# AQUATIC INSECTS OF NORTH DAKOTA

Much like terrestrial insects, aquatic insects are part of the beginning to a huge web of life, or food chain. Without these small organisms, there would be no larger life forms. In other words, these invertebrates without a backbone actually create the "backbone" of life.

Some aquatic insects are referred to as macroinvertebrates and they are large enough to see with the naked eye. Others are much smaller and cannot be seen without the aid of a microscope.

Aquatic insects spend at least part of their life in the water. They can be found in a variety of different habitats, or niches within a water body. In North Dakota, many aquatic insects are found in fertile, shallow wetlands which warm up quickly in the spring. These invertebrates are extremely important as a food source to migrating waterfowl.

Other aquatic insects are found in lakes and rivers where they are important food for fish, freshwater mussels and species like crayfish. These invertebrates generally make their homes in areas with rocks, gravel, fallen trees or other structures which provide protection from predators and a place for them to find their own food.

Water resources in North Dakota are sometimes overlooked and not viewed as important. Investigation of aquatic insects may provide the starting point for future generations to appreciate this somewhat "invisible" world and possibly take steps in improving water quality across the state.

Searching for invertebrates is easy. A simple magnifying glass, fine-meshed minnow net and a collection jar will get you started. Look for invertebrates in wetlands by turning over rocks or looking on vegetation on the underside of a fallen log. Some will be obvious. Others will only be seen after looking at a sample of water under a microscope. Have fun and enjoy our state's water resources.

*Andre Delorme* *Chris Grondahl*

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NORTH DAKOTA GAME AND FISH DEPARTMENT

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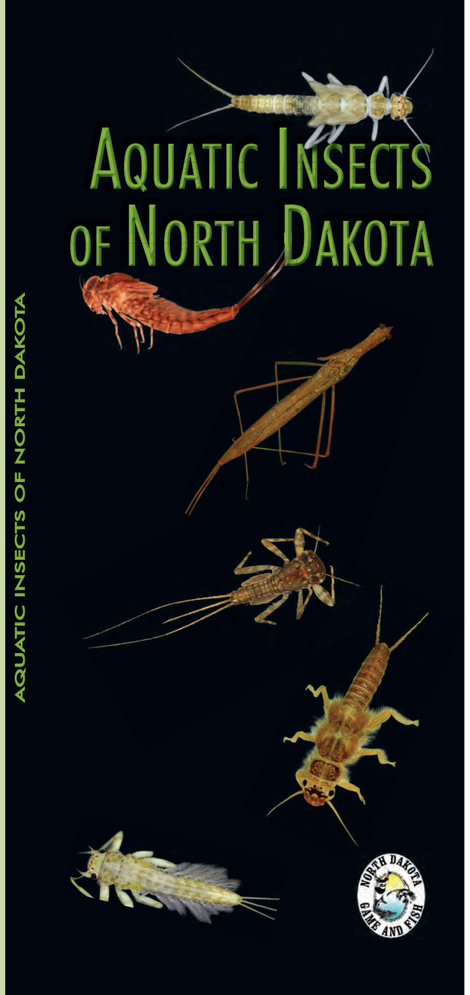
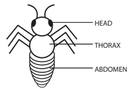



# AQUATIC INSECTS OF NORTH DAKOTA

## INTRODUCTION

### • BODY PARTS

Insects have 3 basic body parts – head, thorax, and abdomen. The head is obvious in most insects, although in some worm-like larvae it is not. The thorax is the middle part of the body where the legs and wings attach. The abdomen is the back part of the insect and is usually the longest part of the body.




### • SIZE

Acquatic insects come in a variety of sizes. Below are the guidelines for sizing. These sizes are for mature larvae and adults.

- **VERY SMALL** – 1/4 inch or less
- **SMALL** – 1/4-1/2 inch
- **MEDIUM** – 1/2-1 inch
- **LARGE** – 1-2 inches
- **VERY LARGE** – Greater than 2 inches

### • INSECT LIFE CYCLES

Most aquatic insects exhibit one of two different types of life cycles. Some insects have an egg, larvae and adult stage while others have the egg, larvae, pupae and adult stage. Which stage you will find in the water depends on the type of insect. Mayflies, stoneflies, dragonflies and damselflies, true flies and caddisflies all have aquatic larvae, but adults are free flying terrestrial insects not normally found in water. The beetles and true bugs have both larvae and adults that are aquatic. Beetles are interesting in that their larvae and adult forms are very different in appearance while true bugs have larval forms, called nymphs, which look very similar to the adults.

### • MAYFLIES – LARVAL FORMS

Mayfly larvae usually have 3 caudal filaments (or tails) and 1 claw on the end of their legs. They have a variety of different gills depending on the species and mature larvae will have wing pads.

*Small Minnow Mayfly*

*Small Minnow Mayfly*

#### Small Minnow Mayflies

These mayflies have streamlined bodies that help them swim. Their legs are usually situated below the body and tucked when swimming. They usually have very long antennae, longer than head and thorax combined.

#### Small Squaregills

The name small squaregills aptly describes these mayflies. The first pair of gills on the abdomen is modified into a pair of operculate covers that protect the rest of the abdominal gills, hence the name squaregills. These small larvae are commonly found in clumps of filamentous algae.

*Small Squaregill*

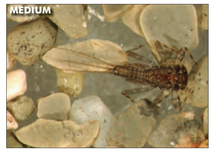
#### Common Burrowers

The burrowing mayflies can be rather large in size compared to most other mayfly larvae. The head has "tusks" which are thought to be used to burrow into the substrate, and their featherlike gills arch over the back. These mayflies live in mud bottoms, burrowing into the sediments.

*Common Burrower*

#### Flatheaded Mayflies

The flatheaded mayflies are well adapted for living in fast moving water. Their flat body with legs splayed out to the side help them cling to substrates. Often found on the underside of logs and stones, they are relatively common mayflies.



*Flatheaded Mayfly*

#### Hacklegills

Hacklegill larvae have a fairly flattened body with a set of tusks on the front of the head. They also have feather-like gills similar to the burrowing mayflies, but their gills usually do not arch over the back.

*Hacklegill*

#### Brushlegged Mayflies

Brushlegged mayfly larvae are good swimmers and are similar in appearance to the small minnow mayflies. The best feature for identification is the 2 rows of long setae on the front legs used for gathering food.

*Brushlegged Mayfly*

### • DRAGONFLIES AND DAMSELFLIES – LARVAL FORMS

These larvae have distinctive hinged mouthparts that can be extended forward for capturing prey. Mature larvae have wing pads.

Damselflies usually have a long, thin body and three flat caudal gills on the end of their abdomen.

#### Narrow-winged Damselflies

These common larvae have a long thin body and can be quite common. The bottom picture shows their hinged mouthparts tucked under the head. This is an identifying feature of all *Odonata*, although there is variation among groups.

*Narrow-winged Damselfly Larvae*

#### Broad-winged Damselflies

These larvae have characteristic long antennae. They also have long legs and the narrow abdomen of most damselfly larvae.

*Broad-winged Damselfly Larvae*

#### Dragonflies

Dragonfly larvae are usually thick bodied with pointed structures on the end of their abdomen.

#### Clubtails

Clubtail nymphs are similar to the darners in that they have flattened mouth parts. They can readily be identified, however, by their distinctive antennae, the third segment of which is elongated. They tend to be a little more compact in body size compared to darners and often bury in sediments waiting for prey.

*Clubtail Larvae*

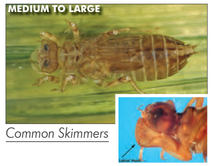
#### Darners

The darners are common large dragonflies. Their mouth parts form a flat structure that can be extended out to capture prey (see bottom photo). These nymphs lie in wait, looking to catch any unsuspecting small aquatic animal that may swim by.

*Darner Larvae*

#### Common Skimmers

The mouthparts of common skimmer larvae distinguish them from the clubtails and darners. Their mouthparts form a spoonlike structure that covers the front of the head. It is often called a "labial mask."



*Common Skimmers*

### • STONEFLIES – LARVAL FORMS

Stonefly larvae have 2 caudal filaments and 2 claws on the end of their legs. Mature larvae will have wing pads.

#### Common Stoneflies

Like most stonefly nymphs, the common stoneflies are usually found in fairly well oxygenated water. They have branched, filamentous gills on the thorax. Some have bold markings on head and body, others are more plain in appearance.

*Common Stonefly*

#### Perlodid Stoneflies

The perlodid nymphs in this area belong to a subfamily commonly called stripetails because of distinctive markings on the abdomen. They are similar to the common stoneflies, but do not have the branched filamentous gills on the thorax. They also have long caudal filaments that are normally longer than their abdomen.

*Perlodid Stonefly*

#### Giant Stoneflies

These are large robust larvae that have bushy filamentous gills on the thorax and the first 2-3 segments of the abdomen. Their head has a somewhat vertical orientation making it appear to be tipped down when the insect is resting flat. Although not common in prairie rivers, they are an interesting find when caught.

*Giant Stonefly*

## • TRUE BUGS – ADULT FORMS

The adult and nymph forms of the true bugs are similar in appearance. Both are characterized by mouthparts modified into a tube for piercing and sucking.

### Giant Water Bugs

These are medium to large bugs with an oval and slightly flattened body. They have large raptorial forearms for grasping prey. Antennae are hidden. They have a pair of air straps on the end of the abdomen to aid in breathing.

Giant Water Bug

### Water Boatmen

Medium to small bugs with forelegs modified into scoop-shaped structures. Hind legs are modified into long oar-like structures. Antennae are hidden. Their beak is short and triangular.

Water Boatmen

### Water Striders

Medium to small bugs with long legs. Antennae are easily seen. Front legs are shorter than mid and hind legs and mid and hind legs are much closer together. Their claws on the end of the legs come out before the tip of the leg. They skate across the surface of the water.

Water Strider

### Water Scorpions

These are medium to large bugs with an elongate body. Forelegs are raptorial and there is a prominent set of breathing tubes on the end of the abdomen. Antennae are hidden.

Water Scorpion

### Pygmy Backswimmers

These are small, highly convex bugs that are less than 3 mm long.

Pygmy Backswimmer

### Backswimmers

These medium-sized bugs have hind legs that are modified into oars. They have a highly convex back that is usually light colored and are called backswimmers because they usually swim upside down.

Backswimmer

## • FISHFLIES AND DOBSONFLIES – LARVAL FORMS

These are elongate larvae with a head capsule and 6 legs. They have chewing mouthparts. Similar to some beetle larvae, they can be distinguished by having lateral filaments on the abdomen and either a terminal filament or hooks on the end of the abdomen.

### Dobsonflies

These larvae are often called hellgrammites. The abdomen has prominent lateral filaments with a pair of prolegs on the end of the abdomen each with 2 hooks. The end of the abdomen also sometimes has a modified breathing tube.

Dobsonfly

### Alderflies

These are smaller than hellgrammites and a little less intimidating. They have chewing mouthparts. These larvae also have prominent lateral filaments and a terminal filament with no hooks.

Alderfly

## • CADDISFLIES – LARVAL FORMS

Many of these larvae make elaborate cases in which to grow and mature. They always have a pair of prolegs on the end of the abdomen with a hook on each proleg. They often have filamentous gills on the abdomen and no wing pads.

### Common Netspinners

The netspinners make a netlike retreat on rocks and debris, and they do not make cases like many other caddisflies. All three thoracic plates are hardened and they have bushy gills on the underside of the abdomen. They also have a brush of hairs on the terminal prolegs.

Common Netspinner

### Microcaddisflies

Living up to their name, these are very small larvae. Like netspinners, they have all three thoracic plates hardened, but their small size easily distinguishes them. There are a variety of types that make some very distinctive cases.

Microcaddisfly

### Longhorned Casemakers

The distinguishing characteristic for this group is their relatively long antenna. Most other caddisflies have very short antenna. They make a variety of cases that can be useful in identification. Their hind legs are much longer than the other 2 pairs.

Longhorned Casemaker

Longhorned Casemaker

### Northern Casemakers

A large and diverse group, most northern casemaker larvae have filamentous gills on the abdomen. They also usually have 3 humps on the first segment of the abdomen. Cases are variable, made of such materials as stones and plant fragments and may even contain snail shells.

Northern Casemaker

### Giant Casemakers

Only the first thoracic segment has a hardened plate completely covering it. This plate and the head often have distinctive stripes. Their cases are large and usually made out of a spiral arrangement of plant material.

Giant Casemaker

### Snail Casemakers

These larvae have a very distinctive case that looks like a snail shell except that it is made of small stones.

Snail Casemaker

## • BEETLES – LARVAL AND ADULT FORMS

Larvae of beetles usually have a hardened head, 6 legs, and there are no wing pads on the thorax. Adults have hardened wing coverings called elytra that cover most of the body.

### Predacious Diving Beetles

Adults have hairs on their hind legs to aid in swimming. Their antennae are usually long without a club on the end. Larvae are variable, but have elongated bodies with 5 segmented legs with 2 claws on each leg.

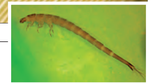
Predacious Diving Beetle

Predacious Diving Beetle Larvae

### Riffle Beetles

The adults are small, crawling beetles usually found in fast moving water. They have strong claws. The larvae are elongate with the last abdominal segment having a chamber with hairs that is covered with a lid-like plate.

Riffle Beetle


Riffle Beetle Larvae

### Whirligig Beetles

Adult whirligig beetles can be found swimming in circles on the water surface. The adults are easily distinguishable by 2 sets of eyes – one sees above the water, the other below. Larvae are long and thin with hooks on the end of the abdomen.

Whirligig Beetle

Whirligig Beetle Larvae

### Crawling Water Beetles

The adult can be identified by a pair of transparent plates on the underside of the abdomen that cover the base of the hind legs. Larvae are elongate with one type having a series of long filaments coming off the dorsal side of the body.

Crawling Water Beetle

Crawling Water Beetle Larvae

### Water Scavenger Beetles

Adult water scavenger beetles are very similar in appearance to the predacious diving beetles. Unlike the predacious diving beetles they have clubbed antennae. Larvae are elongated with usually 8 abdominal segments and the head has a large pair of mandible visible from above.

Water Scavenger Beetle

Water Scavenger Beetle Larvae

## • FLIES – LARVAL FORMS

The larvae are worm-like with no true legs and no wing pads. Some have a hardened head, but many have the head greatly reduced. There are a wide variety of species. Many larve have "prolegs," fleshy stubs that may act as small legs.

### Midges

A large and diverse group, the larvae are long and thin with a pair of thoracic prolegs just under the head capsule and 2 prolegs at the end of the abdomen. The thorax and abdomen are about the same diameter. When alive, many species are bright red.

Midge

### Black Flies

They have distinctive fan-like antennae that are used for capturing food in water current.

Black Fly

The end of the abdomen forms a disk for attaching to rocks. The head is hardened and there is a single median thoracic proleg.

### Crane Flies

The head is reduced and sometimes withdrawn into the body cavity. The body is usually fairly thick and the end of the abdomen often has an elaborate spiracular disk that is surrounded by 3-7 lobes.

Crane Fly

### Phantom Midges

When alive, these larvae have a clear body. They have a large head with large antennae that have bristles on them. The thoracic segments just behind the head are fused and much thicker than the abdomen.

Phantom Midge

### Watersnipe Flies

In watersnipe fly larvae the head is inconspicuous, the body has terminal prolegs, and the abdomen ends in pair of ciliated processes longer than terminal prolegs.

Watersnipe Fly

### Mosquitoes

Mosquito larvae have a fully developed head with the thoracic segments just behind the head fused so they are much thicker than the abdomen. Many species have a large structure called a siphon coming off the rear end of the abdomen.

Mosquito

### Biting Midges

Their head is fully formed and most species have a long, worm-like body with no prolegs or appendages.

Biting Midge