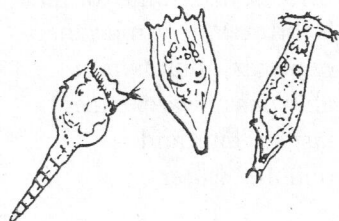


## ROTIFERS

**Foods:** Microscopic plants and animals

**Predators:** Worms, crustaceans

**Habitat:** Near shoreline and around aquatic plants; some occur in open water

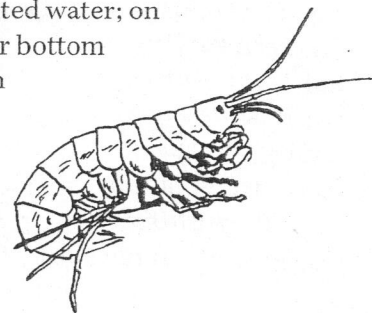


## SCUDS

**Foods:** Scavengers on plant and animal debris

**Predators:** Birds, fish, insects, amphibians

**Habitat:** Clear, unpolluted water; on and among plants; near bottom of pond where they can avoid light

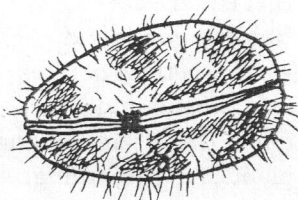


## SEED SHRIMP (Ostracods)

**Foods:** Bacteria, mold, algae

**Predators:** Important food source of small fishes

**Habitat:** On and just above the bottom of ponds; they look like microscopic clams

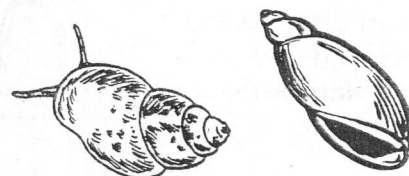


## SNAILS

**Foods:** Algae, other plants, dead plant and animal material

**Predators:** Many kinds of fish, turtles, some birds

**Habitat:** Pond bottom, or on plants and dead material in ponds

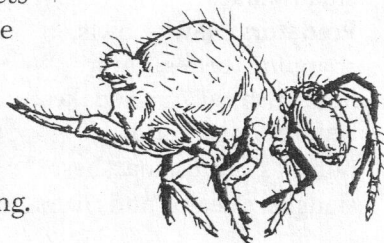


## SPRINGTAIL

**Foods:** Decaying plant and animal material; occasionally some living plant material

**Predators:** Fish, spiders, frogs, other animals that eat insects

**Habitat:** Surface of the pond in quiet backwaters. They hibernate but are among first signs of animal life in the spring.



## STONEFLY NYMPH

**Foods:** Dead plant material; detritus and fine organic particles and the algae, bacteria and fungi living on detritus. As they grow larger they become predators of other invertebrates.

**Predators:** Fish, other predaceous invertebrates, amphibians

**Habitat:** Only found in cool, well-oxygenated flowing waters (very sensitive to pollution); crawl about in rocks, gravel and debris on stream bottom

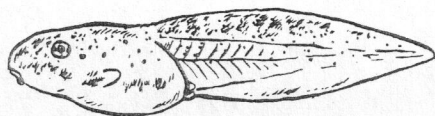


## TADPOLES

**Foods:** Submerged oozes and scums containing small plants and animals; algae, diatoms, desmids, decaying plants

**Predators:** Fish, snakes, giant water bugs. Some predacious insects eat the small tadpoles.

**Habitat:** In shallow areas near the water's edge

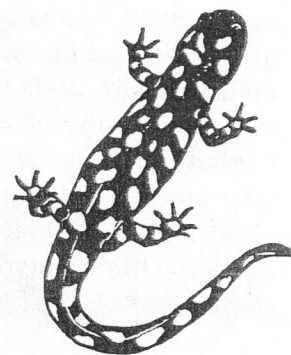


## TIGER SALAMANDER

**Foods:** Earthworms, insects, spiders, slugs, snails

**Predators:** Fishes, snakes, snapping turtles, some birds and mammals

**Habitat:** In burrows under logs and rocks near water; active only at night



## WATER BOATMAN

**Foods:** Algae and decaying plants; sometimes dive to feed on decaying animal material on the bottom; sometimes mosquito larvae

**Predators:** Fish

**Habitat:** Surface of pond, sometimes diving to find food; must cling to something to stay under water surface



## WATER FLEA (Daphnia)

**Foods:** Filter plankton from the water; algae; organic debris

**Predators:** Hydras, insects, fish, some rotifers

**Habitat:** Weedy margins of ponds, abundant in all types of water except fast streams and polluted water



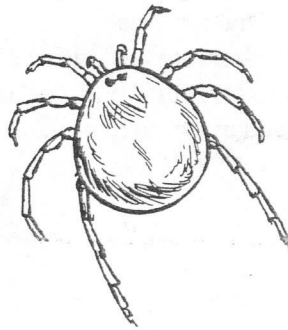
## WATER MITES

**Foods:** Insects, worms. Some are parasitic.

**Predators:**

Hydras, insect, fish

**Habitat:** Creep on bottom and on plants



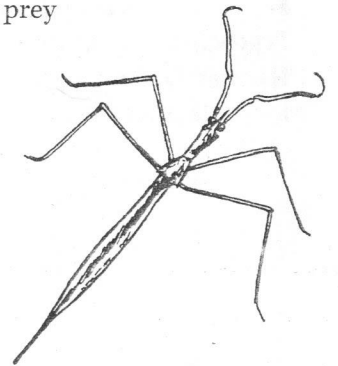
## WATER SCORPION

**Foods:** Small insects; seize prey with powerful forelegs

similar to preying mantis

**Predators:** Animals that eat insects

**Habitat:** Ponds and weedy sections of lakes and streams; hides just under the surface among plants; long breathing tube at rear



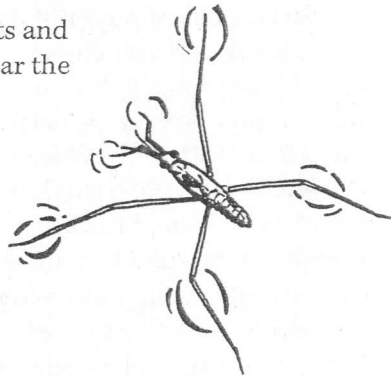
## WATER STRIDER

**Foods:** Prey on insects and small crustaceans near the surface

**Predators:**

Some fish and birds

**Habitat:** Surface of water; often seen "skating" over the surface in search of food

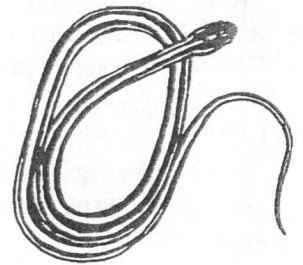


## WESTERN RIBBON SNAKE

**Foods:** Worms, fish, tadpoles, frogs, toads, salamanders, mice, sometimes other small snakes

**Predators:** Hawks, owls, snapping turtles, herons. Some fish eat small snakes.

**Habitat:** Near water, ponds, swamps, marshes, sloughs, streams and rivers

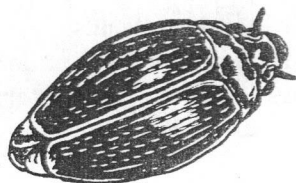


## WHIRLIGIG BEETLE

**Foods:** Whirl in circles collecting insects and organic debris at the surface

**Predators:** Fish, birds, frogs, snakes and other animals that eat insects

**Habitat:** On the surface, often among plants; eyes are divided and can see above and below water at same time

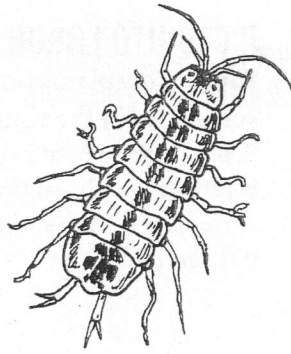


## ISOPODS (Sowbugs)

**Foods:** Detritus; decaying plants on the bottom

**Predators:** They have few predators and are seldom eaten by fish. Some are intermediate hosts for nematodes of fish, birds and amphibians.

**Habitat:** Bottom dwellers able to stand acidic water. Some species prefer clear, cold water; all hide beneath rock and other debris.

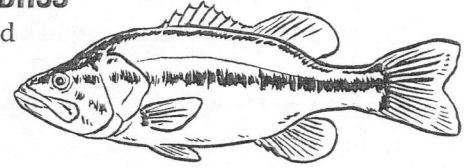


## LARGEMOUTH BASS

**Foods:** Adults feed on fish, crayfish, frogs and large insects. Young feed on daphnia and other small crustaceans.

**Predators:** Snapping turtles, herons. Small fish are eaten by larger fish. Anglers prize large fish.

**Habitat:** Open water or along edge where food supply is abundant.

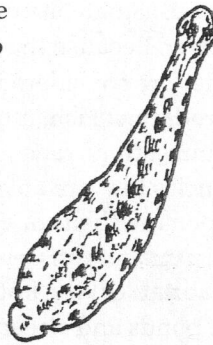


## LEECH

**Foods:** Parasite that feeds on the blood of animals. Most attach to fish, turtles, frogs, snails, insect larvae and worms.

**Predators:** Fish

**Habitat:** Bottom dwellers

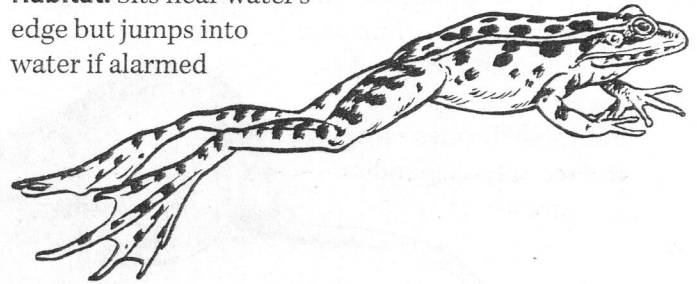


## LEOPARD FROG

**Foods:** Insects, spiders, other invertebrates

**Predators:** Raccoons, snakes

**Habitat:** Sits near water's edge but jumps into water if alarmed

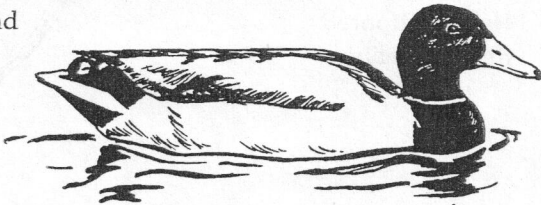


## MALLARD DUCK

**Foods:** Smartweed, corn, acorns, seeds of many water plants, some aquatic invertebrates

**Predators:** Fox, coyotes, bobcat, mink, humans, raccoon, skunk

**Habitat:** Marsh, lakes, rivers; nests on ground

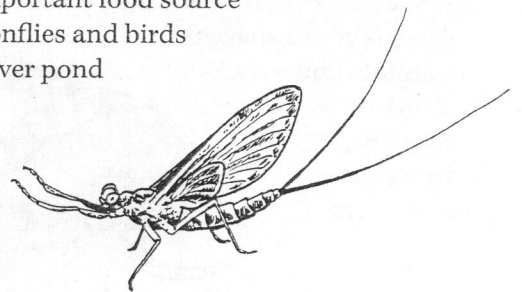


## MAYFLY ADULT

**Foods:** Adults do not eat at all. They live long enough to reproduce, which may only be a few hours.

**Predators:** Important food source for fish, dragonflies and birds

**Habitat:** Air over pond

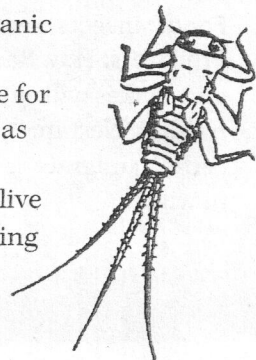


## MAYFLY LARVA

**Foods:** Small plants, animals, organic debris, diatoms

**Predators:** Important food source for fish and other insect-eaters such as dragonfly larva and beetles

**Habitat:** Various species burrow, live on the bottom or are free-swimming among aquatic plants.

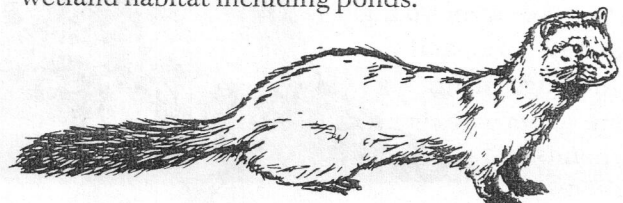


## MINK

**Foods:** Rabbits, muskrats, other small mammals, birds, fish, crayfish, frogs, crustaceans, insects

**Predators:** Humans, dogs, foxes, owls, coyotes, bobcats

**Habitat:** These excellent swimmers live in or near wetland habitat including ponds.

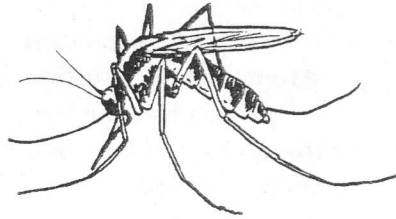


## MOSQUITO ADULT

**Foods:** Females suck mammal blood; males feed on plant juices, if they eat at all.

**Predators:** Dragonflies, damselflies, other insects, birds, frogs, fish, bats

**Habitat:** Air over water and surrounding areas

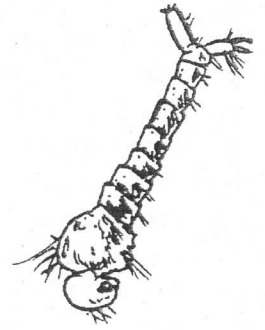


## MOSQUITO LARVA

**Foods:** Tiny plants and animals suspended in the water

**Predators:** Fish, other insects

**Habitat:** Mostly on the water's surface, but dive and hide if threatened

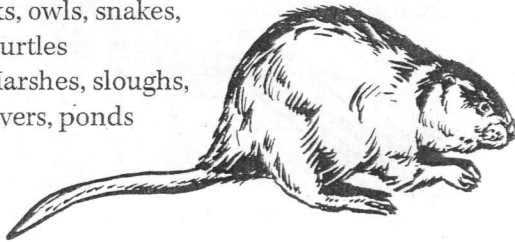


## MUSKRAT

**Food:** Roots, bulbs and foliage of cattails, pondweeds, rushes and wild rice; will eat fish, frogs and insects if plants are not available

**Predators:** Minks, humans, large hawks, owls, snakes, snapping turtles

**Habitat:** Marshes, sloughs, streams, rivers, ponds and lakes

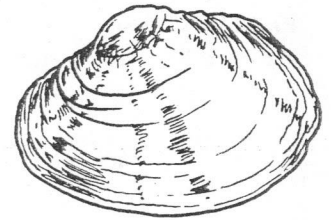


## MUSSELS

**Foods:** Small bits of organic matter suspended in the water. Because they eat small bits of animal matter, they are considered scavengers

**Predators:** Fish, muskrats, mink, otters, raccoons; turtles that are able to open the shells or eat the smaller mussels

**Habitat:** On the bottom of ponds and streams

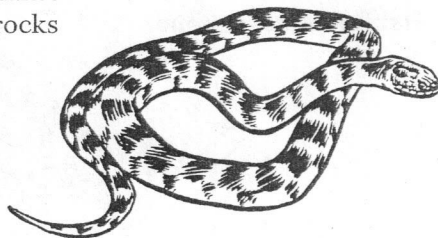


## NORTHERN WATER SNAKE

**Foods:** Crayfish, frogs, tadpoles, small fish, worms, insects

**Predators:** Hawks, owls; large game fish eat young snakes

**Habitat:** Under rocks or debris near shore of ponds, lakes, streams and rivers



## PONDWEEDS

**Producers:** Aquatic seed plants

**Predators:** Birds, muskrats, beaver, deer

**Habitat:** Rooted near shoreline



## RACCOON

**Foods:** Wide variety of small animals, insects, fruits, seeds, garbage, crayfish, frogs, some fish

**Predators:** Few as adults. Humans and large meat-eaters take some young.

**Habitat:** Forest and forest edge; night time visitor to ponds and streams

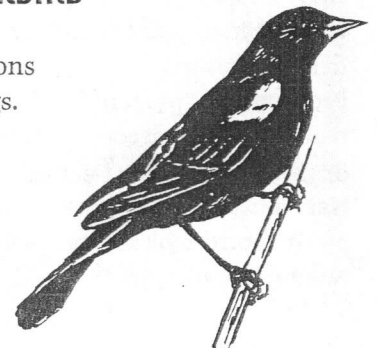


## RED-WINGED BLACKBIRD

**Foods:** Insects, seeds

**Predators:** Few. Raccoons and snakes will eat eggs.

**Habitat:** Nest in cattails; migrate in winter

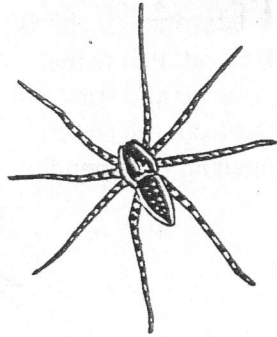


## FISHING SPIDER

**Foods:** Mostly insects; occasionally small fish and tadpoles

**Predators:** Snakes, frogs, some birds

**Habitat:** Surface of pond in dense aquatic plants

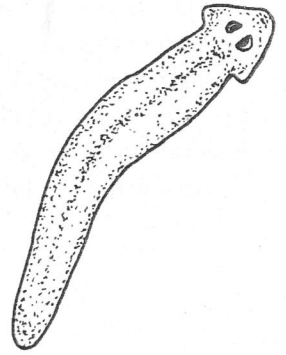


## FLATWORM (Planaria)

**Foods:** Small animals; living or dead protozoans or nematodes

**Predators:** Worms, insects, crustaceans

**Habitat:** Under stones and submerged leaves in dark areas

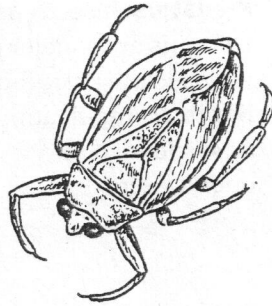


## GIANT WATER BUG

**Foods:** Fiercely predacious, attacking insects, crustaceans and even tadpoles, frogs and fish several times their size

**Predators:** Fish, frogs, shorebirds

**Habitat:** Hanging from surface of the water; on or among the plants; occasionally free-swimming

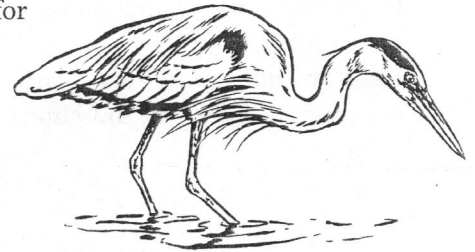


## GREAT BLUE HERON

**Foods:** Mostly small fish, limited numbers of frogs, crayfish, insects and mice

**Predators:** Fox, coyotes, bobcat; too large for most predators

**Habitat:** Marsh, river, lakes; nest in colonies in tops of large, stream-side trees

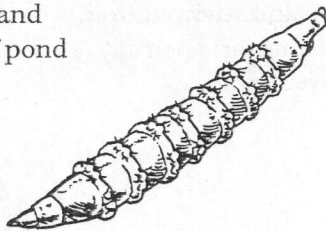


## HORSEFLY LARVA

**Foods:** Worms, snails, other small insects in the water

**Predators:** Fish, birds

**Habitat:** Among plants and along bottom at edge of pond

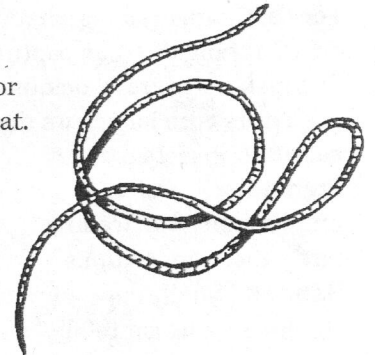


## HORSEHAIR WORMS

**Foods:** Immature are parasites on various crustaceans, mollusks or insects. Adults do not eat.

**Predators:** Fish, giant water bugs

**Habitat:** Quiet water

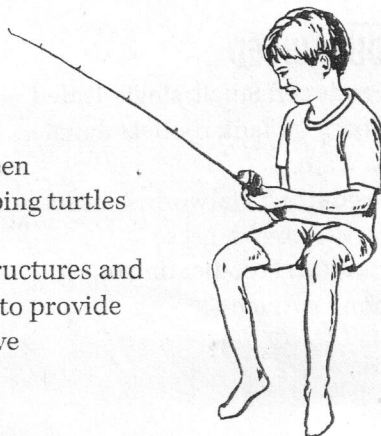


## HUMANS

**Foods:** Bass, bluegill, channel catfish, bullfrog, green frog, crayfish, snapping turtles

**Predators:** None

**Habitat:** Designs structures and alters environment to provide suitable places to live

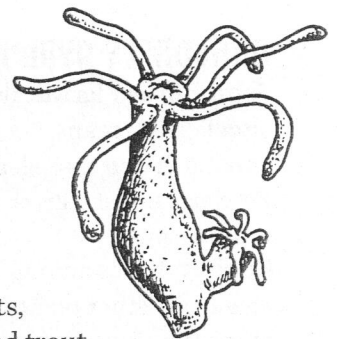


## HYDRA

**Foods:** Tiny (microscopic) animals are trapped in its stinging tentacles. Also, small crustaceans, insects, small clams and fish, seed shrimp, water fleas

**Predators:** Carnivorous insects, water beetles, recently hatched trout

**Habitat:** Attached to twigs or other plants at the bottom of ponds

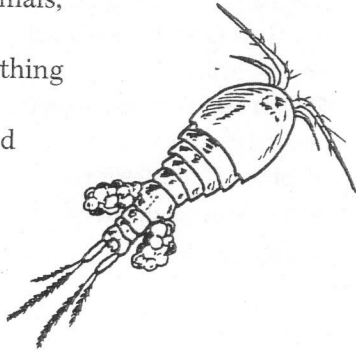


## CYCLOPS

**Foods:** Microscopic animals, algae, detritus

**Predators:** Nearly everything that eats plankton

**Habitat:** Open water and shallow water of ponds

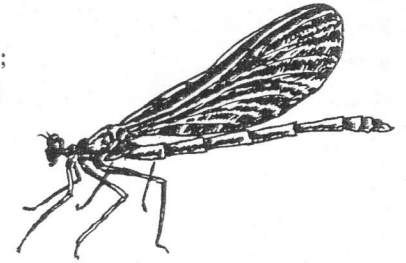


## DAMSELFLY ADULT

**Foods:** Mosquitoes, flies, other insects

**Predators:** Fish, birds

**Habitat:** Plants that grow up and stick out from the water; open air over pond

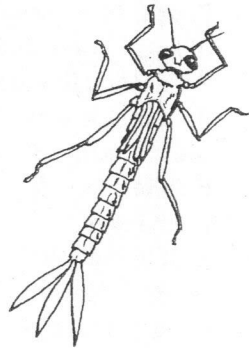


## DAMSELFLY NYMPH

**Foods:** Insect larvae, worms, small crustaceans; occasionally small fish and tadpoles

**Predators:** Fish, larger insects, crustaceans

**Habitat:** Hides among algae and other plants along the shoreline



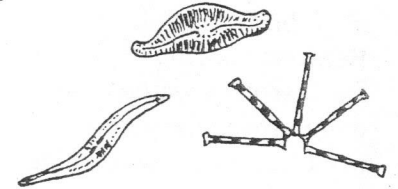
## DIATOMS

**Producer:** Microscopic algae

**Predators:** Insects, fish, microscopic animals.

Diatoms are a major part of the plant-like plankton, which is the basic food source for all consumers.

**Habitat:** Free-floating or suspended in open water

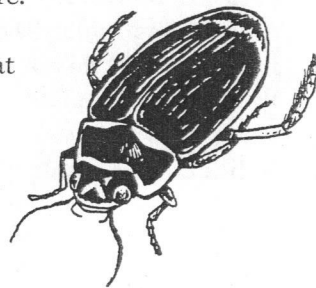


## DIVING BEETLE

**Foods:** Caddisfly larva, or any small animal they can capture. Diving beetles are ferocious predators with large jaws that eat other insects.

**Predators:** Reptiles, amphibians, fish, wading birds, raccoons, skunks

**Habitat:** Usually in weedy shallows along shoreline.



## DRAGONFLY ADULT

**Foods:** Mosquitoes, flies, other insects

**Predators:** Birds, fish

**Habitat:** Plants that grow up and stick out from the water; open air over pond



## DRAGONFLY NYMPH

**Foods:** Insect larvae, worms, small crustaceans; occasionally small fish and tadpoles

**Predators:** Fish, larger insects, crustaceans

**Habitat:** Hides among algae and other plants along the shoreline

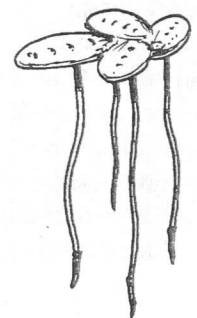


## DUCKWEED

**Producer:** Small, single-leaved floating plant; rootlets dangle in water

**Predators:** Flatworms, insect larvae, ducks, geese

**Habitat:** Free-floating on pond surface

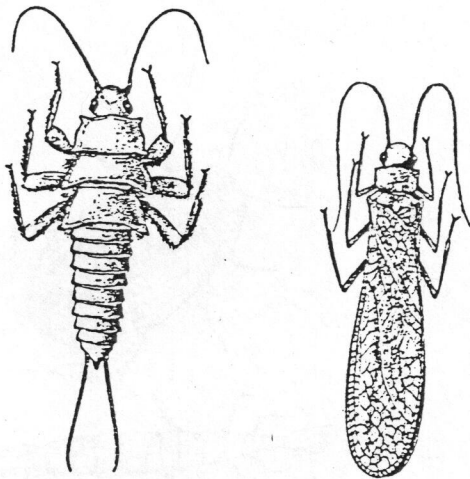


# A Guide to Aquatic Insects

Relatively few of the million or so species of insects in the world inhabit rivers and streams. Of those that do, many live in water only during their immature stages; their adult lives are spent on land and in the air. Even so, aquatic insects are usually the most abundant and easily observed forms of life in streams and rivers.

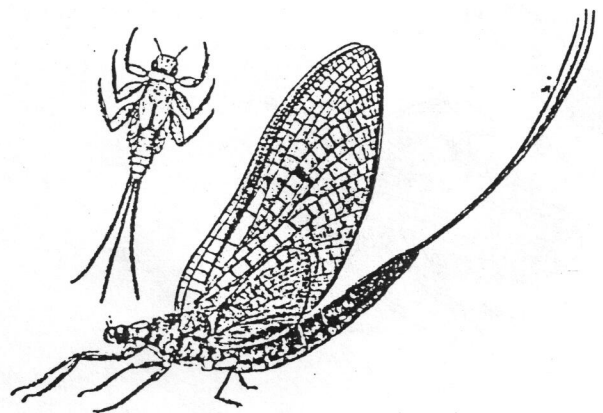
Some, such as water striders, skate across the surface film. Others burrow in muddy bottoms or hide among rocks and fallen logs. Tangled masses of aquatic plants usually teem with insects, and other insects may be observed as they swim through open water. Wherever you look in the stream, in fact, you are likely to find insects involved in their daily struggle to find food and avoid becoming food for other animals.

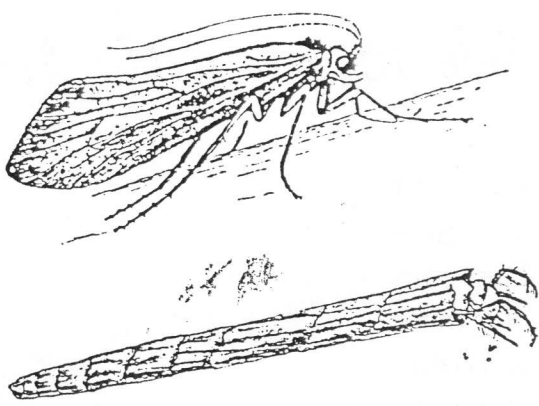
To help you recognize these fascinating creatures, some of the most prominent forms are illustrated and described here. In the case of insects whose immature and adult stages are conspicuously different, both forms are pictured. Others, such as water boatmen, undergo no great changes in form as they mature, and except for the difference in size the young and adult stages of these insects look practically identical; in such cases, only the adults are illustrated.



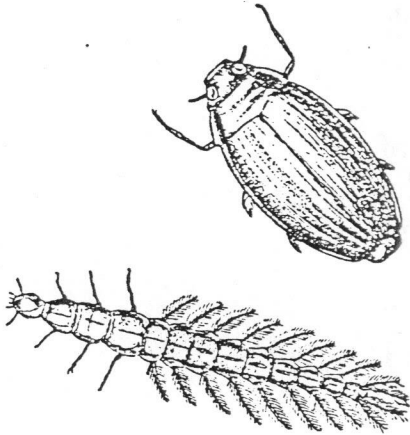
§ **STONEFLY** nymphs have two tails, tufts of threadlike gills on their undersides, and two claws on each foot. Most are herbivores. The adults, which look much like nymphs with wings, are usually found clinging to leaves on streamside trees. At rest they fold their wings back over their bodies.

§ **MAYFLY** nymphs usually have three tails, gills along their sides, and a single claw on each foot. The fragile-looking, short-lived adults have gauzy, iridescent wings, relatively short antennae, and shrunken mouthparts that resemble receding chins. At rest their long front legs point gracefully forward



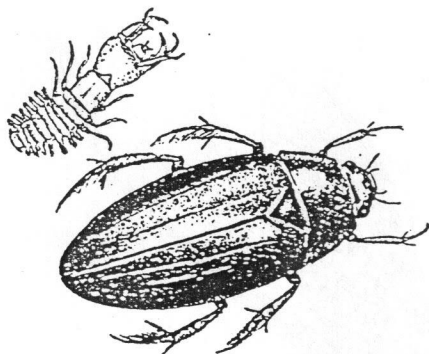
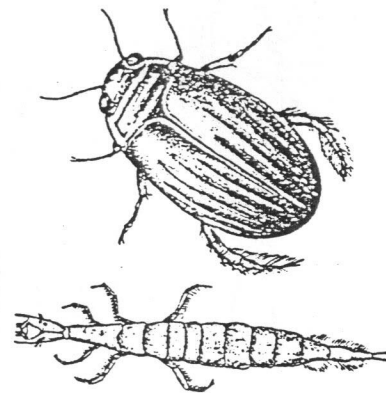


51 CADDISFLY larvae are inconspicuous omnivores best known for the protective cases of sand, pebbles, or plant materials that most species build. The delicate mothlike adults are usually dull-colored, with long threadlike antennae. The wings are covered with tiny hairs and are typically folded tentlike over the insect's back.



52 WHIRLIGIG BEETLE larvae are pale, slender predators with hooklike jaws and a row of fringed gills along each side of the body. The flattened, oval adults have eyes divided into upper and lower halves. They gyrate in schools on the surface, paddling with their hind legs. When handled, they give off a fluid that smells like apple seeds.

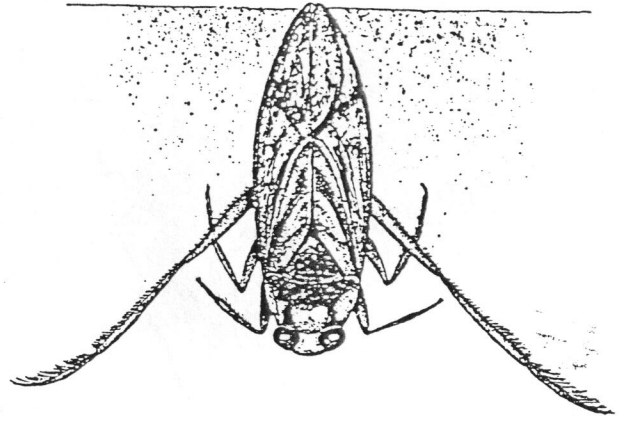
DIVING BEETLE larvae, or water tigers, grasp prey with their strong, sharp jaws. They often hang from the surface, with the tip of the abdomen exposed to the air. The adults are black or brownish, often with yellow markings. They have slender threadlike antennae and hind legs adapted for swimming. Like the larvae, the adults are predators.



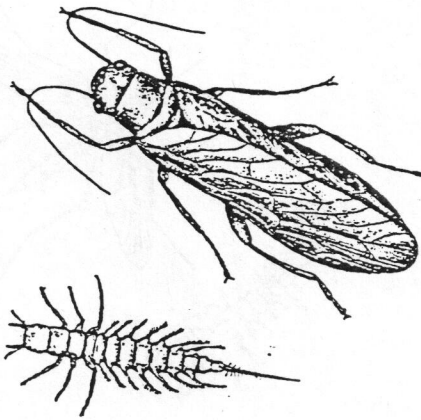
WATER SCAVENGER BEETLE larvae are sluggish predators or herbivores. Most species poke the tip of the abdomen through the water surface for air. The adults resemble diving beetles, but they have short clublike antennae that are often hidden, and they hang tail down instead of head down from the surface when they come up for air.



BACKSWIMMERS habitually swim upside down, rowing with their long fringed hind legs. They hang head down from the surface as they take on bubbles of air, then dive and cling to plant stems. These half-inch-long predators are often strikingly patterned. Their boat-shaped bodies are keeled along the back.

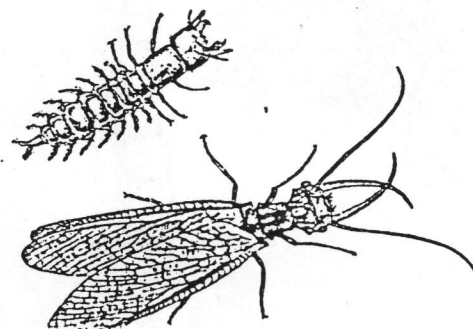


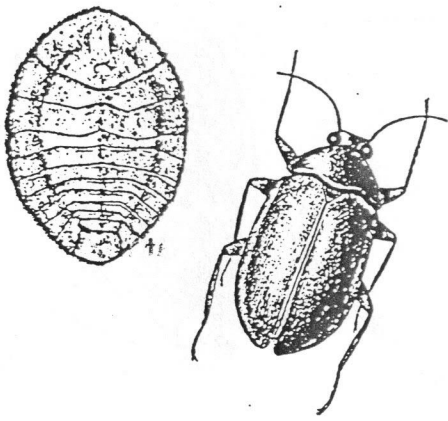
WATER BOATMEN look much like backswimmers, but they swim right side up, moving their fringed hind legs like oars. They use their middle legs for hanging onto rocks and plants and their basketlike front legs for straining microscopic plants from water and mud. Most are dark gray or mottled gray and black.



ALDERFLY larvae are brownish bottom-dwelling predators, about an inch long when full-grown. They have long tails and a row of bristly fingerlike gills along each side. The adults are clumsy fliers with membranous wings that lie flat or rooflike over their bodies when at rest. They have long antennae and stout jaws.

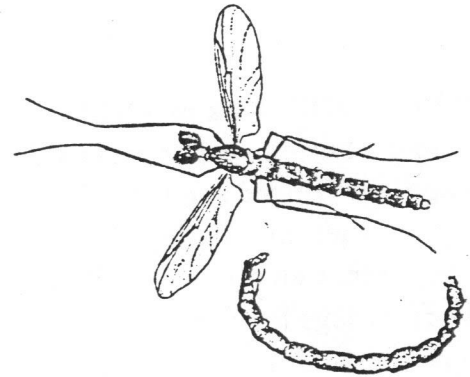
DOBSONFLY larvae, or hellgrammites, are two to three inches long when full-grown. They have strong biting mouthparts and a pair of long fingerlike gills on each abdominal segment. The large-winged adults have stout tusklike jaws and long segmented antennae.



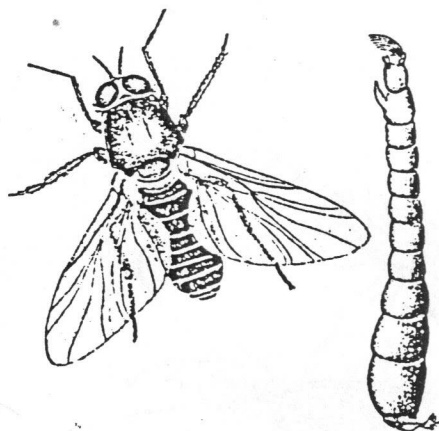
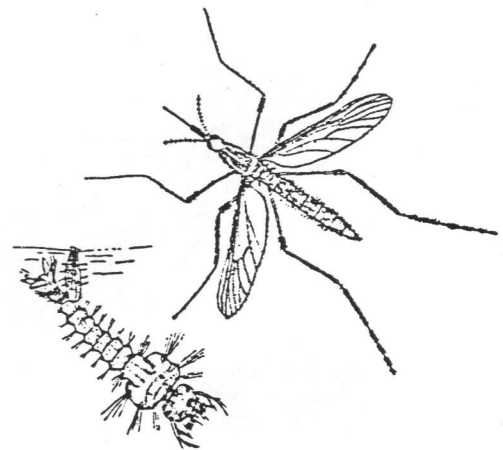


ST WATER PENNIES are flattened, oval beetle larvae that cling to the undersurfaces of rocks in shallow riffles. The head, legs, and tufts of threadlike gills are visible only when the larvae are pried loose from the stones. The adults are small, inconspicuous beetles covered with fine hairs, and are seen occasionally in flight or creeping over streamside rocks.

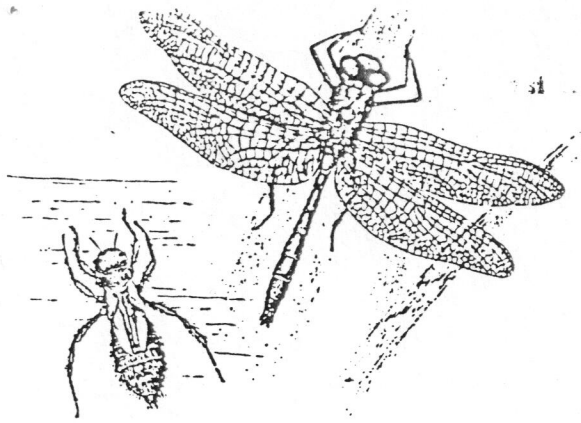
T MIDGE larvae are slender, fleshy wormlike creatures found in all sorts of aquatic habitats. The adults are delicate flies that are often confused with mosquitoes, but the wings are bare and the females do not bite. Even so, enormous swarms of mating adults are sometimes a nuisance.



MOSQUITO larvae, also called wrigglers because of their jerky swimming movements, hang head down or parallel to the water surface, with their breathing tubes projecting through the surface film. The adults have characteristic fringes of tiny scalelike hairs on the margins and along the veins of their wings. The females buzz and bite, but the males do not.

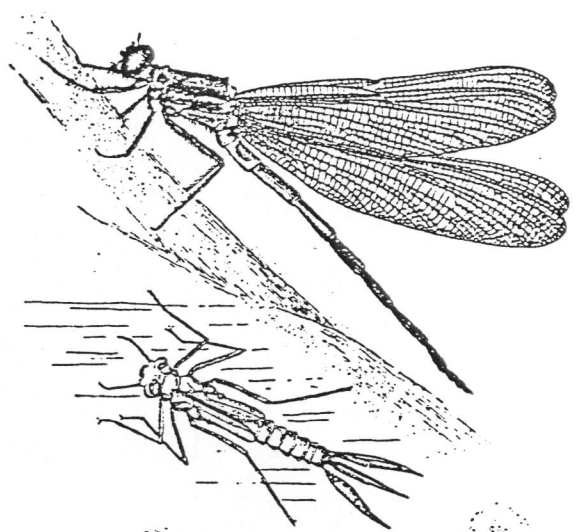


T BLACK FLY larvae cling in masses to rocks in swift currents, anchoring their soft bodies with suckers at the hind ends and straining food from the water with fan-shaped mouth brushes. The small black humpbacked adults are notorious pests that inflict painful bites.

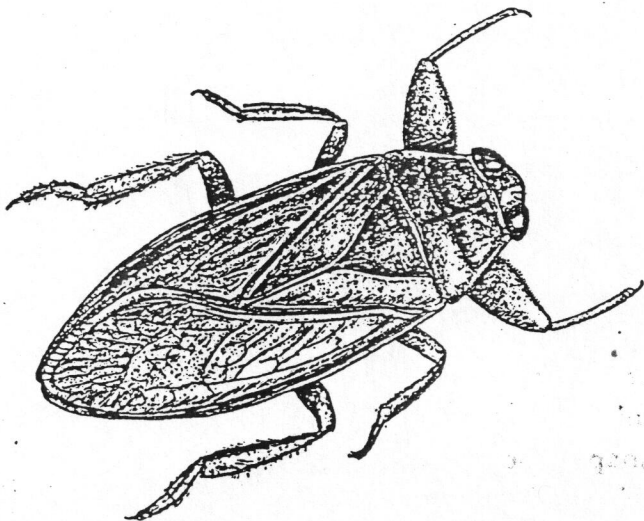
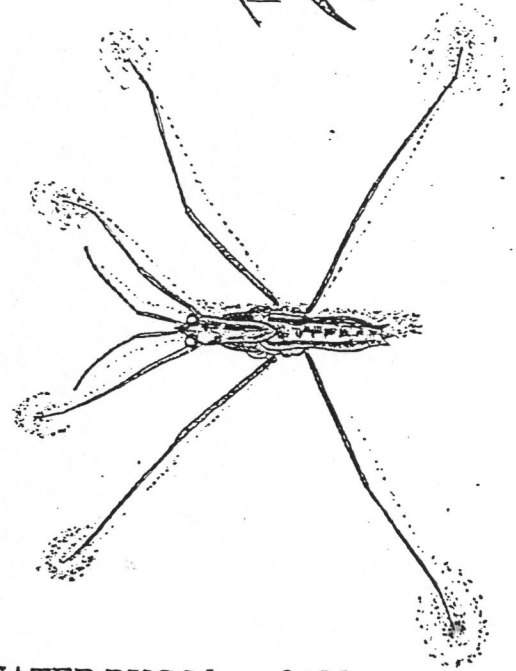


ST DRAGONFLY nymphs are short, chunky predators with hidden internal gills. The hinged lower jaw folds back under the chin but can be extended forward for grasping prey. The adults spread their four wings horizontally when resting, and the front wings are narrower at the base than are the rear wings.

S DAMSELFLY nymphs are more slender than dragonfly nymphs and have three taillike gills, but the mouthparts are similar. The adults usually fold their wings upward and back when resting. The front and rear wings look alike. Unlike dragonflies, whose bulging eyes often meet at the top of the head, damselflies have eyes that are widely separated on the sides of the head.



T WATER STRIDER nymphs and adults look practically identical. These long-legged predators skate across the surface film and suck juices from prey with their needlelike mouthparts. Some species have wings and can fly away if their pool dries up, but most are wingless.



T GIANT WATER BUGS have hidden antennae, paddlelike hind legs, and flattened bodies that are keeled along the underside. They capture prey with their hooked front legs and use their pointed beaks to suck out juices. Males of some species carry incubating eggs on their backs. They often rest at the surface, with the tip of the abdomen projecting from the water for air.



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