turtle Eggs</p>
<p>Sea White</p> 	 <p>Young Sea Otters</p>
<p>Cranefly</p> 	 <p>Cranefly Larva</p>
<p>Manatee</p> 	 <p>Young Manatee</p>
<p>Skate</p> 	 <p>Skate Egg Cases</p>

Name \_\_\_\_\_

Date \_\_\_\_\_

# Aquatic Animal Habitats

Student Worksheet

Air	Surface	Water Center	Bottom Mud

Name \_\_\_\_\_

Date \_\_\_\_\_

# Aquatic Animal Habitats

Student Worksheet

**Pools**

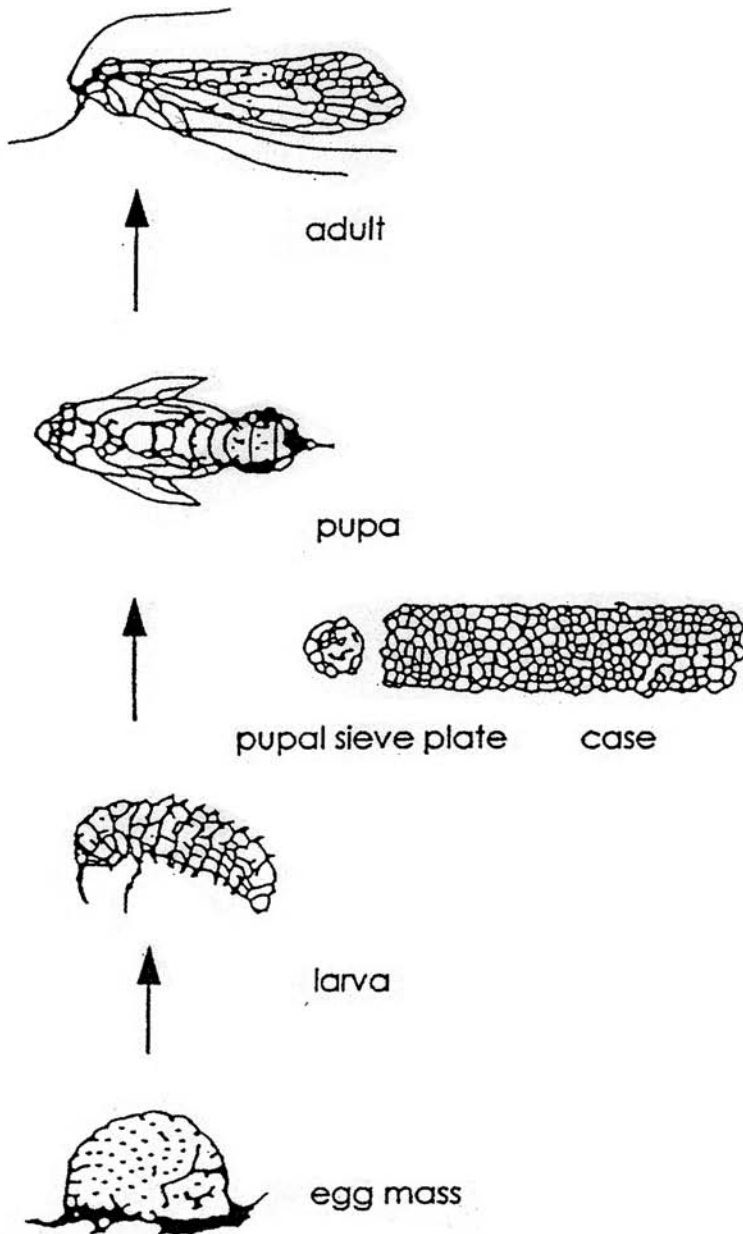
**Riffles**

--	--

# Aquatic Insect Life Cycle Stage

## Fact Sheet

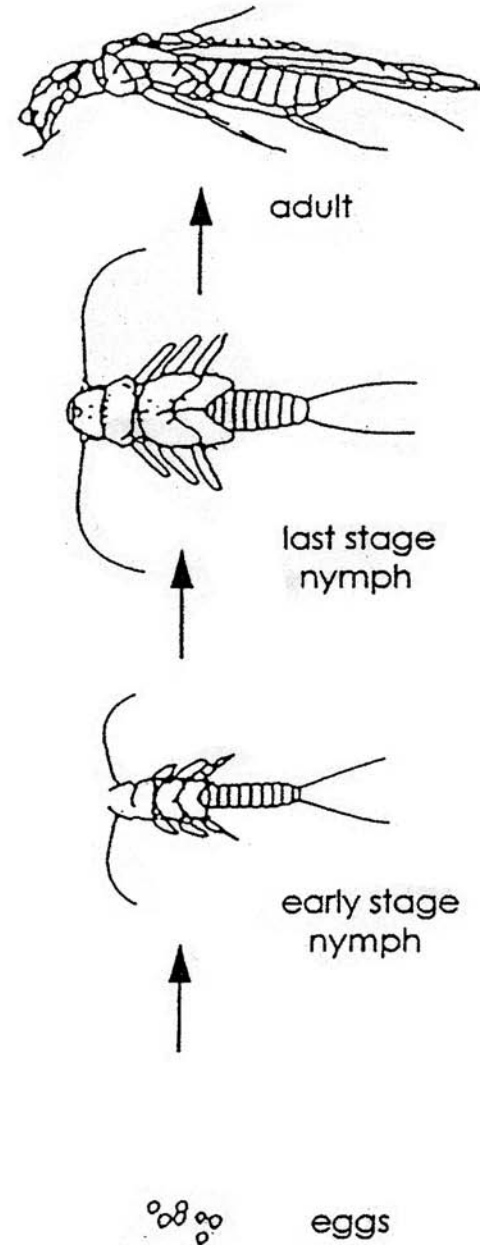
Caddisflies (Trichoptera)



A

**Complete Metamorphosis**

Stoneflies (Plecoptera)



B

**Incomplete Metamorphosis**

**Source:**

Rob Plotnikoff, Ambient Monitoring Section, Washington Department of Ecology



# Scud (Sideswimmer) Fact Sheet

**Order:** *Amphipoda*

**Family:** *Gammaridae*

**Number of species in North America:** 150

**Size:** 5–20 mm

**Similar to:** Aquatic Sowbug

- Body flattened side to side (scud) vs. body flattened top to bottom (aquatic sowbug).

**Facts:**

- Flattened sideways
- Swims sideways and rests in a curved position.
- White or clear body with many segments.
- 2 scuds often cling together.

**Diet:** Detritus (dead animal and plant pieces or other organic matter). Some may filter feed.

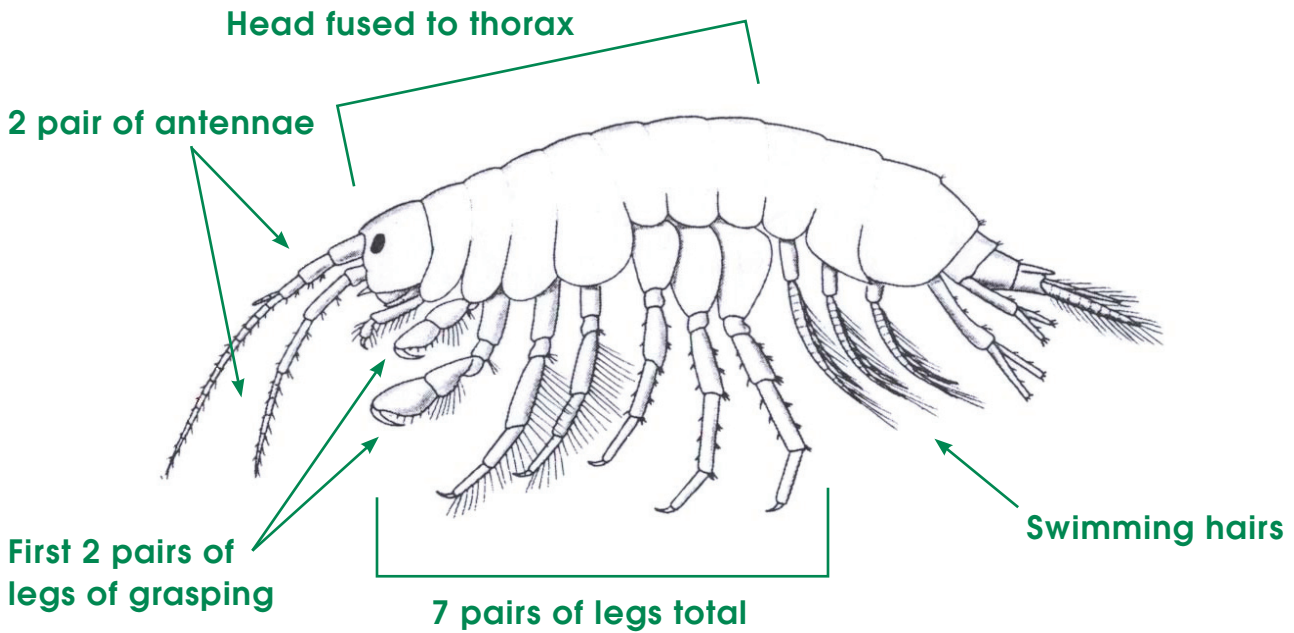
**Food for:** Fish, predaceous water insects.

**Habitat:** Open water and rests on bottom and on debris in shallow water environments.

**Movement:** Swims on side. Also crawls and walks. Often will swim in circles. More active at night.

**Breathing:** Movement of swimming hairs pushes oxygen into the gills under its body.

**Water Quality Indicator:** Group II—Can tolerate some water pollution.

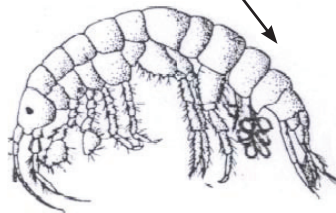


## Life Cycle Corner

### Incomplete Metamorphosis

Eggs kept with female in portions of a shedded skeleton.

Eggs hatch in 9–30 days revealing miniature adults that stay with female for a few days until she molts releasing the young.



Images: McCafferty, W. Patrick. *Aquatic Entomology*, 1981.



**CREEK CONNECTION**  
Allegheny College

# Crayfish Fact Sheet

**Order:** *Decapoda*

**Family:** *Astacidae*

**Number of species in North America:** 280

**Size:** 10–150 mm

**Similar to:** Fresh Water Prawn

- Crayfish are generally brownish-green, speckled and mottled, while prawns are light-gray or cream-colored, and usually translucent.
- Both can change color depending on surroundings.

**Diet:** Will consume whatever is available. Primary diet decaying vegetation; also feed

on live snails, aquatic insects, scuds, small fish, and fish eggs.

**Food for:** Game fish, predaceous water insects.

**Habitat:** Shallow water of rivers, lakes, ponds, and swamps; hidden among rocks or debris.

**Movement:** Hide during day, crawl on legs at night. When disturbed, swim backward. Use tail for propulsion.

**Breathing:** Through gills—wave to circulate water into gill chambers.

**Water Quality Indicator:** Group II—can exist under a wide range of water quality conditions; a large number indicates *moderate* water quality.

**5 pairs of walking legs.**

**Cephalothorax**

(where head is fused with thorax).

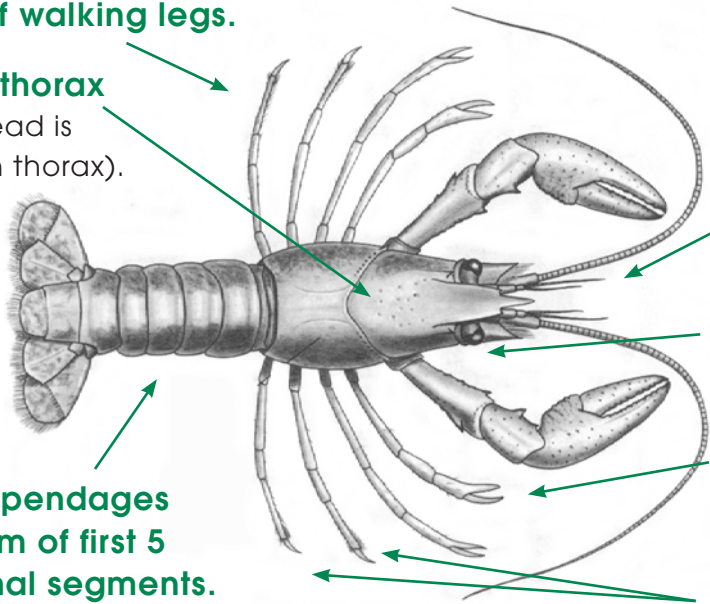
**1 pair of antenna much longer than other 2 pairs.**

**2 large, compound eyes.**

**First 2–3 pairs of walking legs have hinged claw.**

**Small appendages on bottom of first 5 abdominal segments.**

**Other legs have pointed tip.**

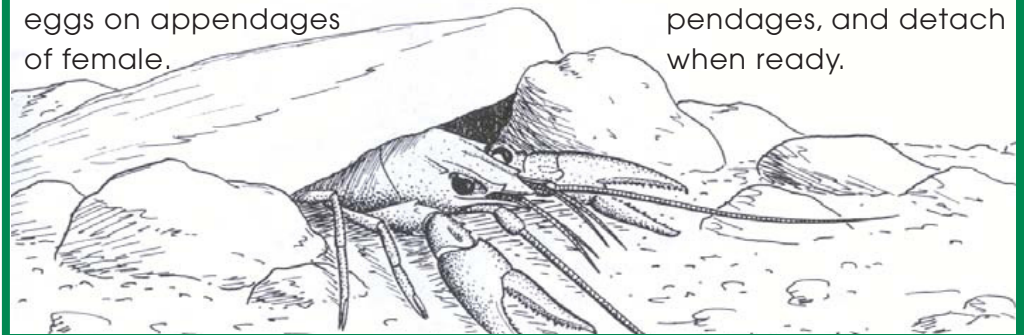


## Life Cycle Corner

### Incomplete Metamorphosis

Sticky substance holds 100–450 eggs on appendages of female.

When eggs hatch, the babies stick to the appendages, and detach when ready.



Images: McCafferty, W. Patrick. *Aquatic Entomology*, 1981.



**CREEK CONNECTION**  
Allegheny College

# Waterstrider Fact Sheet

**Order:** *Hemiptera*

**Family:** *Gerridae*

**Number of species in North America:** 47

**Size:** 3–20 mm (adult)

**Facts:**

- Also called “pond skaters” or “Jesus bugs” because they seem to “walk on water.”
- Middle and hind legs touch water—front legs are held up while middle legs row.
- Steers with hind legs and unequal strokes of middle legs.
- No gills present.

**Diet:** Terrestrial and aquatic insects (living and dead).

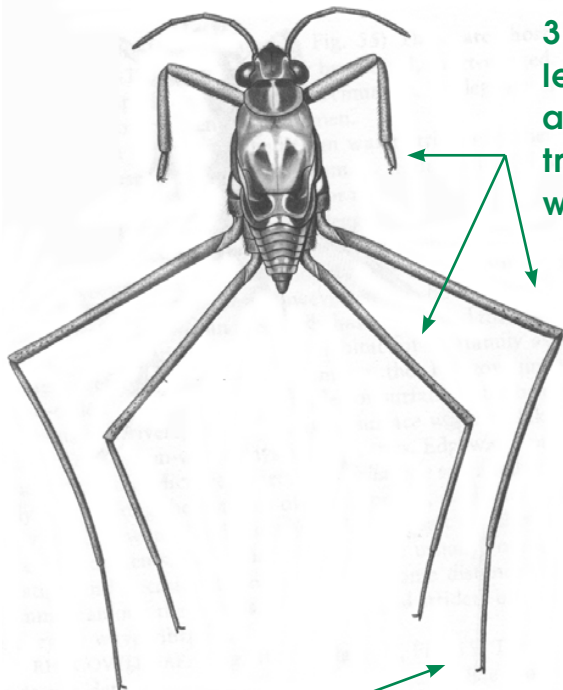
**Food for:** Game fish, predaceous water insects.

**Habitat:** Surface of streams, lakes, ponds, marshes, and ditches.

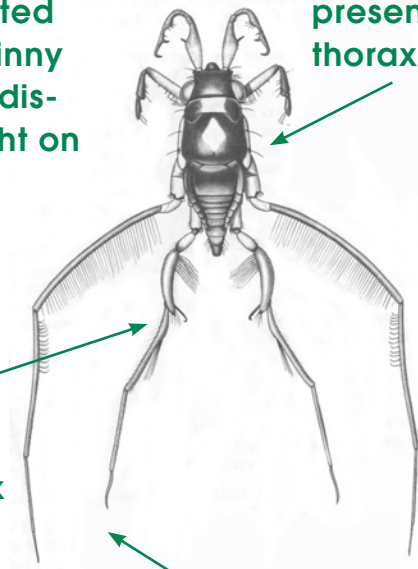
**Movement:** Skate on surface of water.

**Breathing:** Openings in sides of bodies (spiracles). When diving, a thin layer of air is trapped on the unwettable hairs covering body.

**Water Quality Indicator:** Group II—can exist under a wide range of water quality conditions; a large number indicates *moderate* water quality.



3 pairs of segmented legs on thorax, skinny and long, to help distribute body weight on water surface.



Wing pads present on thorax.

Claws on upper leg do not break surface tension.

Ends of legs have non-wettable hairs.

2 claws on segmented legs.

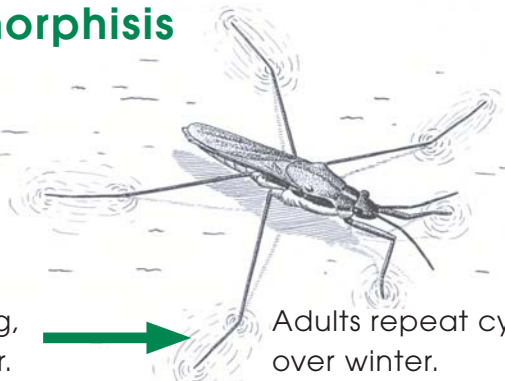
## Life Cycle Corner

### Incomplete Metamorphosis

Loose eggs usually deposited underwater. Attached to solid objects.



Adults lay eggs in spring, develop during summer.



Adults repeat cycle over winter.

Images: McCafferty, W. Patrick. *Aquatic Entomology*, 1981.



# Water Boatman

## Fact Sheet

**Order:** *Hemiptera*

**Family:** *Corixidae*

**Number of species in North America:** 129

**Size:** 3–11 mm (adult)

**Similar to:** Backswimmer

- Backswimmers swim on back. Water boatmen swim upright.
- Backswimmers have long front legs. Water boatmen have short front legs.

**Diet:** Insect fluids, small, dead insect parts, detritus, algae.

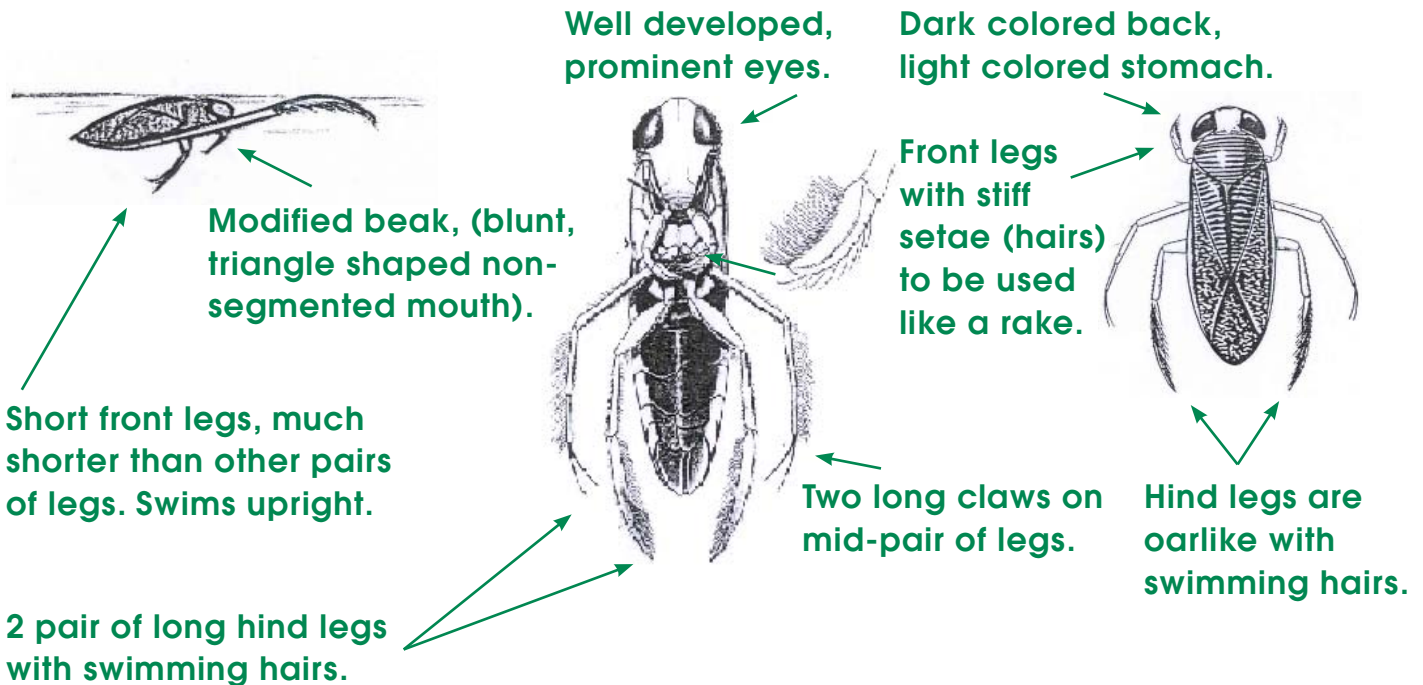
**Food for:** Fish (perch, bass, bluegill, crappie), predaceous water insects

**Habitat:** In the water and bottom. Ponds, shallow lakes, running and quiet waters, stagnant pools, even oceans.

**Movement:** Swims using hind legs and their swimming hairs. When not swimming, will rest on plants or the bottom, and must hold onto an object in order to stay under water.

**Breathing:** Surface for air. Thin film of air on the underside (plastron) kept on body. Hairs keep the air there.

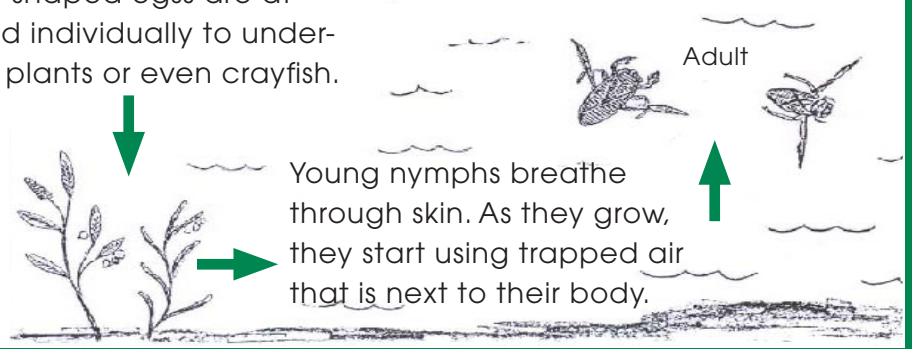
**Water Quality Indicator:** Group III. Some are highly tolerant of water pollution.



## Life Cycle Corner

### Complete Metamorphosis

Onion-shaped eggs are attached individually to underwater plants or even crayfish.



Images: McCafferty, W. Patrick. *Aquatic Entomology*, 1981.



**CREEK CONNECTION**  
Allegheny College



# Net-Spinning Caddisfly Larvae

## Fact Sheet

**Order:** *Trichoptera*

**Family:** *Hydropsychidae*

**Number of species in North America:** 149

**Size:** 10–16 mm

**Facts:**

- Usually captured clinging to rocks and vegetation.
- Builds mesh net for filter feeding—quickly abandon when disturbed.

**Diet:** Collector-feeders; construct mesh net to remove particles from water.

**Food for:** Game fish, predaceous water insects.

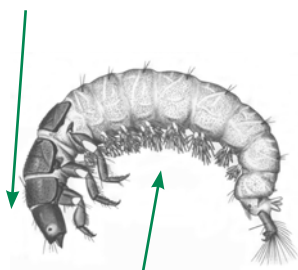
**Habitat:** Flowing waters, usually between rocks or submerged debris.

**Movement:** Clingers; live in tubular retreats attached to solid objects in current.

**Breathing:** Closed breathing system; diffusion over soft body tissue.

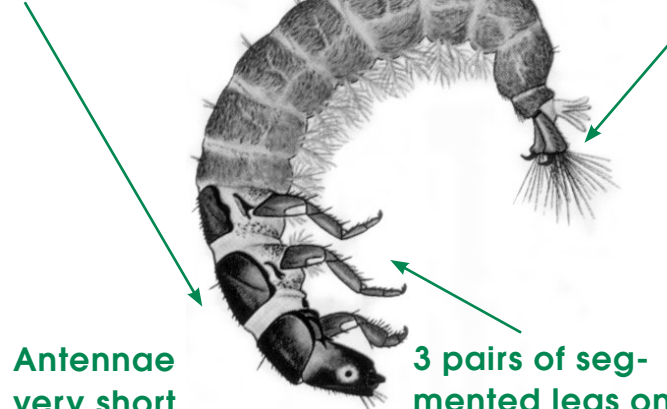
**Water Quality Indicator:** Group II—can exist under a wide range of water quality conditions; a large number indicates *moderate* water quality.

Thick, hardened skin on head.



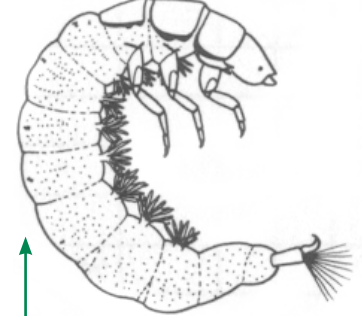
Abdomen is made of thin, soft skin.

No wing pads on thorax.



Antennae very short, barely visible.

1 pair of prolegs with 1 claw on each.



When removed from water, larvae lay on side in C-shape.



Uses silk to secure retreat.



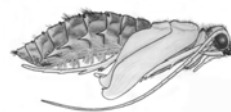
## Life Cycle Corner

### Complete Metamorphosis

Eggs are deposited near the shore.



5 larval instars—the pupal stage takes place in a sealed cocoon (fixed to an object).



Three weeks later, the caddisfly emerges as an adult.

Images: McCafferty, W. Patrick. *Aquatic Entomology*, 1981.



**CREEK CONNECTION**  
Allegheny College

# Stonefly Nymph

## Fact Sheet

**Order:** *Plecoptera*

**Families:**

- *Perlidae*—Common
- *Perlodidae*—Perlodid
- *Leuctridae*—Rolledwinged

**Number of species in North America:** 500

**Size:** 5–35 mm

**Similar to:** Mayfly Nymph

- Stoneflies have 2 tails, mayflies have 3.
- Stoneflies have 2 claws, mayflies have 1.
- Stoneflies do not have abdominal gills, mayflies do.
- Stoneflies have long antenna, mayflies have short antenna.
- Stoneflies have a double set of wings, mayflies have one set.

**Diet:** Small aquatic plants (periphyton) and animals; organic debris; fungi and bacteria from decomposing leaves.

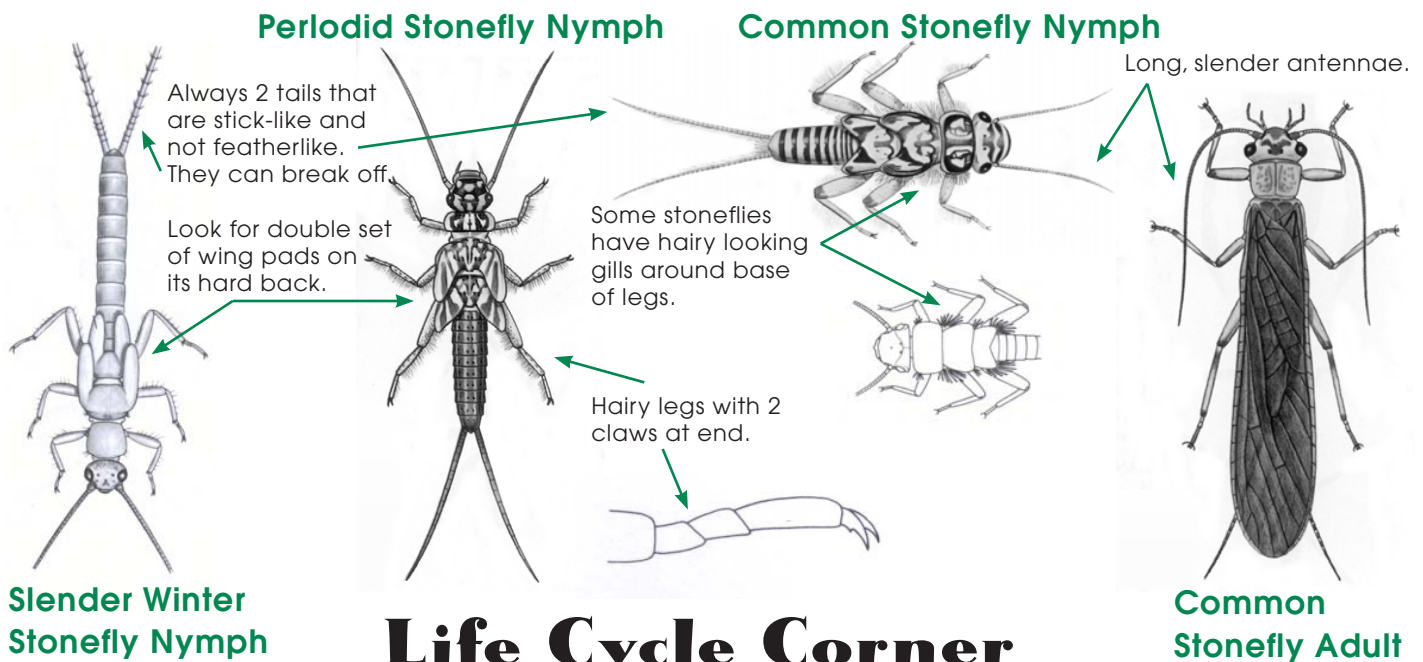
**Food for:** Fish (especially trout), predaceous water insects, crayfish.

**Habitat:** Bottom dweller, on/under rocks, flowing waters (streams and rivers), rarely ponds or lakes.

**Movement:** Crawling on the bottom, some drift.

**Breathing:** Gills, which are sometimes visible around base of legs; will do “push-ups” to elevate oxygen flow over body.

**Water Quality Indicator:** Group I—generally sensitive to pollution; a large number indicates good water quality.



## Life Cycle Corner

### Incomplete Metamorphosis

Eggs deposited in water; a sticky coating keeps them on the bottom. Larva crawl out of water and then transform into adult. Larva or nymph stage is long (months–year). Molts up to 22 times.



Images: McCafferty, W. Patrick. *Aquatic Entomology*, 1981.



**CREEK CONNECTION**  
Allegheny College

# Water Penny Beetle Fact Sheet

**Order:** *Coleoptera*

**Family:** *Psephenidae*

**Number of species in North America:** 16

**Size:** 3–10 mm (larvae)

**Diet:** Larvae are scrappers, they feed on algae, especially diatoms, that collect on rocks and stones in the stream, adults may not feed.

**Food for:** Trout, predaceous water insects.

**Habitat:** Larvae can be found on rocks and stones in areas with riffles. Adults can be found

on land near water.

**Movement:** Larvae are clingers; they are able to grip rocks tightly in areas with strong currents.

**Breathing:** Larvae collect oxygen through gills on underside of abdomen.

**Water Quality Indicator:** Group I—can exist under a limited range of water quality conditions; a large number indicates good water quality.

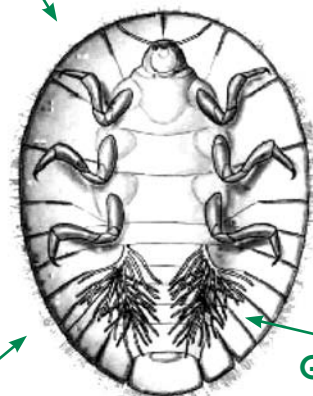
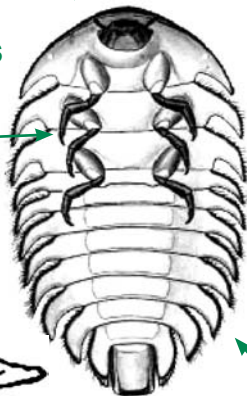
Jaws have thin sharp edge to scrape algae.

Dense fringe of fine hairs to increase grip on rocks and stones.

Adults can be found on rocks and logs above the water surface.

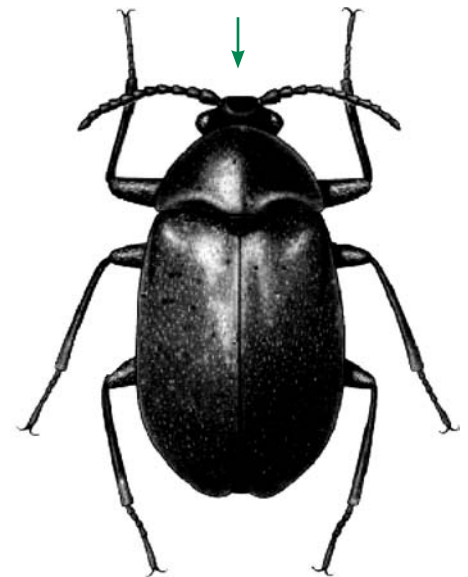
Single hooks at the end of legs.

Side view (larva).



Gills

Thin, flat, flexible plates to help mold body to rock shape.



EUBRIINAE LARVA (ventral)

PSEPHENINAE LARVA (ventral)

ADULT WATER PENNY BEETLE

## Life Cycle Corner

**Complete Metamorphosis** 1–2 years to complete life cycle



Little is known about adults, they are thought to live for only a short period of time.

Pupate on protected rocks near the water surface.

Mature larvae crawl out of water.

Eggs are deposited in patches. Each patch is a single layer contains 400–600 bright yellow eggs.

Larvae are facultative. They can not live in areas with large concentrations of algae and sediments.

Images: McCafferty, W. Patrick. *Aquatic Entomology*, 1981.

Voshell, Reese J. Jr. *A Guide to Common Freshwater Invertebrates of North America*, 2002.



**CREEK CONNECTION**  
Allegheny College

# Mosquito Larvae Fact Sheet

**Order:** *Diptera*

**Family:** *Culicidae*

**Number of species in North America:** 166

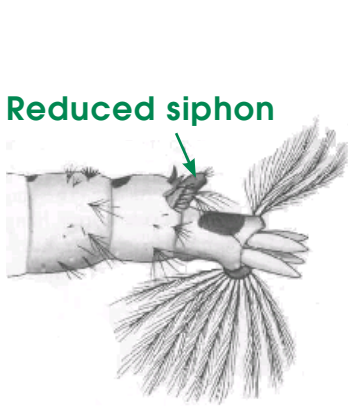
**Size:** 4-14 mm

**Diet:** Collector-filterers collect algae, bacteria, fungi and protozoa, some feed on other species of mosquito larva.

**Habitat:** Any type of still water habitat.

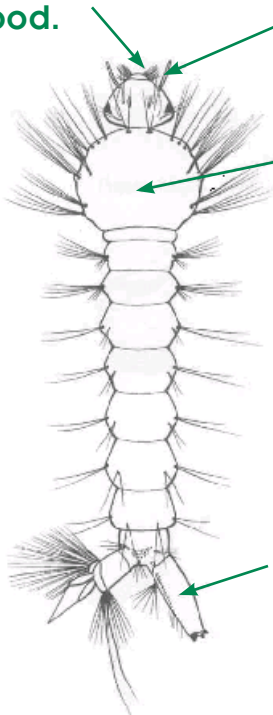
**Movement:** Swimmers, both larvae and pupae swim below the surface by alternately bending and unbending the body.

**Breathing:** Siphons and respiratory horns collect oxygen from air above the surface.



ANOPHELINEAE LARVA, end of abdomen.

Mouth brushes consist of 10 short rods used to collect food.



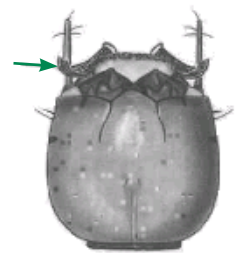
CULICINAE LARVA

Antenna

Mouth brush rods

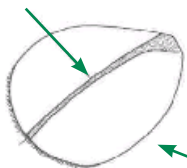
Thorax is thicker than abdomen.

Siphon sticks out above the water surface and is used to breathe air.

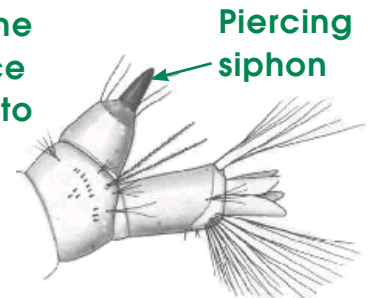


TOXORHYNCHITINAE LARVA, head

Midrib

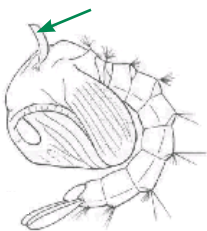


Paddle is used by pupa to swim in a jerking motion



CULICINAE LARVA, end of abdomen

Respiratory horn



## Life Cycle Corner

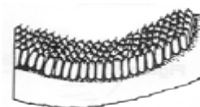
### Complete Metamorphosis

The pupae stage takes place in a sealed cocoon (fixed to an object).



Days later, the mosquito emerges as an adult.

Larva live in the water and shed their skin four times. Larvae live in the water from 4 to 14 days.



Eggs can remain dormant until there is sufficient water to hatch.



Eggs are deposited individually or in groups called rafts in the water or on a land area that will be flooded.

Images: McCafferty, W. Patrick. *Aquatic Entomology*, 1981.

Voshell, Reese J. Jr. *A Guide to Common Freshwater Invertebrates of North America*, 2002.



CREEK CONNECTION  
Allegheny College



# Mayfly Nymph

## Fact Sheet

**Order:** *Ephemeroptera*

**Family:** *Baetidae*—Small minnow;

*Heptageniidae*—Flatheaded;

*Ephemeridae*—Common Burrower

**Number of species in North America:** 149

**Size:** 3–20 mm (nymph), 5–8 mm (adult)

**Similar to:** Stonefly

- Mayflies have 3 tails, while stoneflies have 2. Just a general rule; some species only have 2 tails. Often, tails break off easily.
- Mayflies have 1 claw, stoneflies have 2.
- Mayflies have abdominal gills, while stoneflies do not.
- Mayflies have a single set of wingpads, while stoneflies have double.
- Mayflies have short antennae, while stoneflies have long.

**Facts:**

- Some Mayflies use hairs on their forelegs to filter food out of the water. Most, but not all, are filter-feeders.
- Adults have triangular-shaped wings that are held straight-up when body is at rest.

**Diet:** Microscopic algae, small bits of organic matter, plants; a few eat other insects.

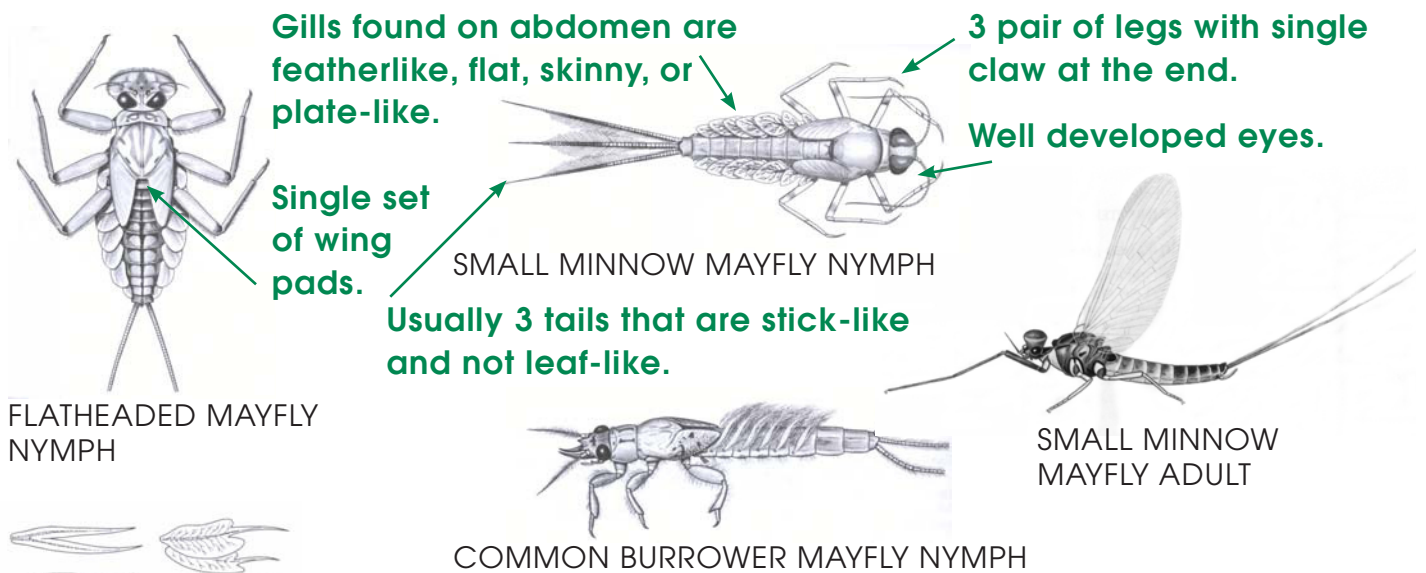
**Food for:** Game fish, predaceous water insects.

**Habitat:** Bottom dwellers; flowing waters (streams and rivers), ponds and shallow lakes.

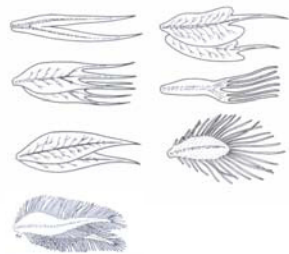
**Movement:** Swim, cling to rocks, some burrow.

**Breathing:** Through gills on abdomen.

**Water Quality Indicator:** Group I—generally sensitive to pollution; a large number indicates good water quality.



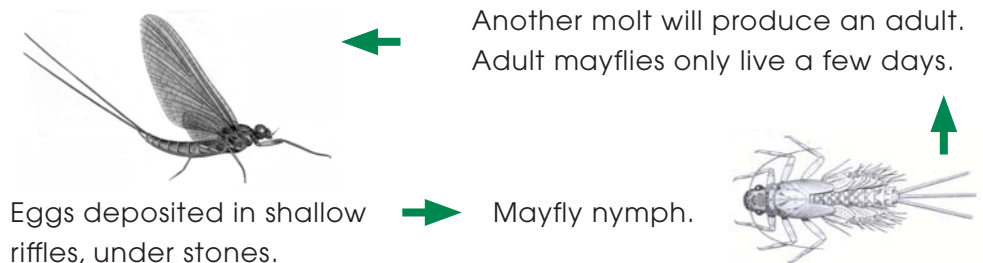
FLATHEADED MAYFLY NYMPH



Variety of gills.

## Life Cycle Corner

### Incomplete Metamorphosis



Images: McCafferty, W. Patrick. *Aquatic Entomology*, 1981.



# Dragonfly Nymph

Fact Sheet

**Order:** *Odonata*

**Family:** *Aeshnidae*—Darners; *Gomphidae*—Clubtails; *Libellulidae*—Common Skimmers

**Number of species in North America:** 243

**Size:** Darners: 45 mm (larvae), 79 mm (adult); Clubtails: 30 mm (larvae), 50 mm (adult); Common Skimmers: 21 mm (larvae), 50 mm (adult)

**Similar to:** Damselfly

- A dragonfly's head is narrower than thorax and abdomen, while a damselfly's head is wider.

**Diet:** Insects (and larvae), other dragonfly nymphs, worms, small crustaceans. Will go af-

ter movement and even stalk prey.

**Food for:** Gamefish, frogs, birds, beetles, other dragonflies.

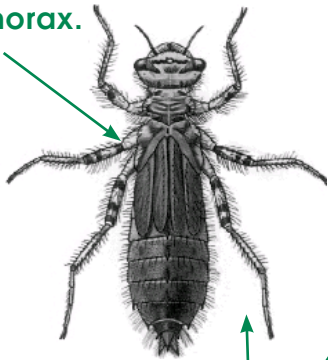
**Habitat:** Ponds, marshes, lake edges, shallow streams, slow streams and rivers

**Movement:** Climb and crawl on bottom. Some burrow. Can propel through water by sending water out their rear (rectal chamber).

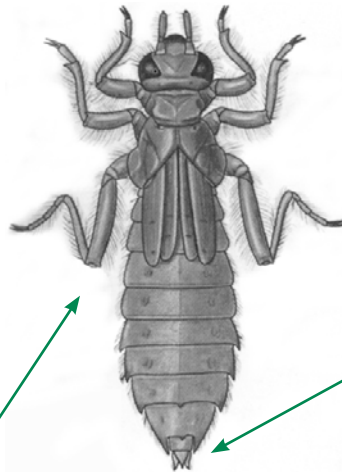
**Breathing:** Through gill folds on rear area of body, and thin-walled body regions.

**Water Quality Indicator:** Group II—can exist under a wide range of water quality conditions; a large number indicates *moderate* water quality.

Thick, hardened skin on head and thorax; 2 pairs of wing pads on thorax.



COMMON SKIMMER  
DRAGONFLY NYMPH

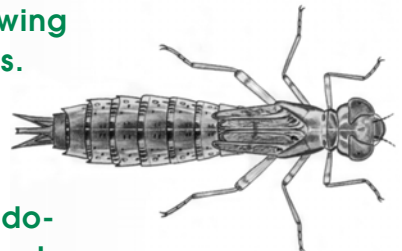


CLUBTAIL  
DRAGONFLY NYMPH

Scooplike lip (called labium) to capture food. Large chewing mouthparts.



No tail. Abdomen terminates with 3 stubby wedgeshaped structures.



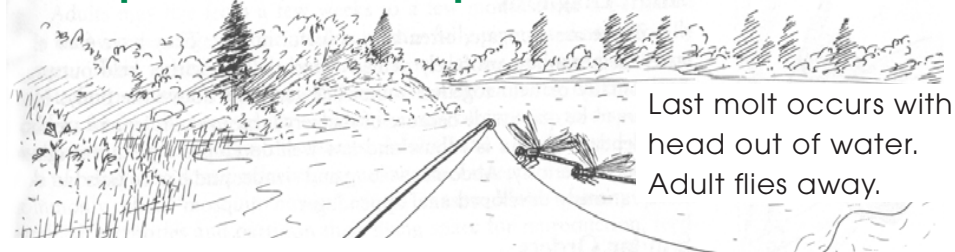
DARNER NYMPH  
AND ADULT



3 pairs of segmented legs extend from thorax. 2 claws at the end of each leg.

## Life Cycle Corner

### Incomplete Metamorphosis



Eggs deposited onto plant leaves/stems underwater. Sometimes eggs are just laid in shallow water.

Last molt occurs with head out of water. Adult flies away.

Nymph hatches and molts 12 times.

Images: McCafferty, W. Patrick. *Aquatic Entomology*, 1981.



CREEK CONNECTION  
Allegheny College

# Case-Building Caddisfly Fact Sheet

**Order:** *Hydropsychidae*

**Family:** *Limnephilidae*

**Number of species in North America:** > 300

**Size:** body 20–30 mm, case 25–50 mm

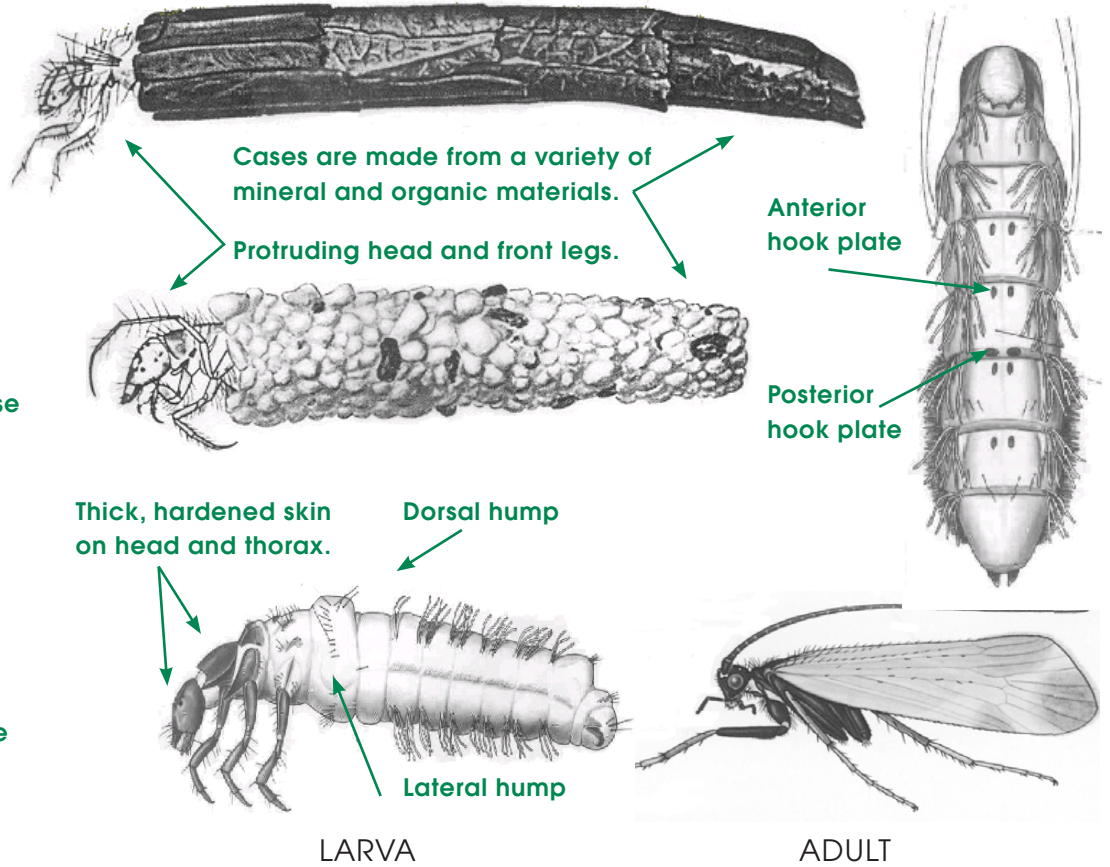
**Diet:** Shredder-detritivores, shredder-herbivores, collector-gatherers, scraper.

**Food for:** Game fish, predaceous water insects.

**Habitat:** Lentic and lotic habitats, streams, rivers, springs, marshes and ponds.

**Movement:** clingers, crawlers and climbers.

**Water Quality Indicator:** Groups I and II—can exist under a limited or wide range of water quality conditions; a large number indicates good water quality.



## Life Cycle Corner

### Complete Metamorphosis

Adults emerge in late spring or early fall and live for approximately 30 days. →

The pupa stage lasts 2–3 weeks. Pupae are aquatic and obtain oxygen in the same way as larvae. ←

Larvae create a cocoon in the water for the pupa. ←

Eggs are deposited in gelatin masses in the stream. Masses vary from a few eggs each to several hundred eggs in each mass. Egg masses are sometimes green, yellow or orange. →

The larval stage can last from 2–3 months to 2 years. Larva shed their exoskeleton an average of 5 times. ↑

Images: McCafferty, W. Patrick. *Aquatic Entomology*, 1981.  
Voshell, Reese J. Jr. *A Guide to Common Freshwater Invertebrates of North America*, 2002.