



Benthic Macroinvertebrate Identification



University of Iowa Hygienic Lab

Other Life in Streams



- Aquatic Plants – Plants that grow in the water or wet soils
 - Stabilize substrate, provide habitat, produce oxygen & can remove contaminants from sediment.



- Algae – microscopic plants that live in water
 - Single cell or grow in colonies.
 - Can be an indication of high nutrients

- Bacteria – Single celled organisms
 - Some are indicators of pollution



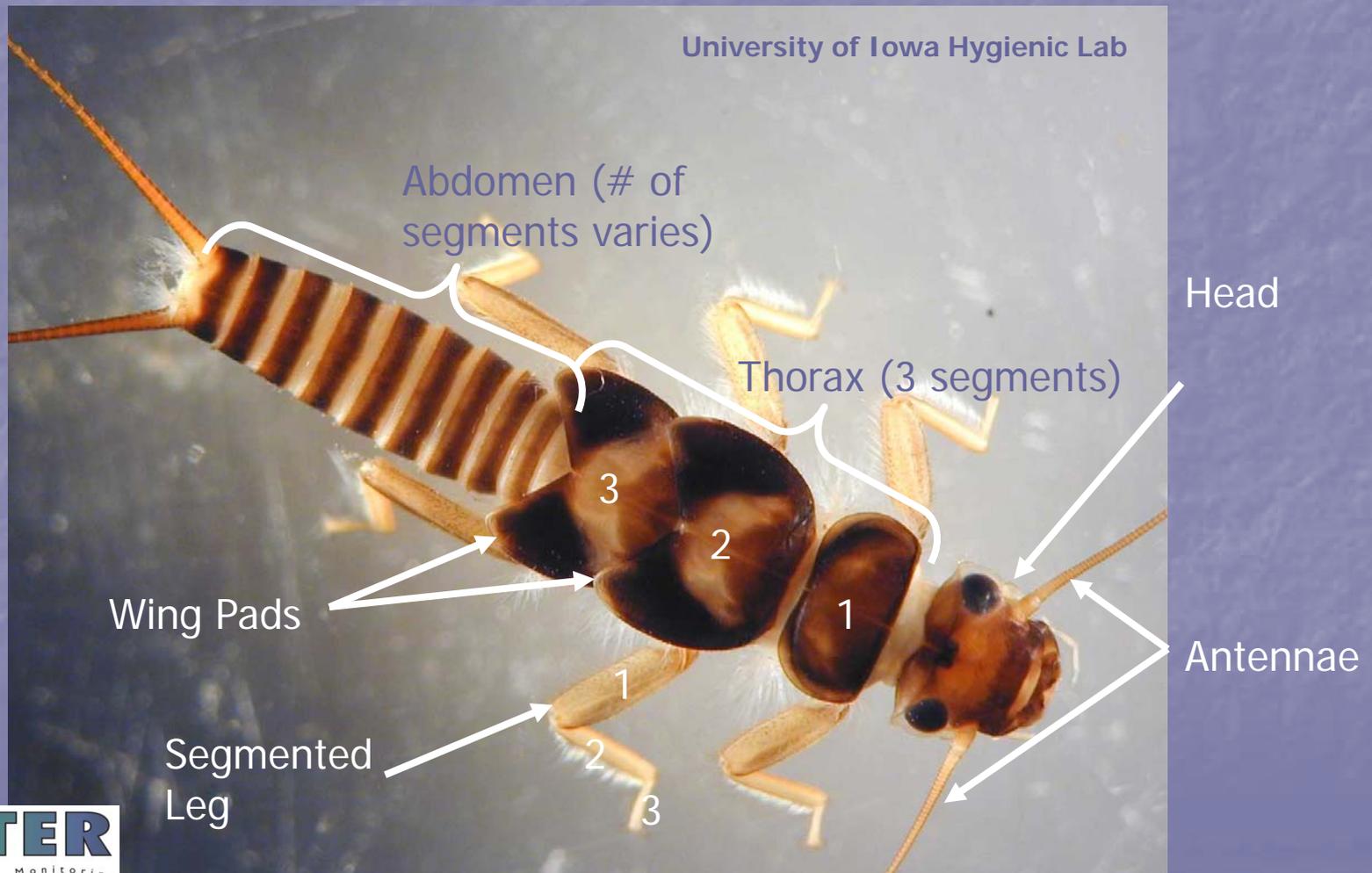
Benthic Macroinvertebrate (BMI) Identification - Classification

Kingdom - Anamalia				
Phylum	Subphylum	Class	Order	Family
				Dytiscidae <i>(predacious diving beetle)</i>
Arthropoda	Hexapoda	Insecta	Coleoptera <i>(water beetles)</i>	Elmidae <i>(riffle beetle)</i>
				Gyrinidae <i>(whirligig beetle)</i>
				Haliplidae <i>(crawling water beetle)</i>
				Hydrophilidae <i>(water scavenger beetle)</i>
				Psephenidae <i>(water penny beetle)</i>

BMI Identification

Insect Morphology

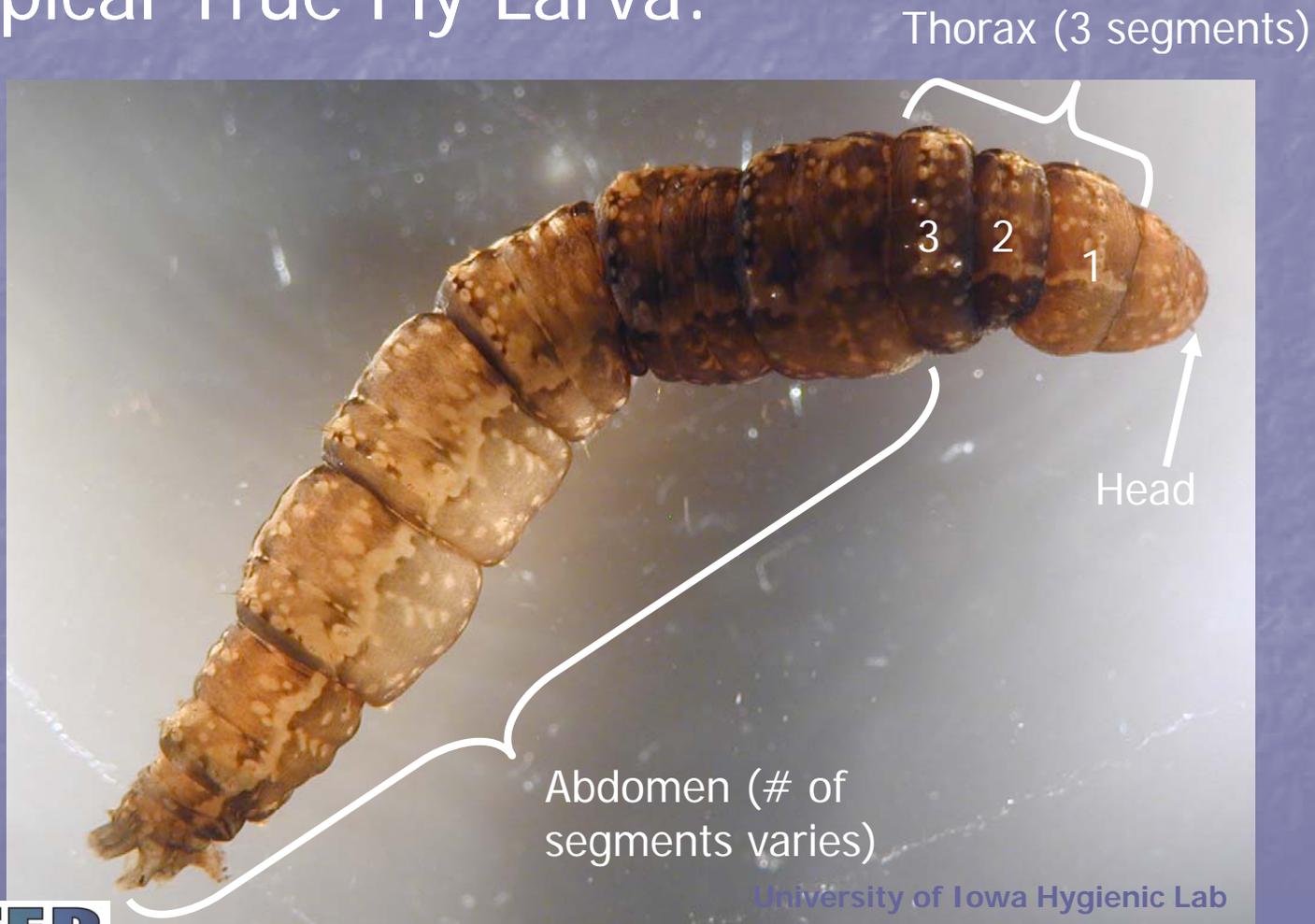
- Typical Aquatic Insect Larva:



BMI Identification

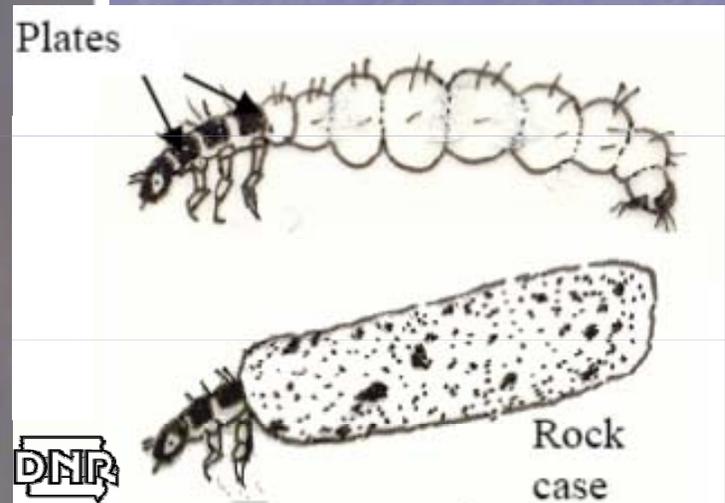
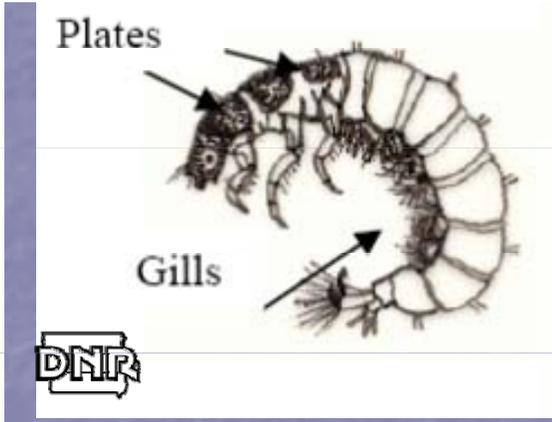
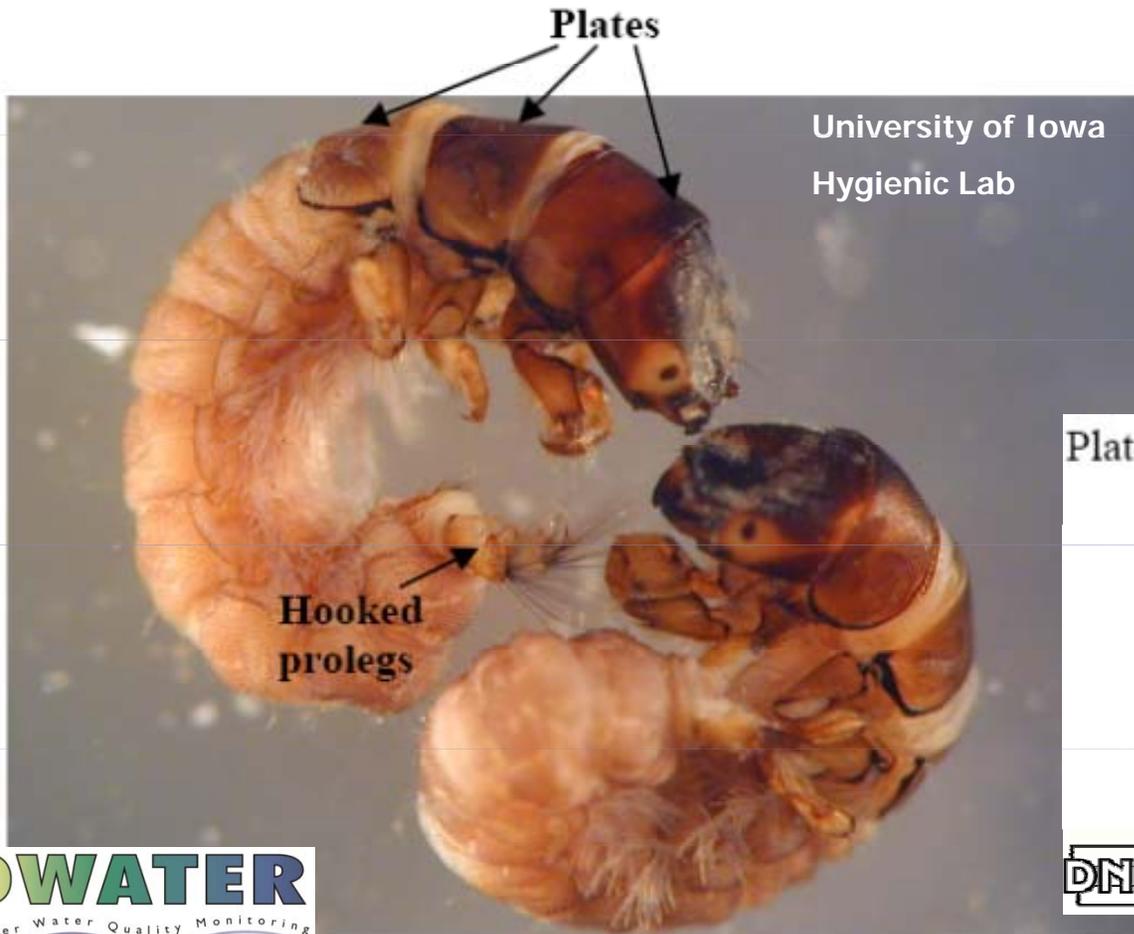
Insect Morphology

- Typical True Fly Larva:



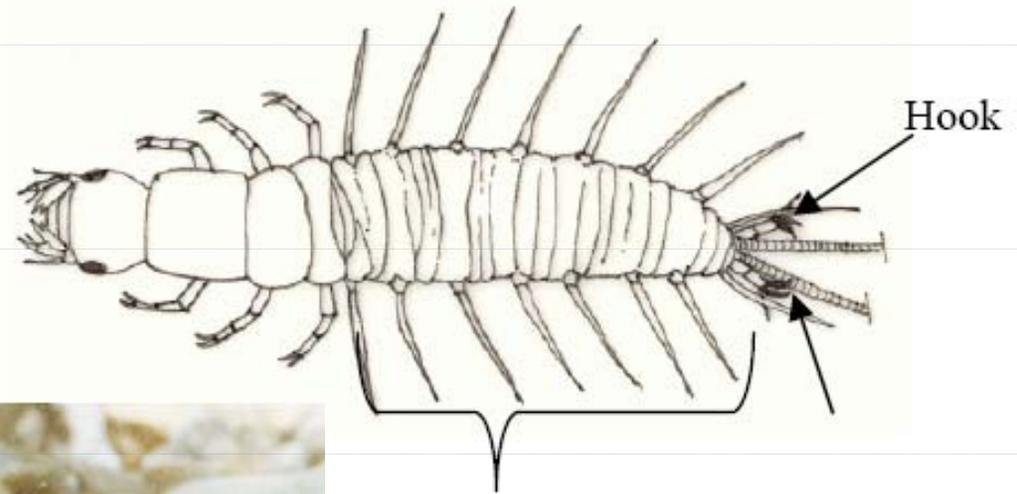
University of Iowa Hygienic Lab

Caddisflies – Have 3 pairs of legs each terminating in a pair of hooks. Head and thoracic segments (sometimes only the 1st segment) covered in hard plates and a soft abdomen that ends in a pair of prolegs bearing hooks. Sometimes builds a stick, rock, or leaf case.



Dobsonflies – Have 3 pairs of legs, 8 pairs of lateral filaments on abdomen and large forward projecting jaws. The end of the abdomen has a final set of lateral filaments and a pair of fleshy appendages; each bears a pair of hooks.

B



Lateral filaments



Missouri Department of Conservation

Right spiral snail – Their opening spirals up from the right if you look at the shell with the tip pointed away from you. Do not count empty shells.

C

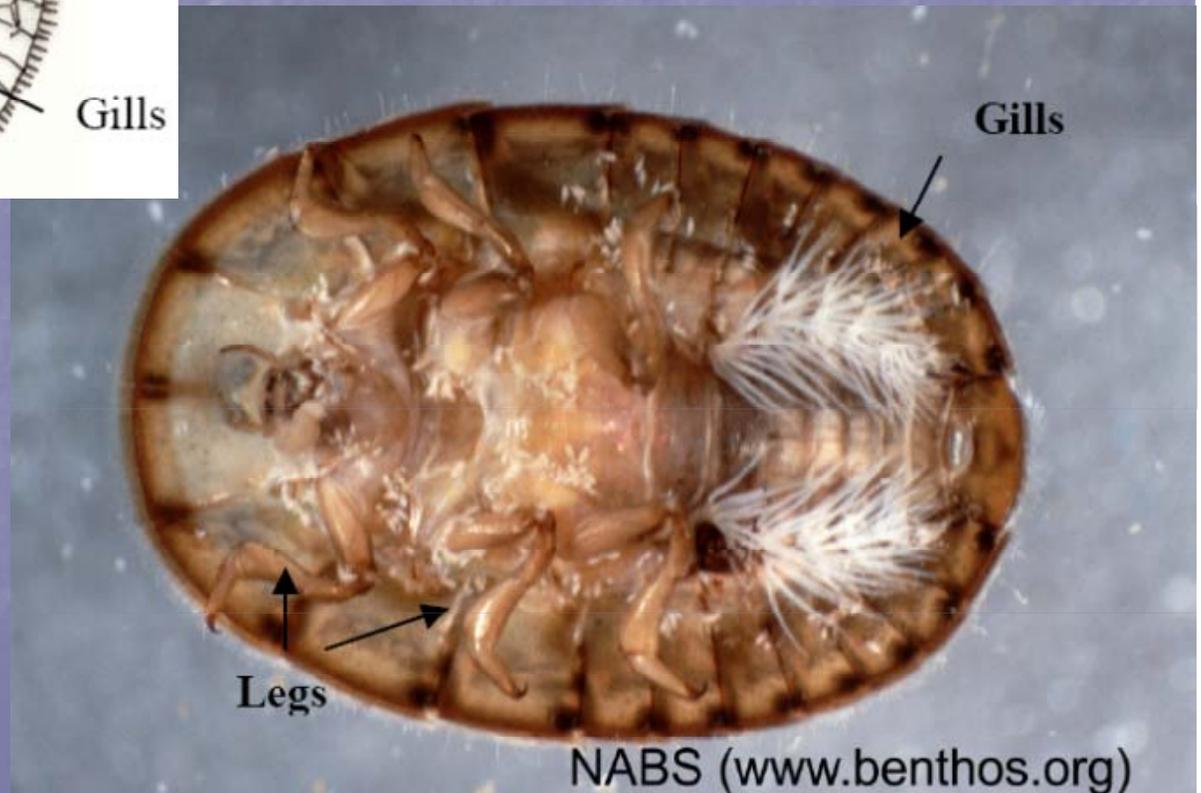
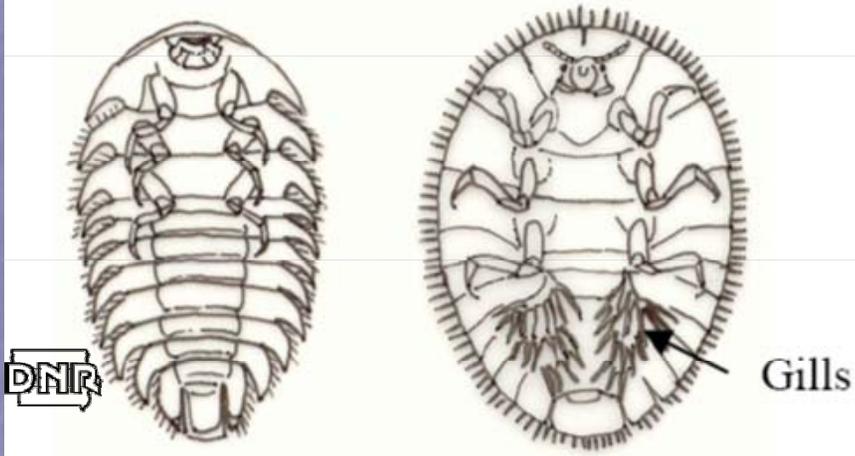
Missouri Department of Conservation



DNR

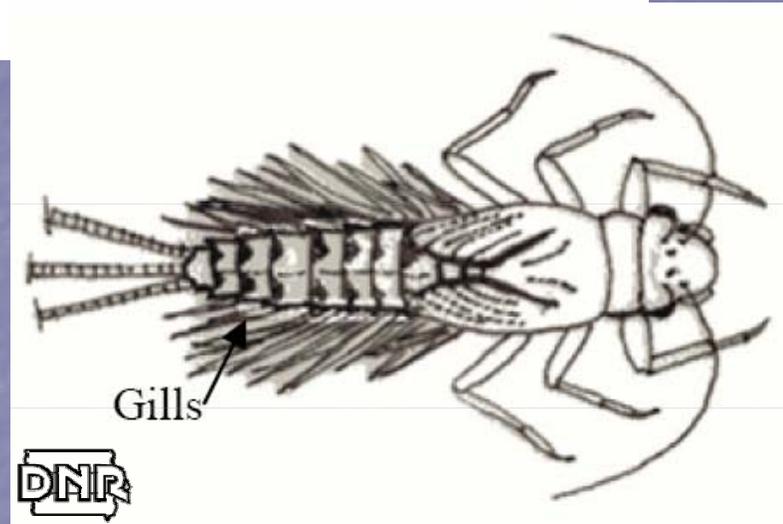
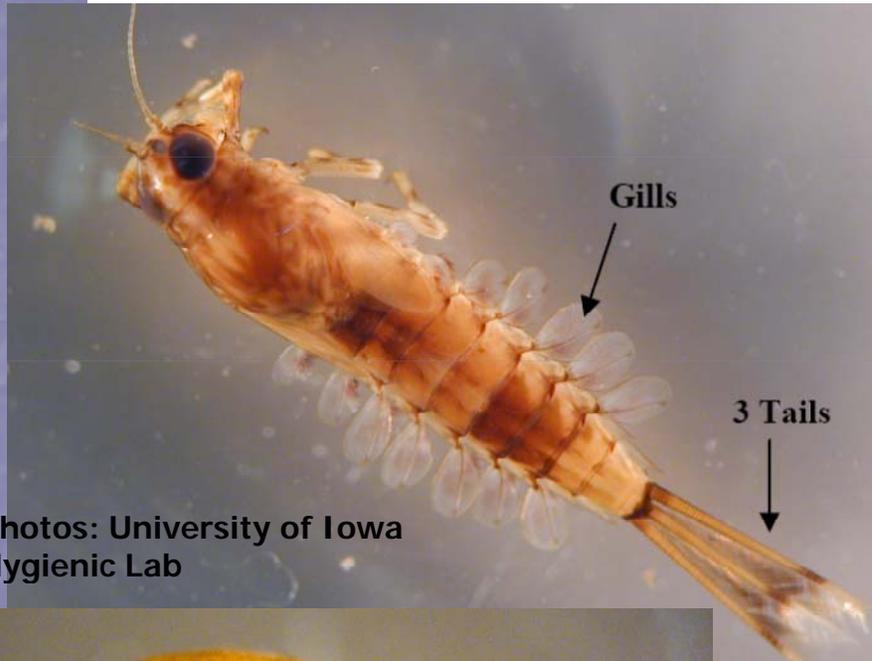
Opening to
the right

Water Penny Beetles – Are flat and saucer-shaped. They have 3 pairs of tiny legs and gills on the underside of their bodies.

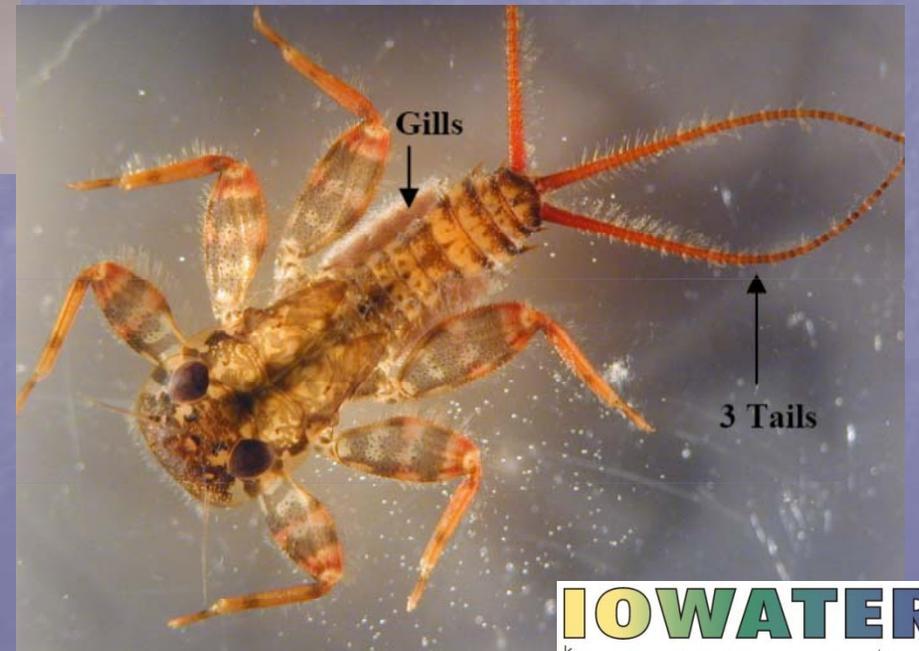


Mayflies – Have 3 pairs of legs, feather or oval-shaped gills on their abdomen (lower body) and 2 to 3 long tails.

E

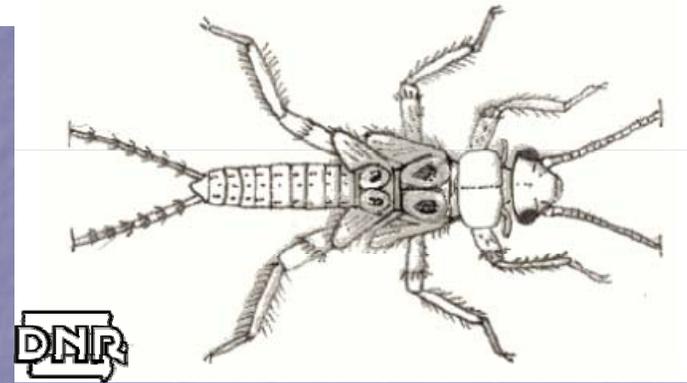


Photos: University of Iowa Hygienic Lab

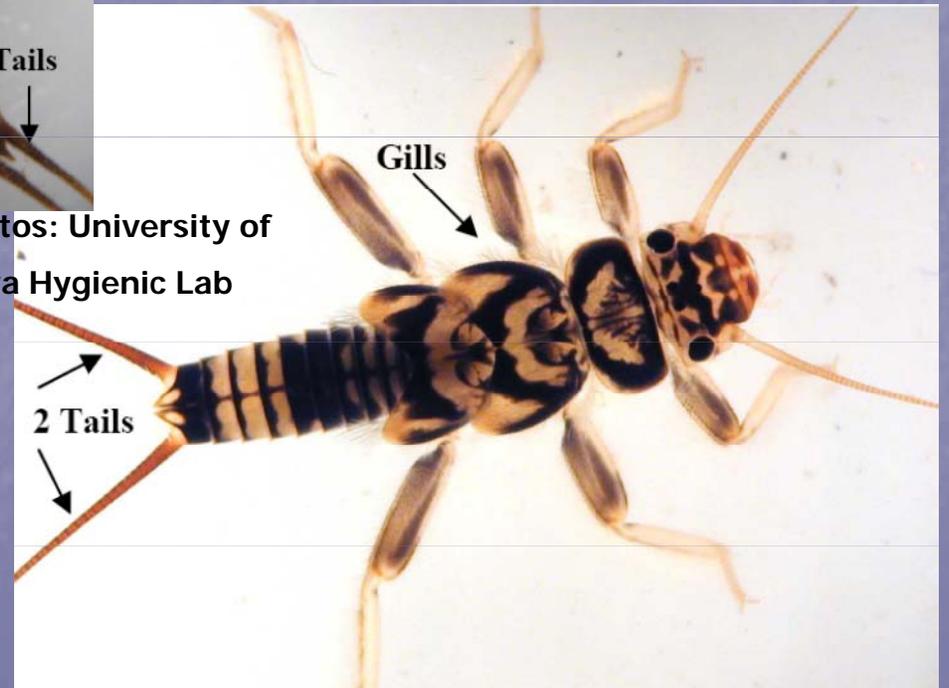


Stoneflies – Have 3 pairs of hooked legs, antennae, 2 tails and gill tufts under their legs (hairy armpits) or no visible gills.

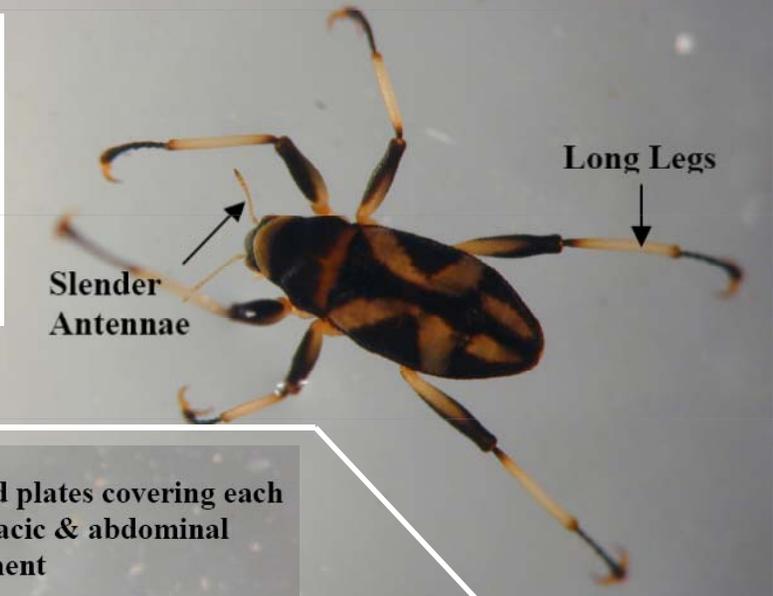
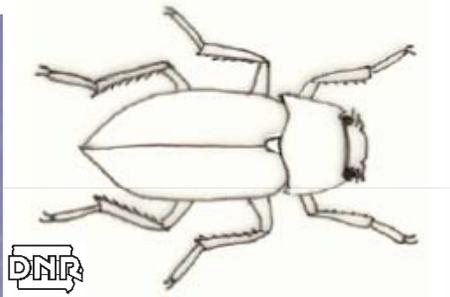
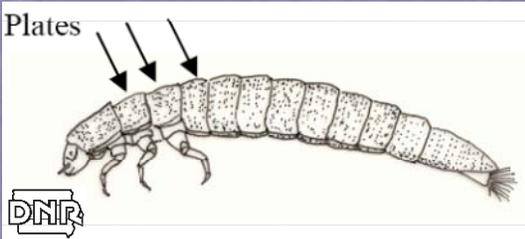
F



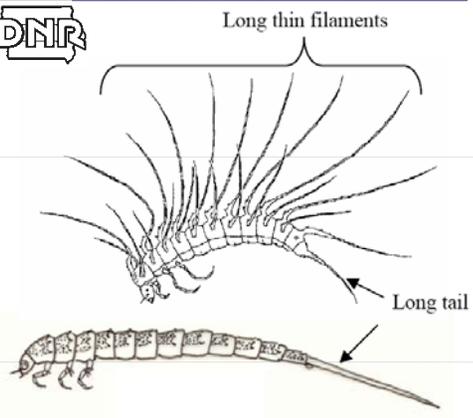
Photos: University of Iowa Hygienic Lab



Riffle Beetles (Adult) – Have 3 pairs of long legs, slender antennae, and walks slowly under water.

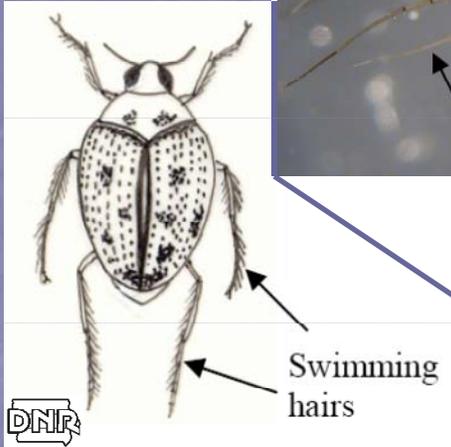
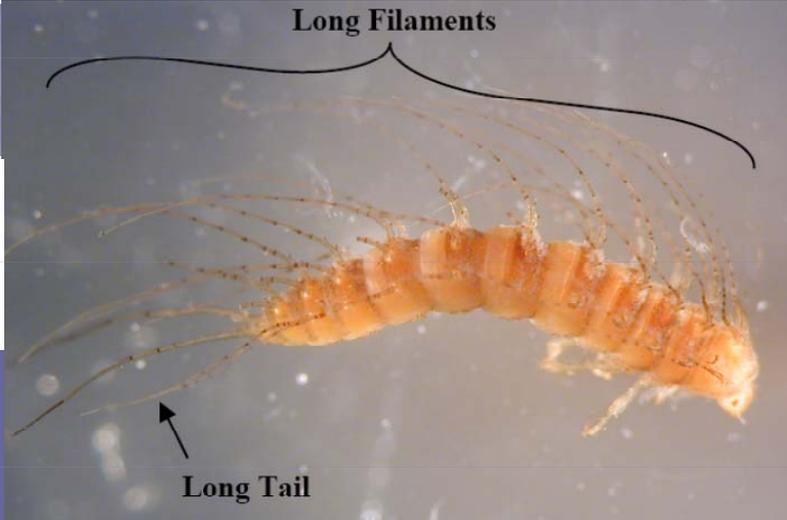


Riffle Beetles (Larva) – Have 3 pairs of legs terminating in a single claw. Thoracic and abdominal segments covered with hard plates.



Crawling Water Beetles (Larva) – Has 3 pairs of legs each ending in hook-like claws, one long tail, and sometimes with long thin filaments extending dorsally from each thoracic and abdominal segment.

Photos: University of Iowa Hygienic Lab



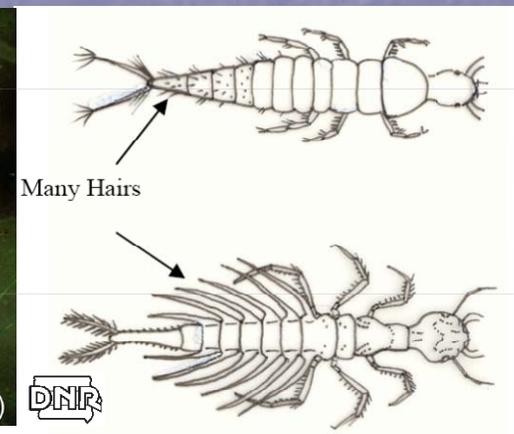
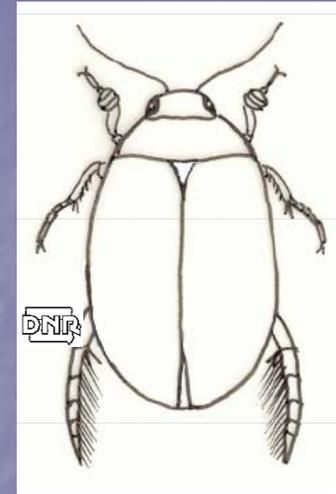
H

Crawling Water Beetles (Adult) – Have long, slender antennae, swimming hairs on 3 pairs of legs and is often patterned or spotted.



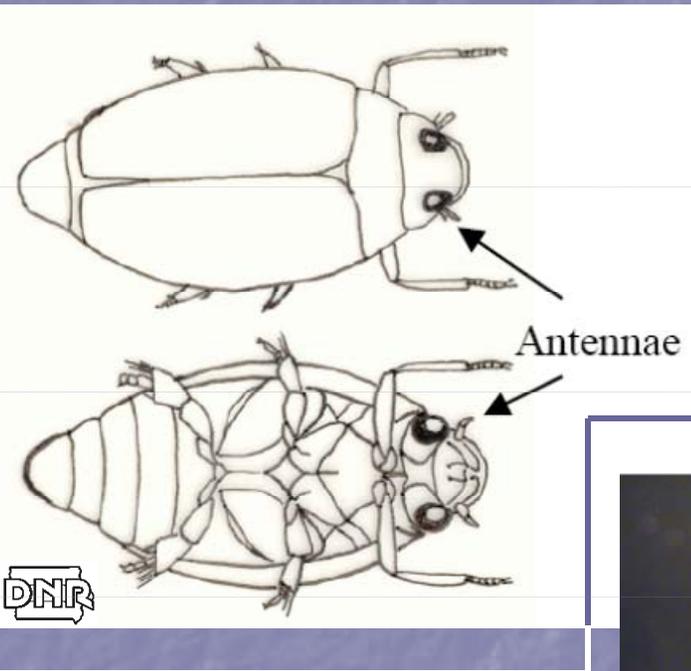
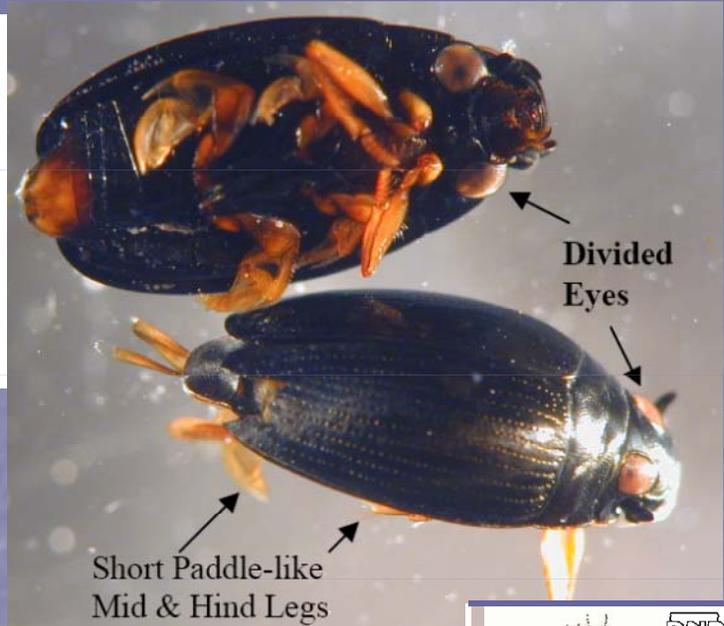
Predaceous Diving Beetles (Adult) – Oval streamline body, antennae longer than Whirligig Beetle's and slender.

Photos: University of Iowa Hygienic Lab



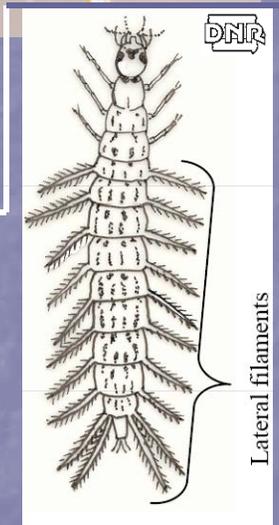
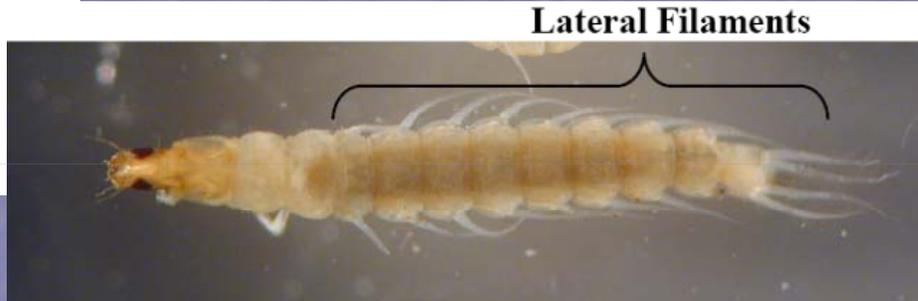
Predaceous Diving Beetles (Larva) – Have many hairs on body (sometimes very short), two feathery tails and a large head and jaws.

Whirligig Beetles (Adult) – Have an oval body, short clubbed antennae and mid and hind legs that are short and paddle-like. They have compound eyes that are divided so that it appears that they have eyes on the top and bottom of their bodies. They are erratic swimmers on the waters surface.



K

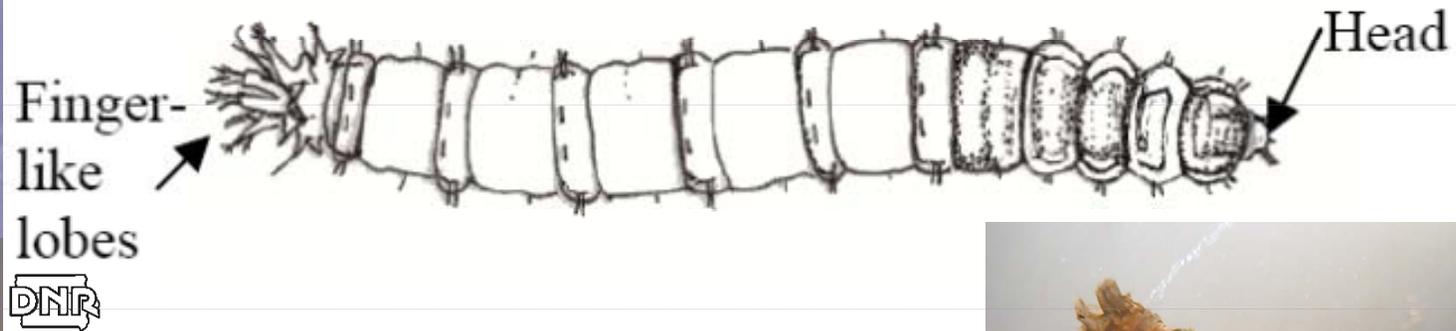
Photos: University of Iowa Hygienic Lab



Whirligig Beetles (Larva) – Has 3 pairs of clawed legs, 10 abdominal segments with lateral filaments and a short tail or no tail.

Crane Flies – Have a caterpillar-like segmented body with 4 finger-like lobes at the posterior of the abdomen and a head retracted into the body.

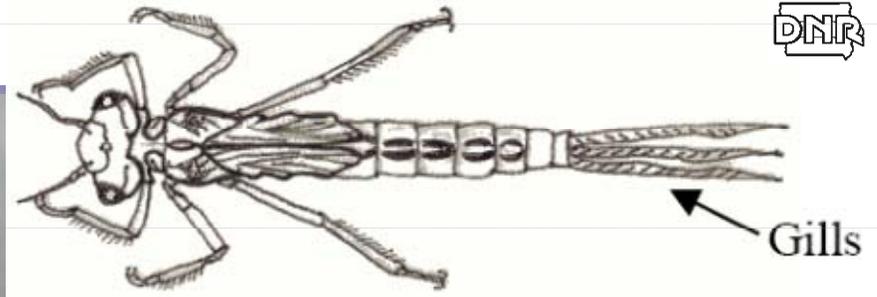
L



Photos: University of Iowa Hygienic Lab

Damselflies – Are more slender than dragonflies. They have 3 pairs of thin hooked legs, large eyes and 3 broad oar-shaped “tails” (gills). Their lower lip forms an extendable mask-like or scoop-like feature that is used to catch prey.

M



Photos: University of Iowa Hygienic Lab

Damselflies & Dragonflies lower lip:



Spoon-shaped lower lip



Mask-like lower lip

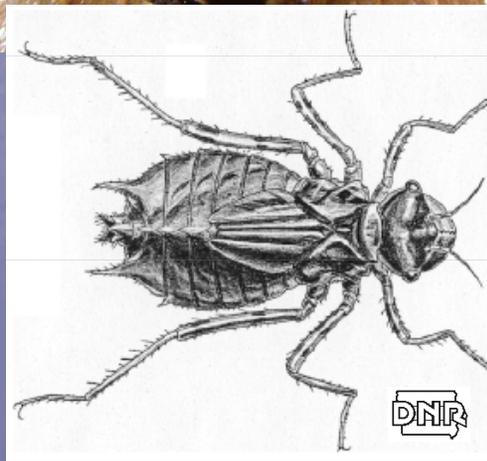
Photos: California Dept. of Fish & Game Aquatic Bioassessment Lab

Dragonflies – Have a wide oval abdomen, 3 pairs of hooked legs and large eyes. Their lower lip forms an extendable mask-like or scoop-like feature that is used to catch prey. Dragonflies swim by taking in water with their mouths and shooting it out their anus (Jet-propulsion!)

Jacklyn Gautsch



United States Geological Survey



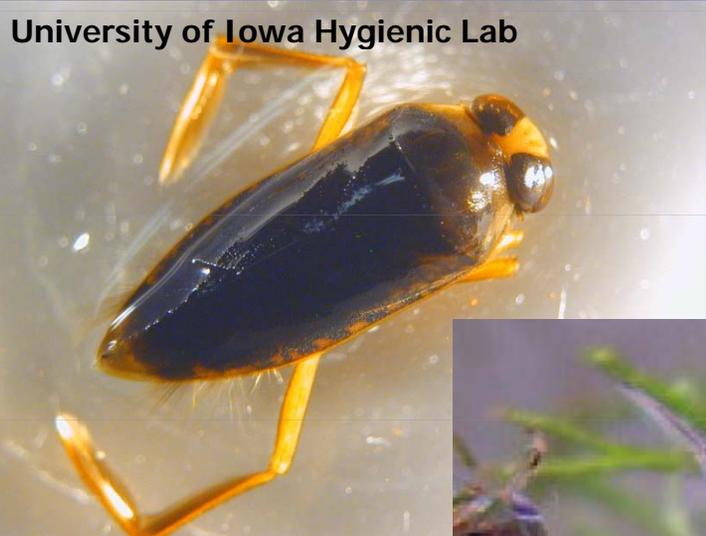
DNR



University of Iowa Hygienic Lab

Backswimmers – Have forelegs that are not as spoon-shaped as the Water Boatmen and a v-shaped body. The backswimmer swims upside down so that when it comes to a stop its legs will be pointing up.

0

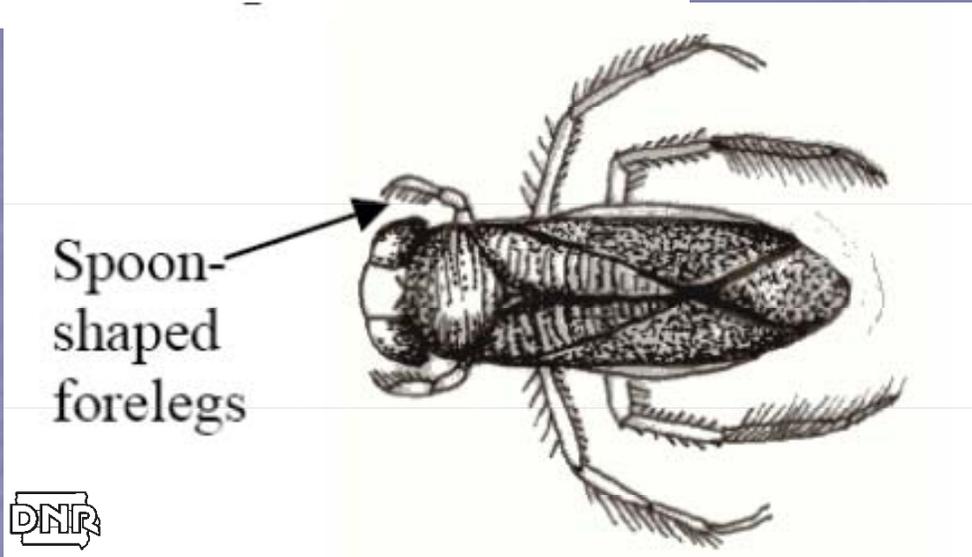


Water Boatman – Their forelegs are spoon-shaped and shorter compared to the backswimmer.

P



University of Iowa Hygienic Lab



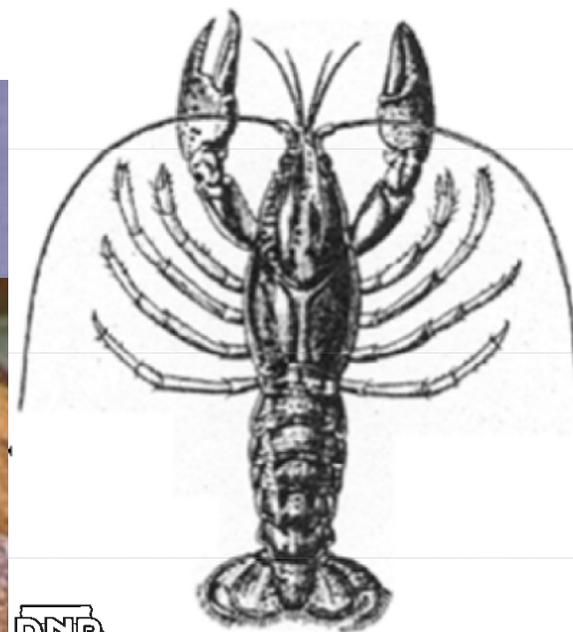
DNR



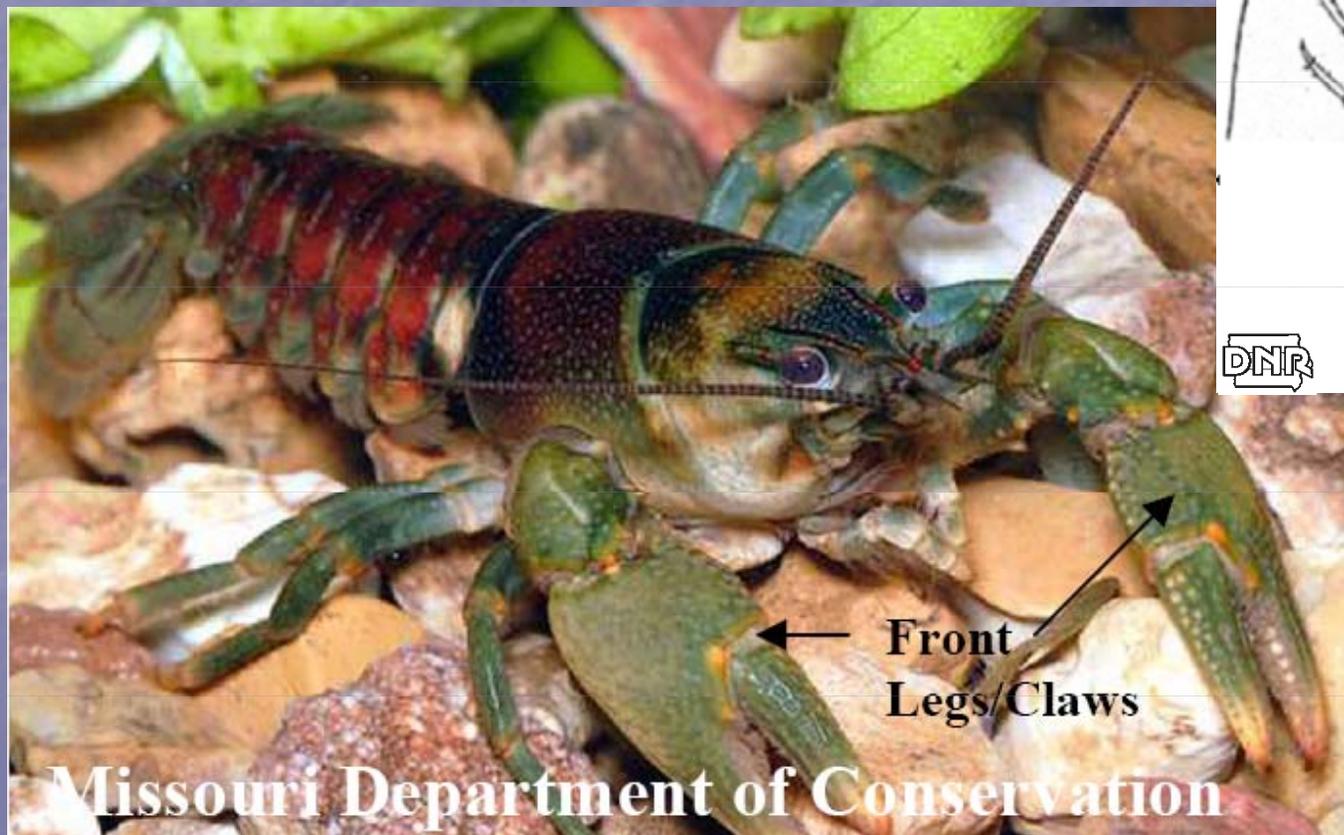
NABS (www.benthos.org)

Q

Crayfish - Look like small lobsters and have ten legs, with the front two bearing large claws, antennae and an exoskeleton composed of chitin.



DNR



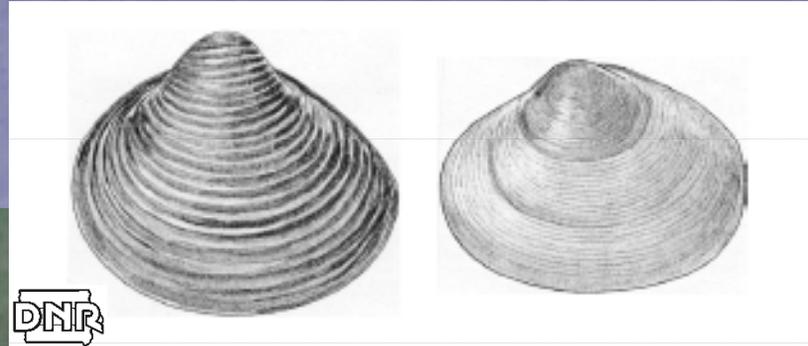
← Front
Legs/Claws →

Missouri Department of Conservation

IOWATER
Volunteer Water Quality Monitoring

Clams and mussels – Fleshy body enclosed between 2 clamped shells. Do not count empty shells.

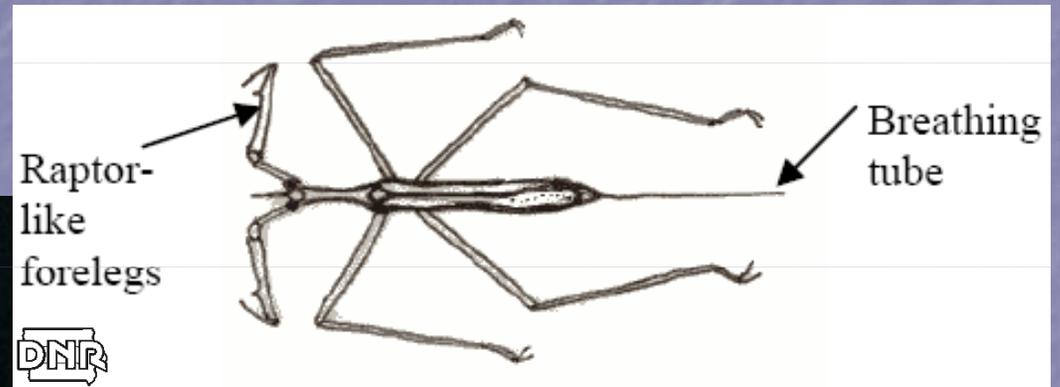
R



Missouri Department of Conservation

Water Scorpions – Raptor-like forelegs for catching prey, a long stick-like body and a long breathing tube extending from their abdomen.

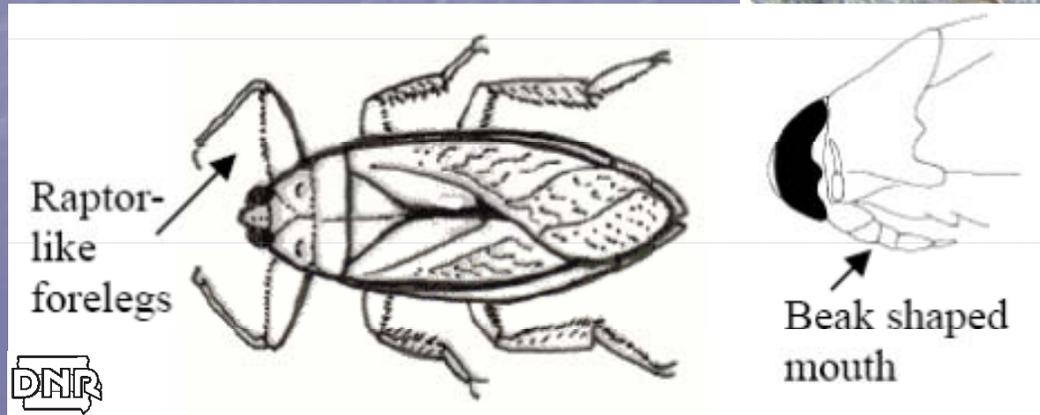
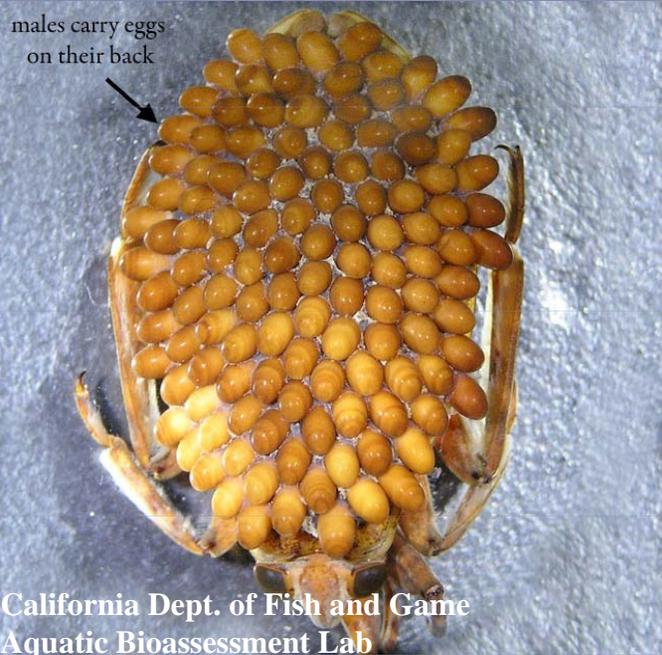
S



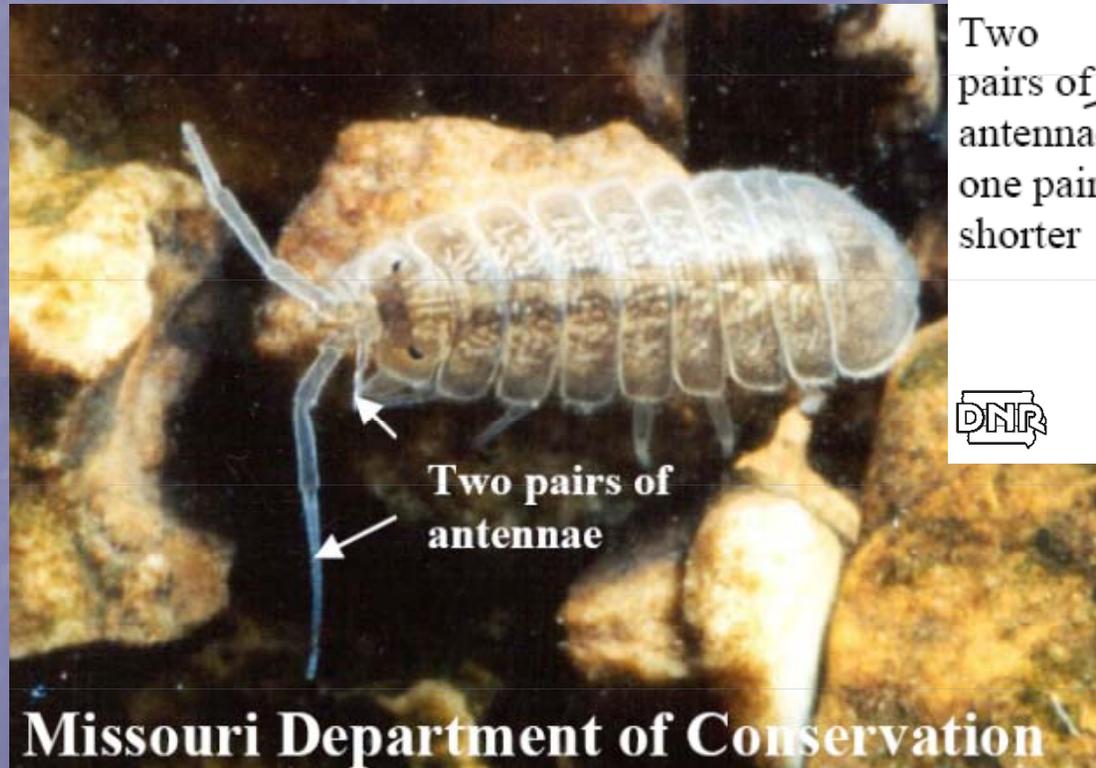
James Lindsey at Ecology of Commonster

Giant Water Bugs – Oval body, raptor-like forelegs for catching prey, a beak shaped mouth and leathery textured wings that fold across the back.

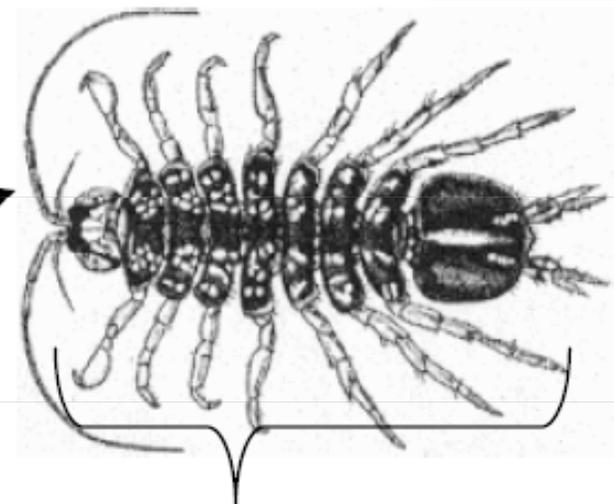
T



Sowbugs - Look similar to scuds except they are dorso-ventrally flattened (body is wider than it is high) and gray to brown in color. They have seven pairs of legs, two pairs of antennae (one pair shorter than the other), and an exoskeleton composed of chitin.

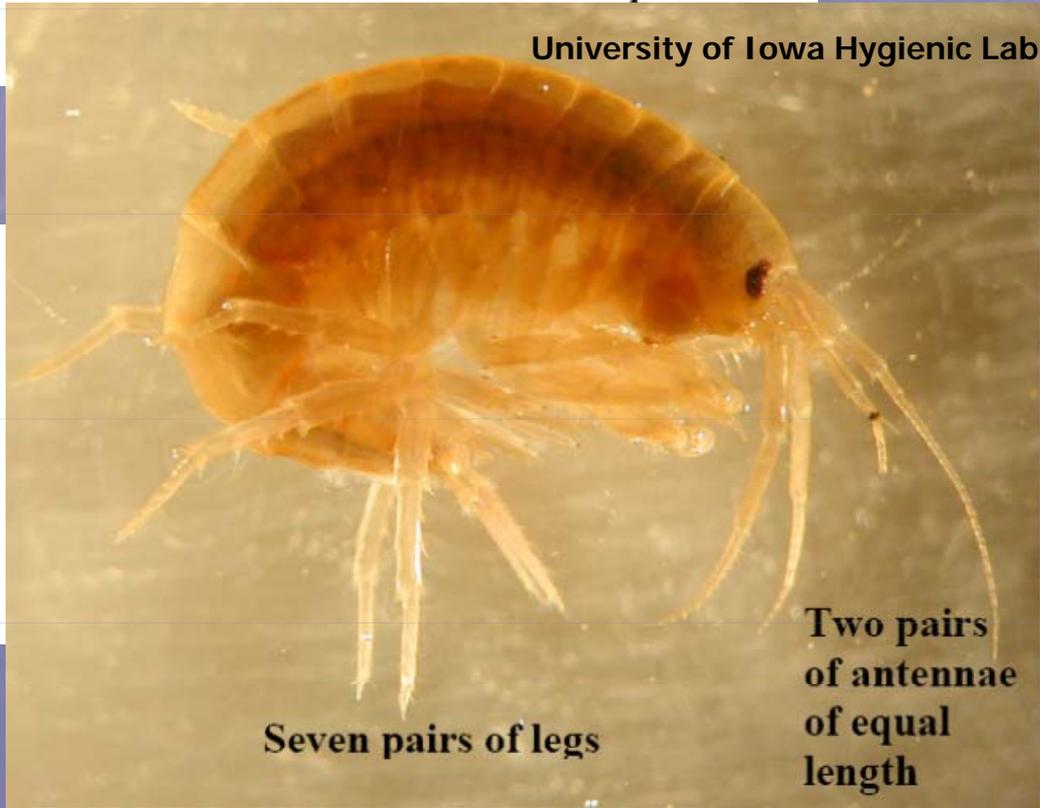
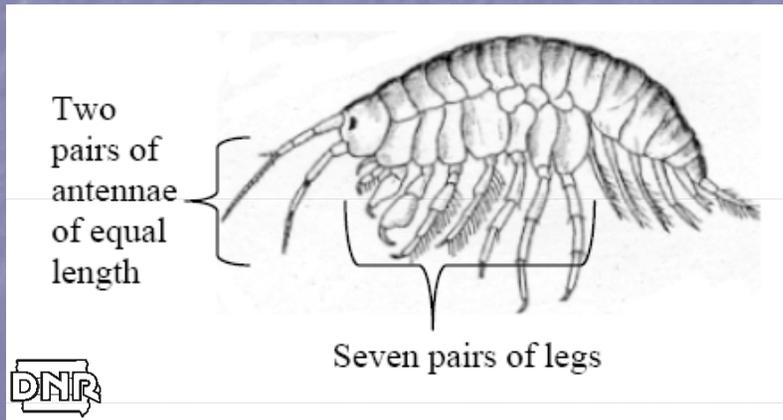


Two pairs of antennae, one pair shorter



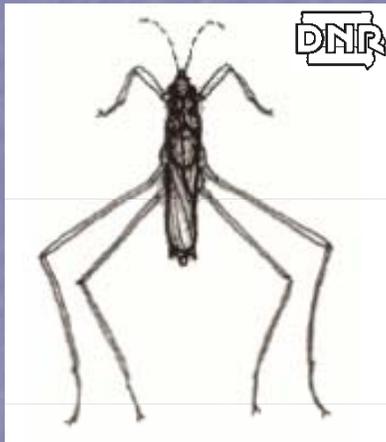
DNR

Scuds – Laterally compressed (body is higher than it is wide), white to pale yellow in color, and are good swimmers. They are also called “freshwater shrimp” (although there is no relation); scuds will be on their sides if removed from the water because of their body shape. They have seven pairs of legs, two pairs of antennae of equal length, and an exoskeleton composed of chitin.



Water Striders – Have a slender body with long legs that allow them to “walk” on the water surface with a combination of surface tension, claws on their legs and an excreted wax.

W

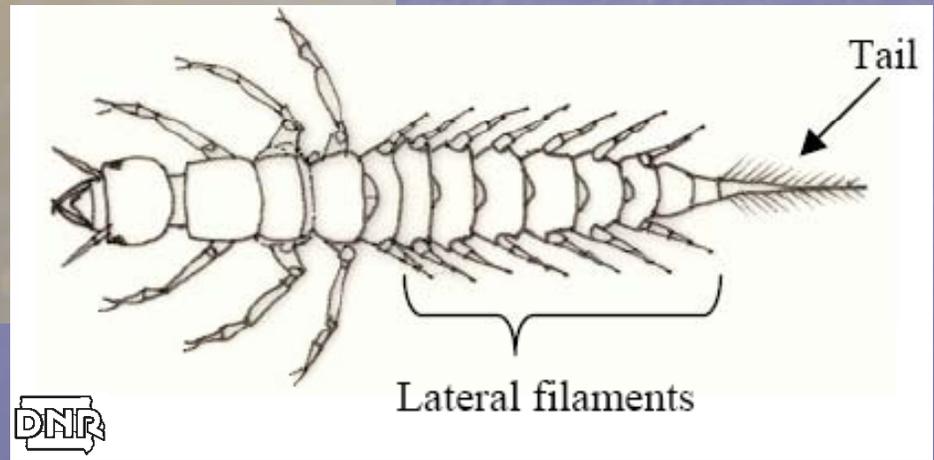
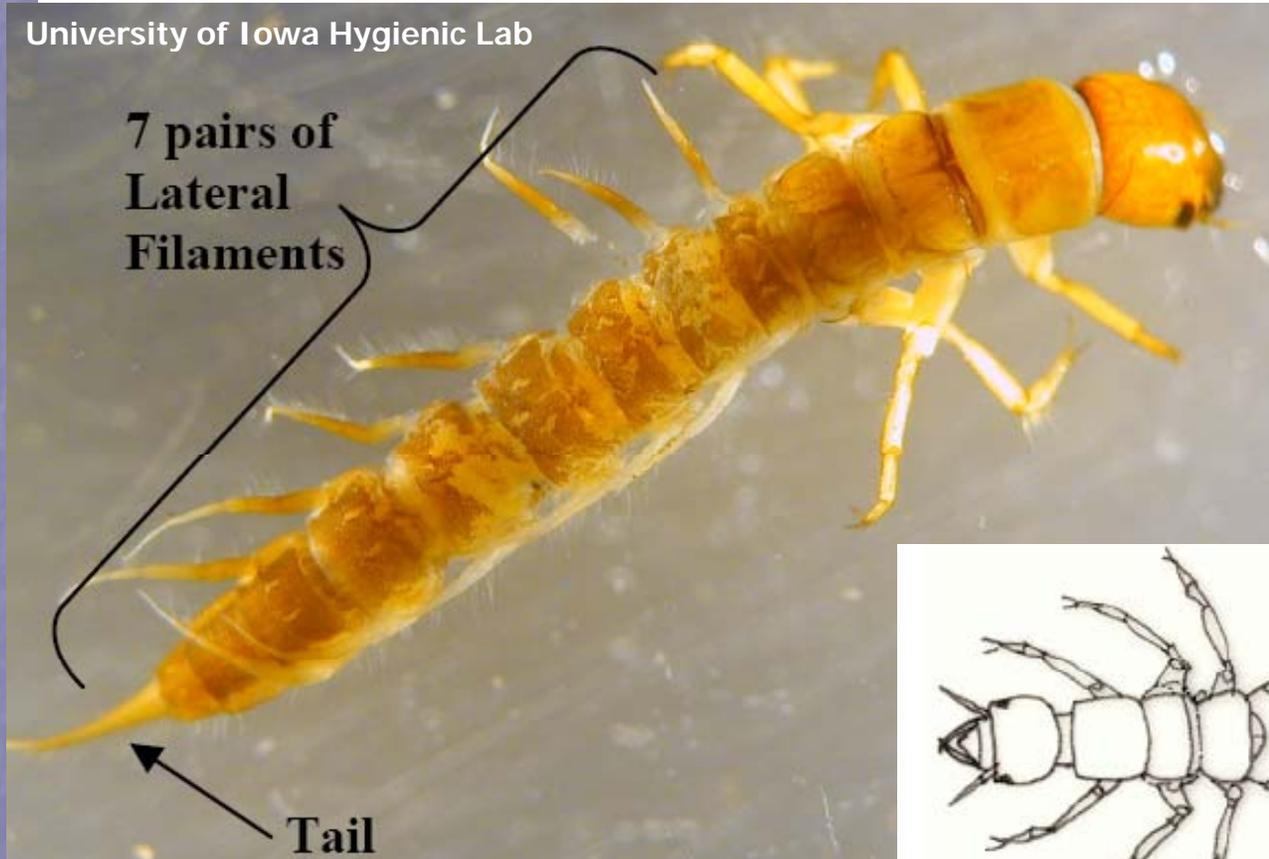


James Lindsey at Ecology of Commonster

Alderflies – Have 3 pairs of legs, 7 pairs of lateral filaments on abdomen and large forward projecting jaws. Looks like a small dobsonfly but has only one long tail filament.

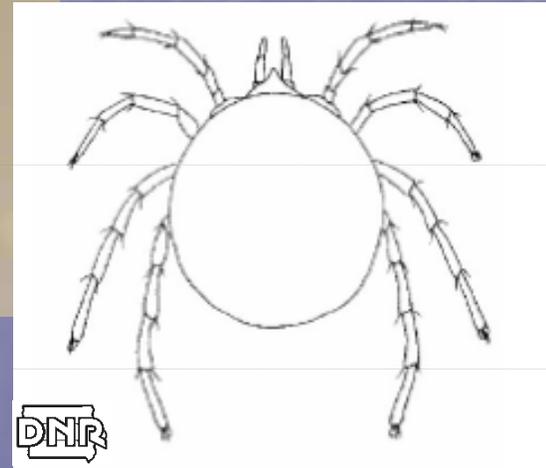


University of Iowa Hygienic Lab



Water Mites - Have 8 legs, no antenna, and a round one segment body.

University of Iowa Hygienic Lab



Z

Limpets – Have a single uncoiled shell.



**California Dept. of Fish and Game
Aquatic Bioassessment Lab**

a

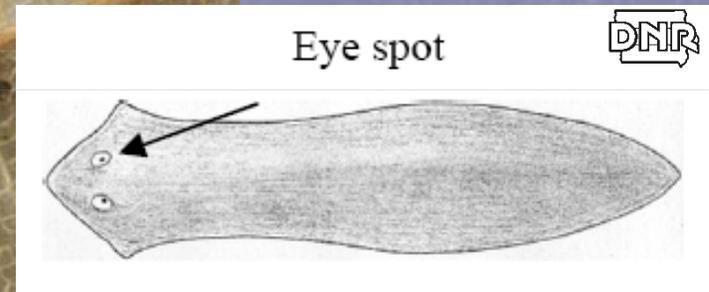
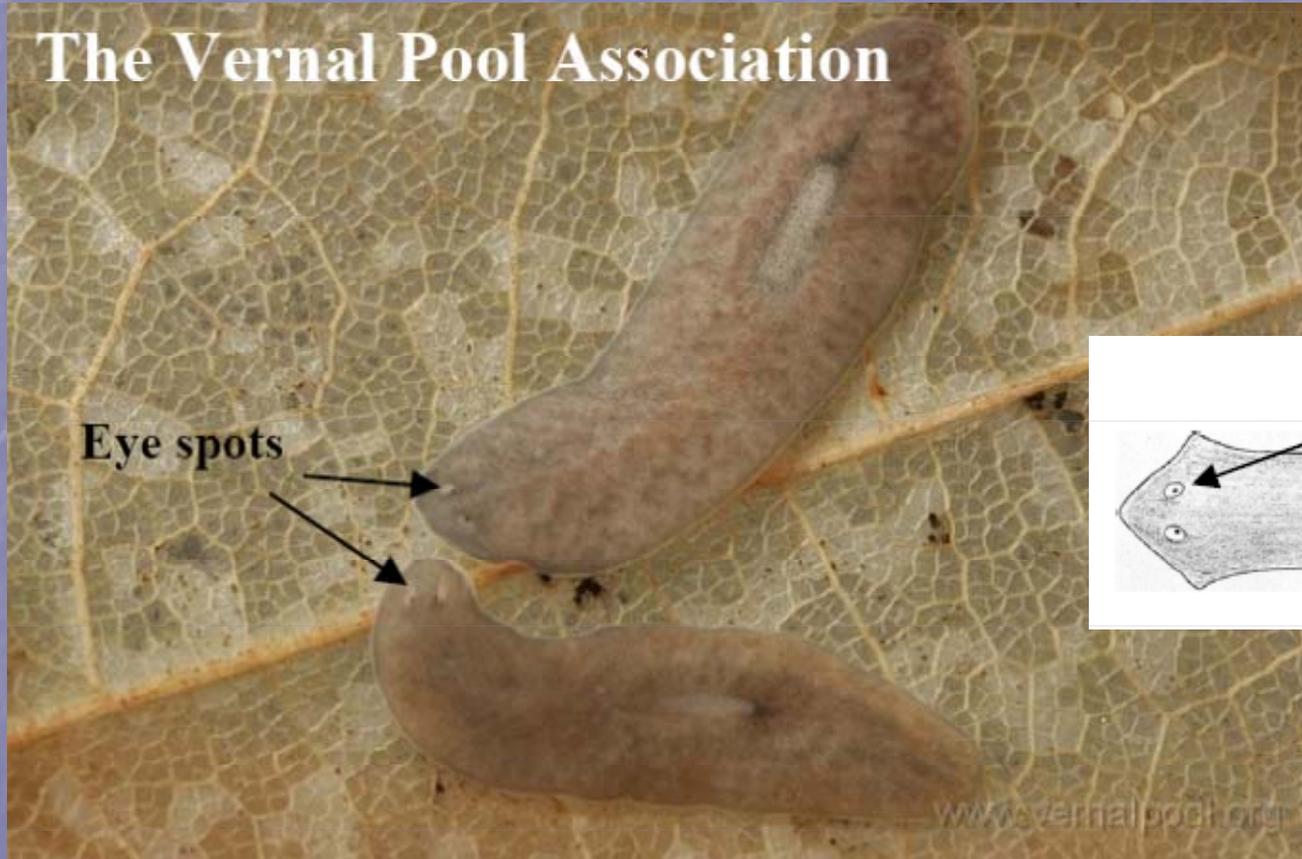
Orbsnails – Have a single coiled shell resembling the horns of a ram. Do not count empty shells.



Missouri Department of Conservation

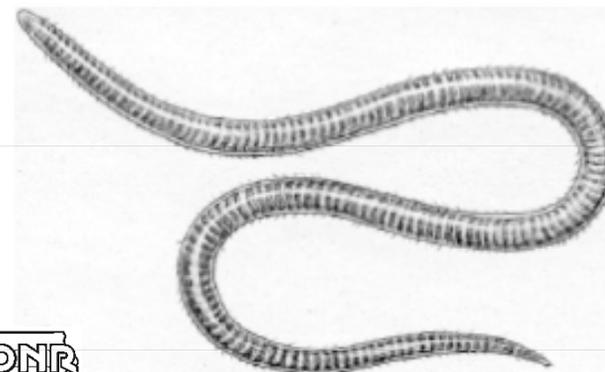
Flatworms - Small, flat, soft-bodied worms which often have a triangular or arrowhead-shaped head and visible eye spots.

b



C

Aquatic worms - Look like earthworms you might find in your garden, although usually they are smaller, thinner, and more delicate. They are segmented.



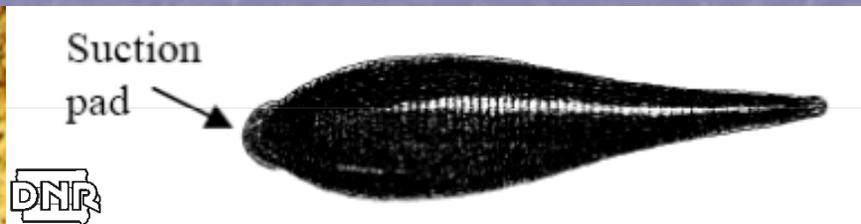
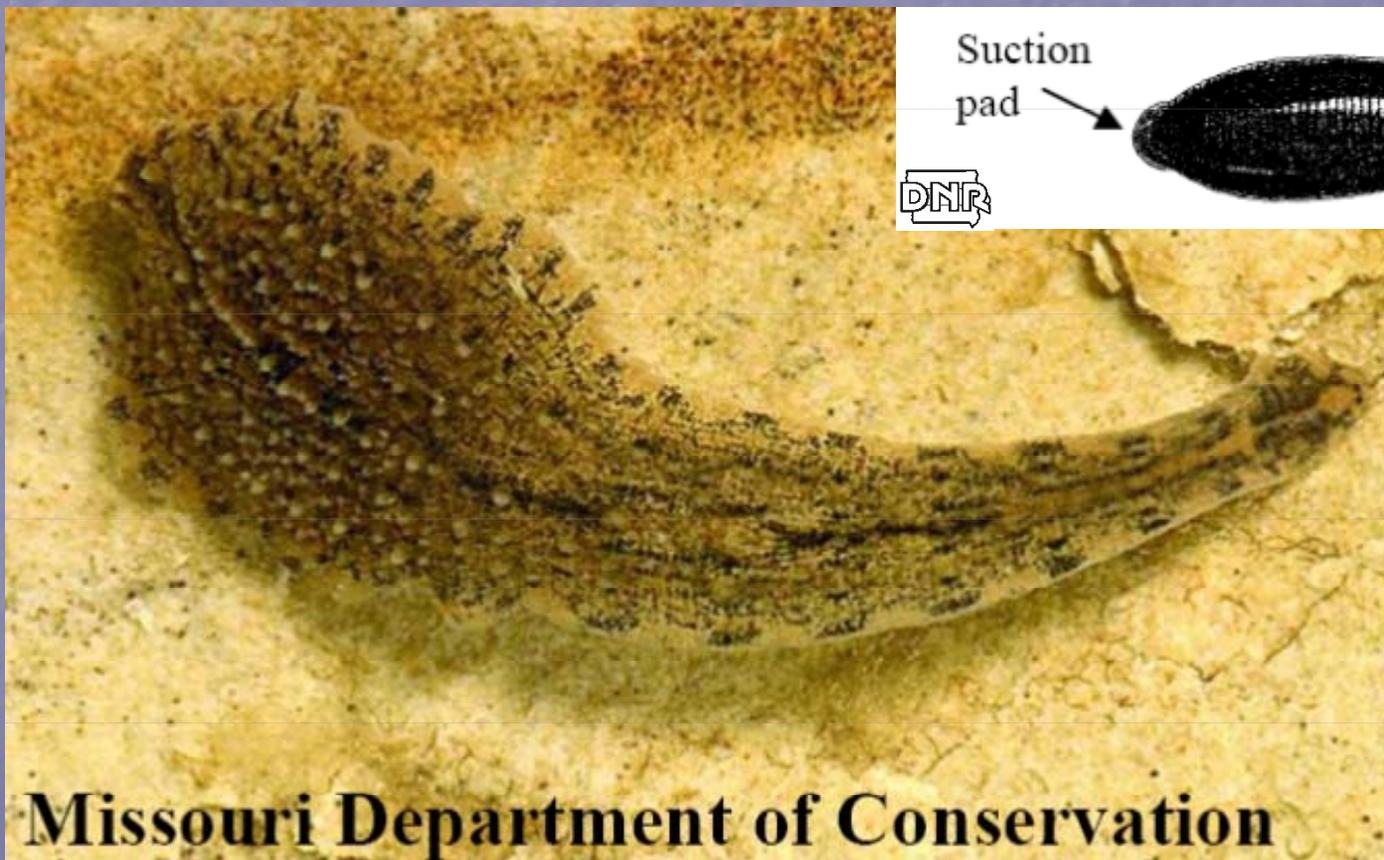
DNR



Missouri Department of Conservation

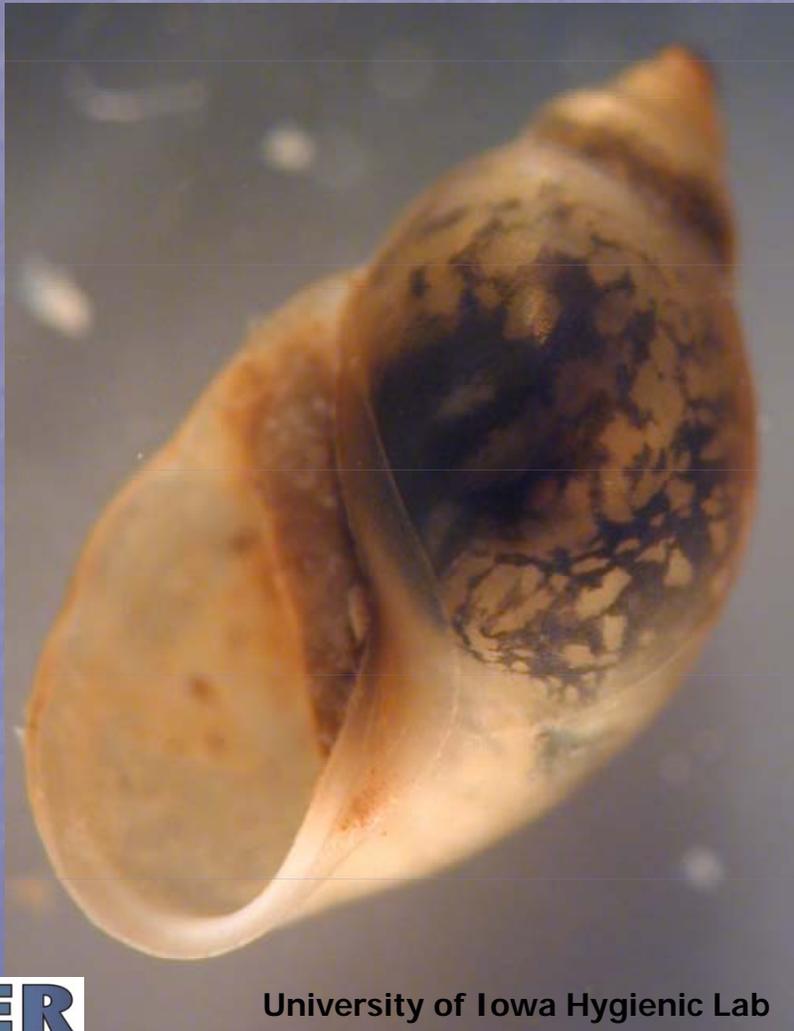
d

Leeches - Larger than aquatic worms, flattened, and usually have a suction pad on at least one end of their body. Usually brown but they can sometimes be brightly colored.



Missouri Department of Conservation

Left spiral snails (pouch snail) – Their opening spirals up from the left if you look at the shell with the tip pointed away from you.



e

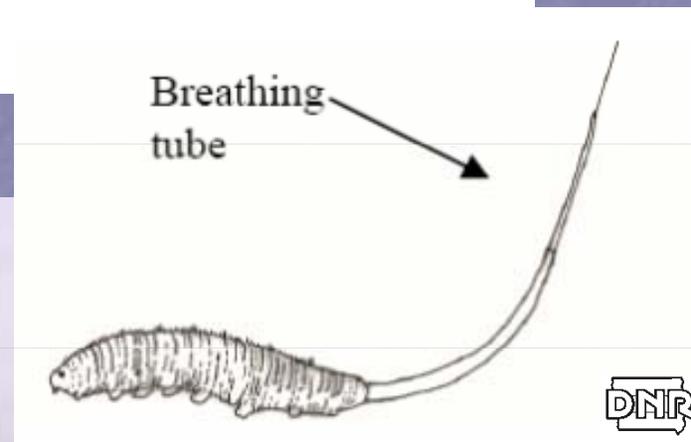
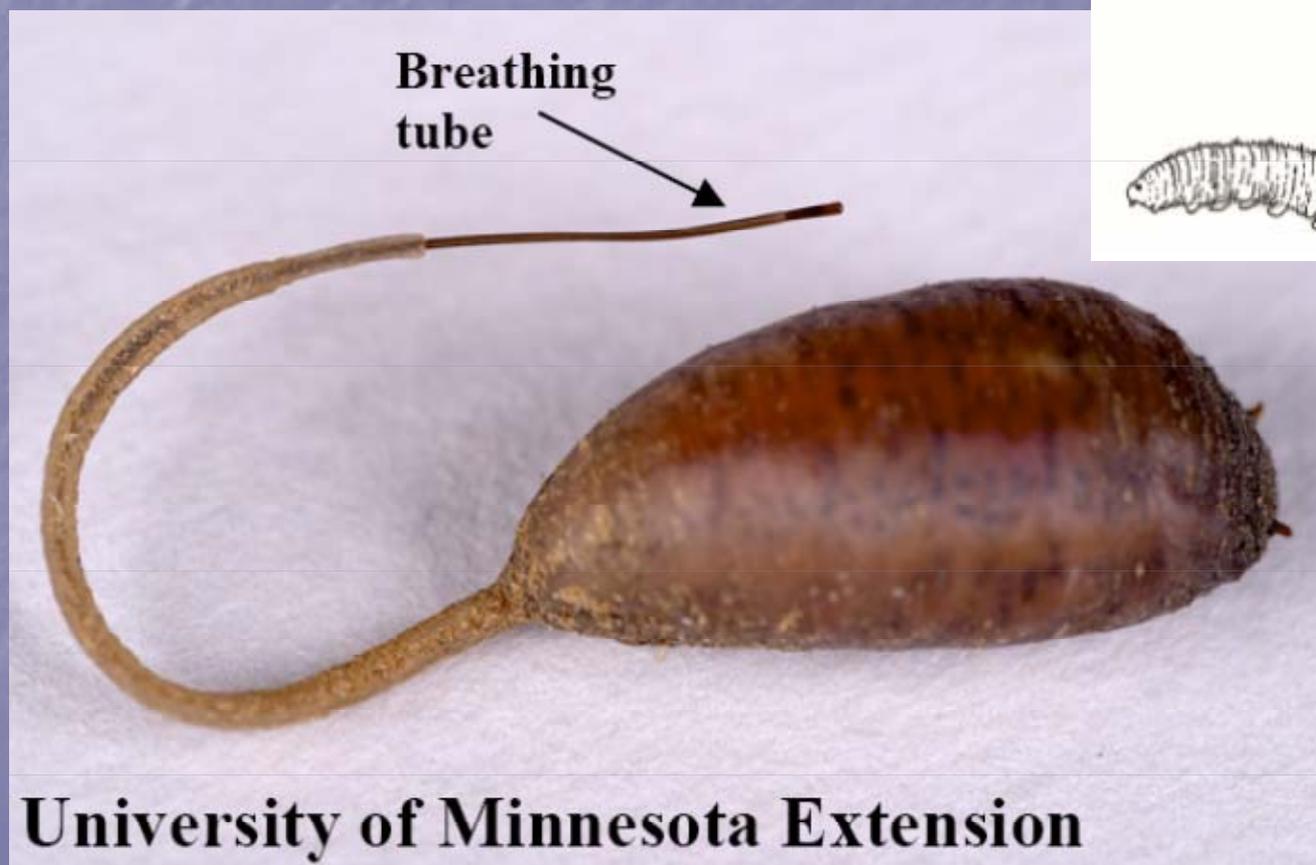
DNR



Opening
to the left

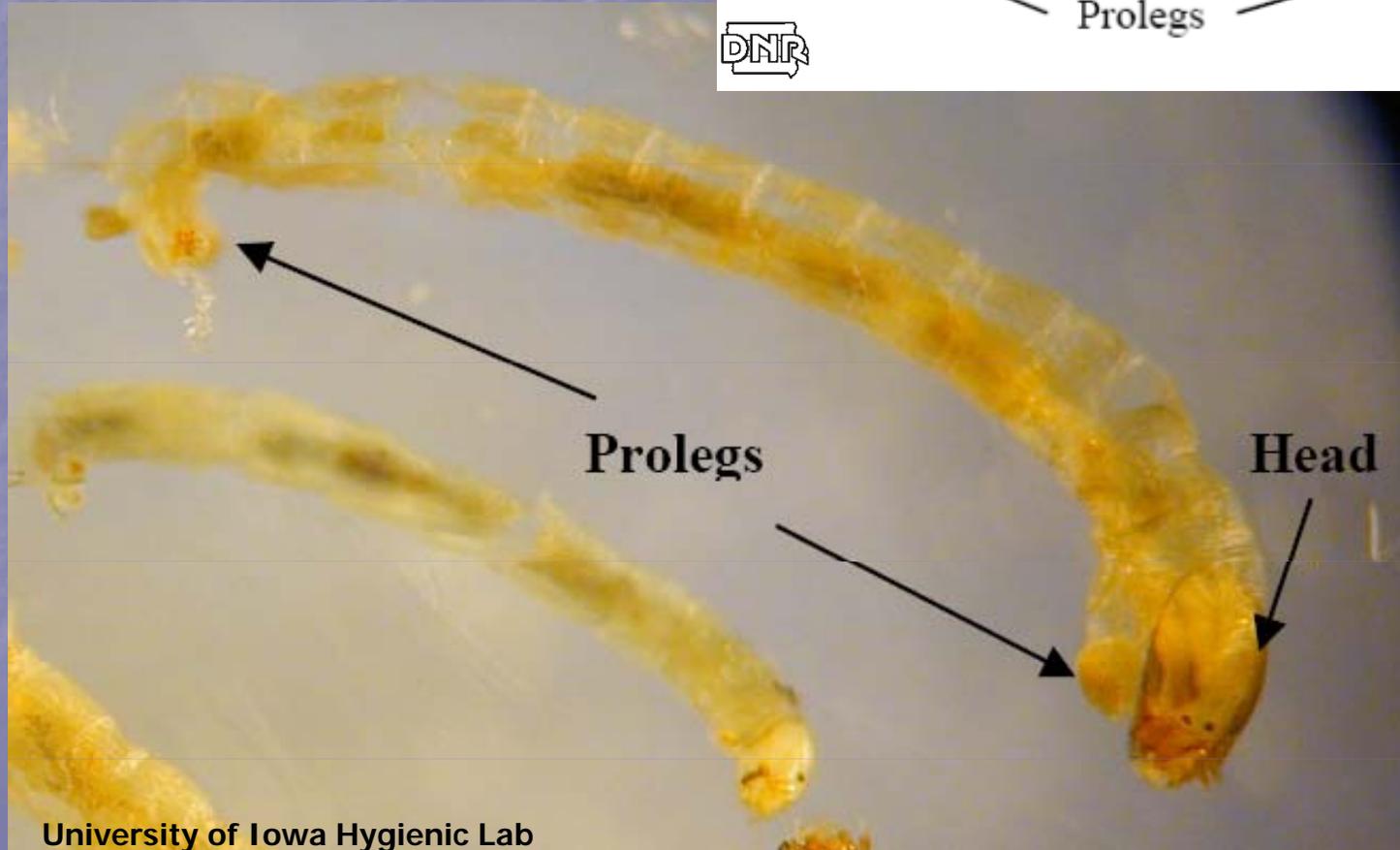
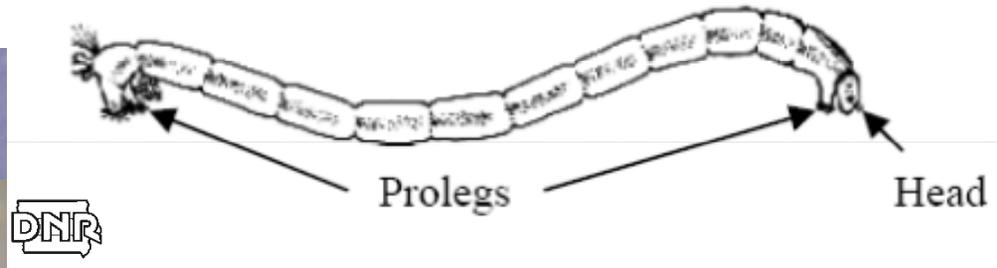
Rat-Tailed Maggots – Has a worm-like or grub-like body, semi-transparent skin and a long breathing tube.

f



University of Minnesota Extension

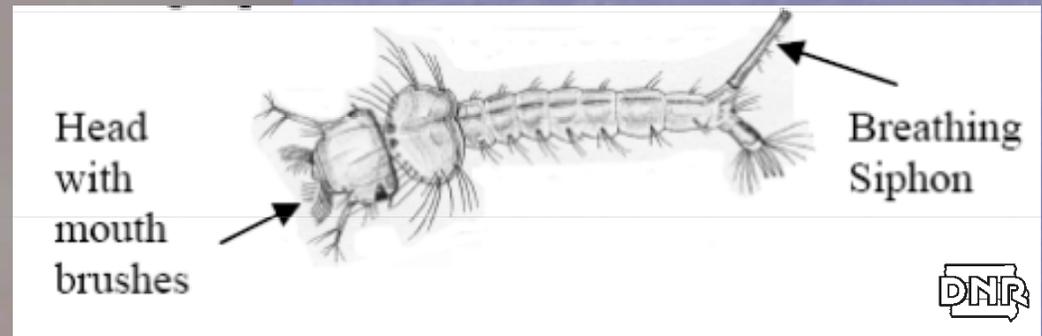
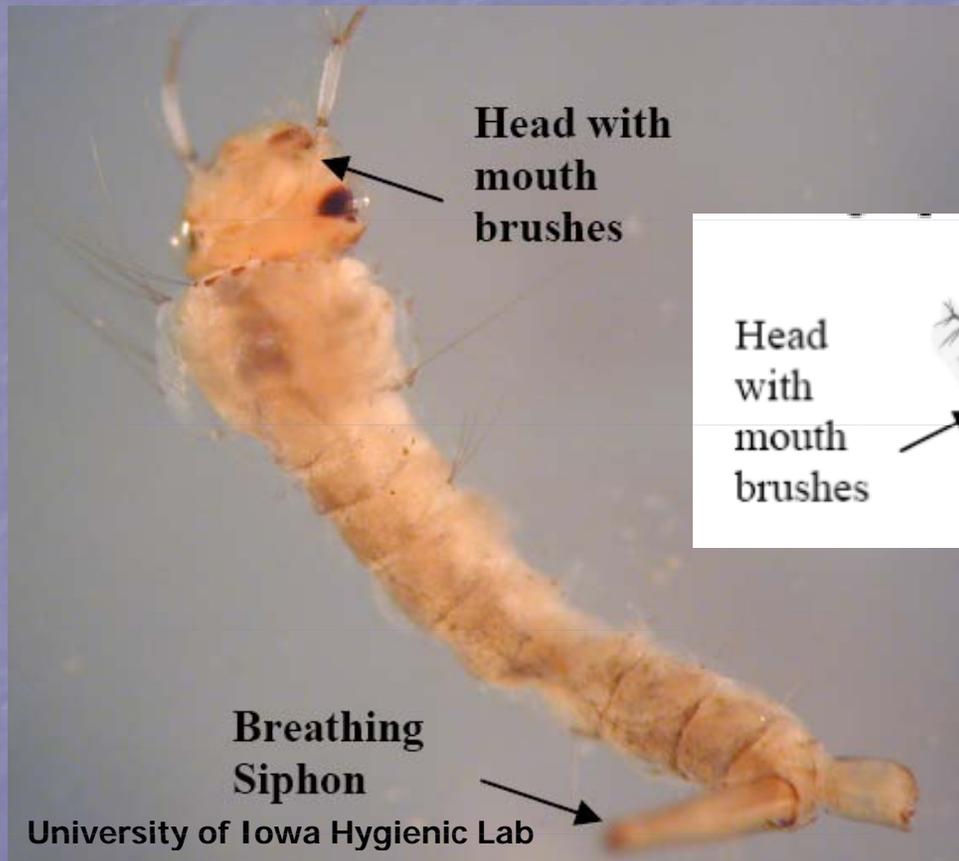
Midge Flies – Have small worm-like bodies, with a hard usually dark head and 2 small prolegs on each end.



University of Iowa Hygienic Lab

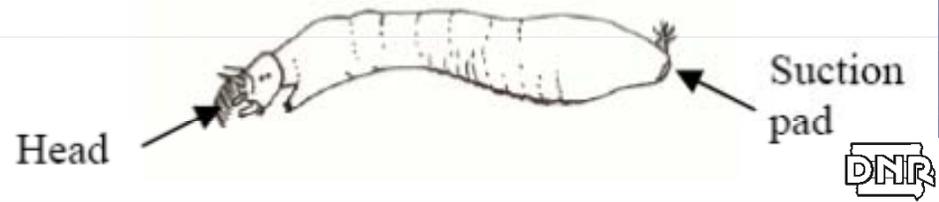
Mosquitoes – Has a wide head with small mouth brushes and short antennae. Its abdomen has a breathing siphon at the end.

h



Black Flies – The posterior of the abdomen is wider than the rest of the body and has a suction pad. The head is small, hard and black.

i



University of Iowa Hygienic Lab

Water Scavenger Beetles (Adult) – Are sometimes streamlined, few have swimming hairs on their legs and have short clubbed antennae.

j

Non-streamlined Body

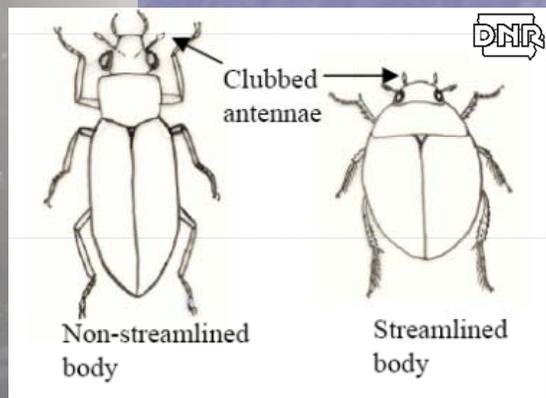


University of Iowa Hygienic Lab

Streamlined Body



University of Iowa Hygienic Lab



Water Scavenger Beetles (Larva) – Have short antennae, soft bodies and large mandibles.

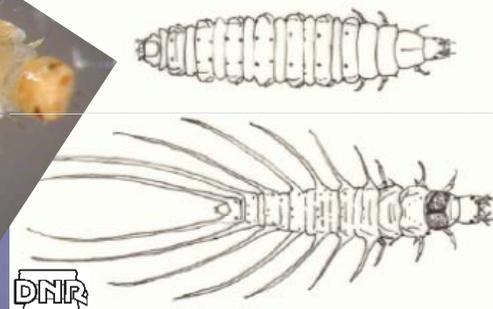
Large Mandibles



California Dept. of Fish and Game Aquatic Bioassessment Lab



University of Iowa Hygienic Lab



What
BMIs do
you
see?



Jacklyn Gautsch

What
BMIs do
you
see?

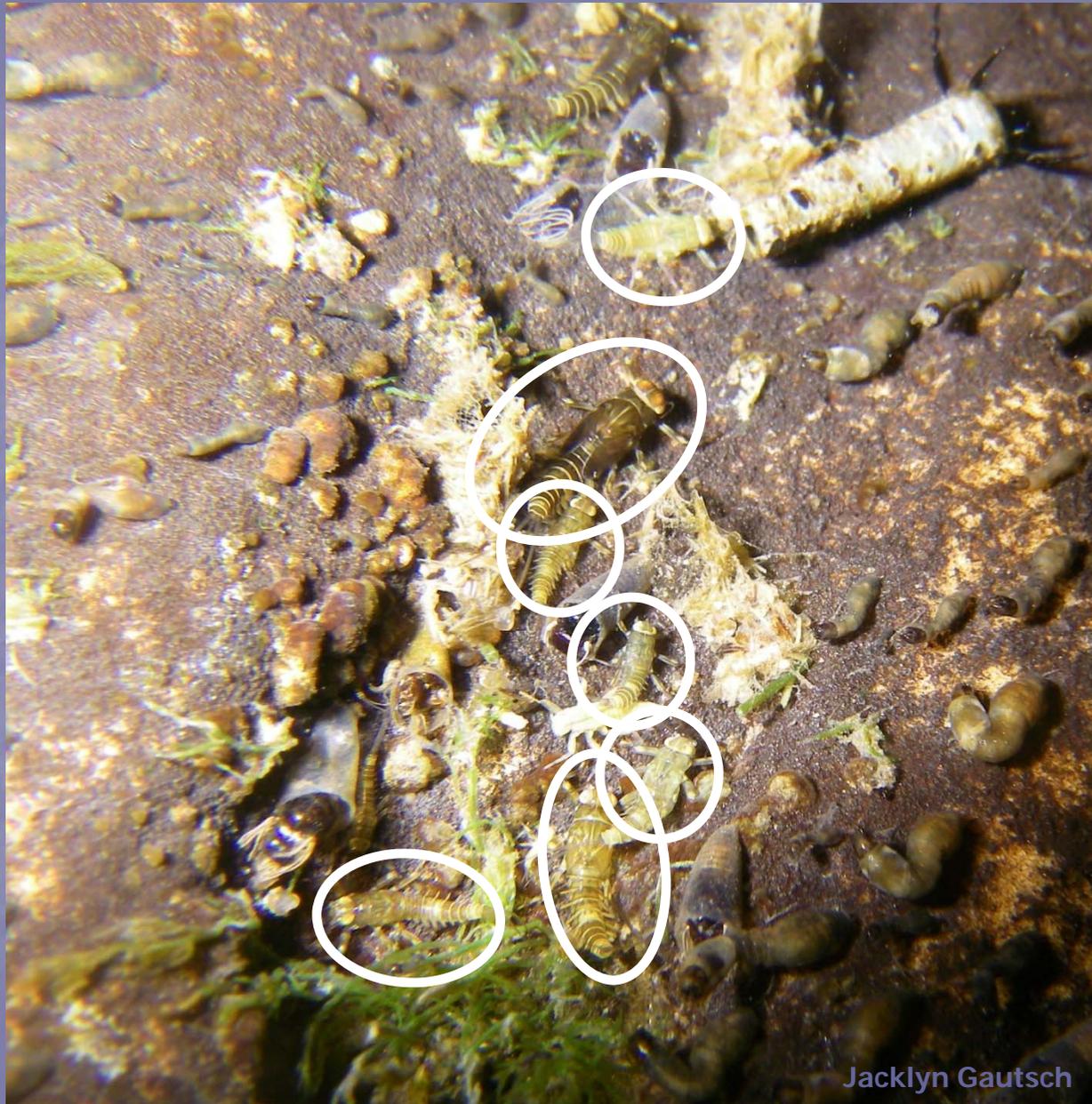
Caddisfly



Jacklyn Gautsch

What
BMIs do
you
see?

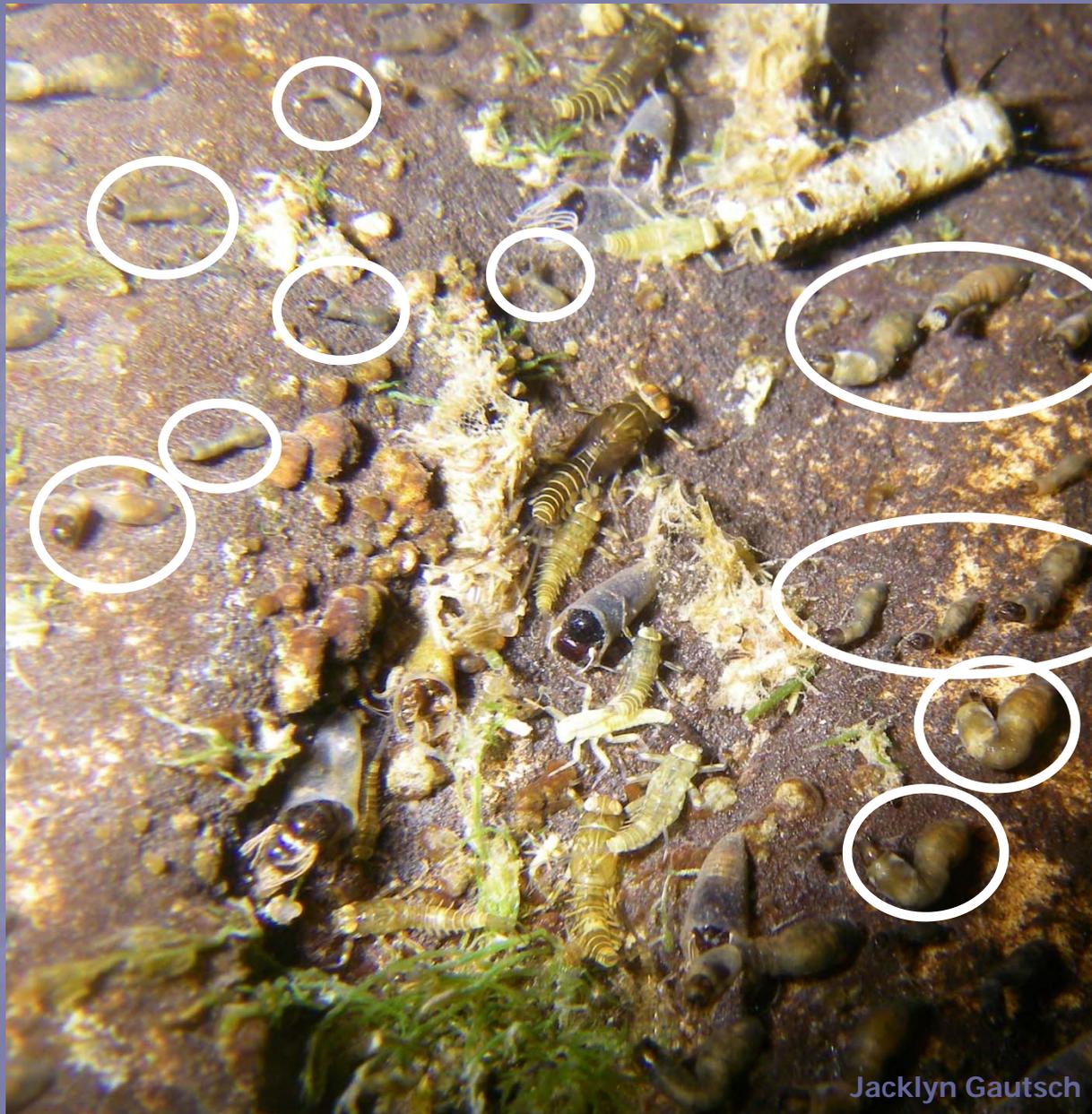
Mayfly



Jacklyn Gautsch

What
BMIs do
you
see?

Black Fly



Jacklyn Gautsch

Where can I get ID help?

- IOWATER – we will gladly look at photos and/or preserved bugs
- BugGuide.net – a Nationwide Online Community where you can post photos to get ID help
- Additional keys and resources listed in the Benthic Links section of www.iowater.net