What is an insect?

An insect is an invertebrate (an animal with no spine) that has three-pairs of legs (except Diptera) and three body divisions; the head is the location of the mouth, antenna, and eyes; the thorax is the attachment site for the legs and wing pads; and the abdomen, which often has a variety of structures attached including filamentous gills and tails. Gills are usually leaf-like, plate-like, or thin filaments. Tails can be long and thin, hairy, webbed or paddle-like. Aquatic insects are described and illustrated on page one and the top of page two; non-insect group descriptions and illustrations begin on page two. Additional tips are provided at the bottom of page two.

Insect groups

Mayflies

Order **Ephemeroptera**: Three-pairs of legs with a single hook at the end; three some-times two tail filaments; gills attached to the abdomen, which may sometimes be covered and difficult to see. Mayflies exhibit several types of movements (or habits); swimmers, clingers, crawlers, and burrowers. (VS-M) (M) Families above left-right: Heptageniidae, Isonychidae and *Ephemeroellidae*.

**Dragonfly**

**Damsel fly**

Stoneflies

Order **Plecoptera**: Three-pairs of legs with two-hooks at the end; two tail filaments; no gills attached to the abdomen but some kinds may have gills near the top of the abdomen; gills if visible, mostly on the legs and thorax. (S-VL) (M) Families above left-right: Perlidae, Capniidae and Peltoperlidae.

**Helgrammite/Fishfly**

**Alderfly**

Case-building caddisflies

Order **Trichoptera**: Grub-like soft body and a hard head; Three-pairs of legs located on the upper third of the body; tail is small and usually forked, sometimes fringed with hairs; gills are scattered on the underside of the abdomen. The case (retreat) is a relatively solid structure made of a variety of streambed materials held together by silk. (VS-L) (M) Families above left-right: Brachycentridae, Limnephilidae and Glossosomatidae.

**Common netspinner**

**Finger-net**

**Free-living**

Dragonflies and Damsel flies

Order **Odonata**: Three-pairs of legs; large eyes; long spoon-like jaws; no tails on the abdomen. Dragonflies sub-order *Anisoptera* have a broad shaped abdomen, while the Damsel flies sub-order *Zygoptera* abdomen’s is much narrower. Damsel flies gills are attached to the end of the abdomen, they look like tails. (M-VL) (M)

**Water penny**

**Riffle beetles**

**Whirligig beetle**

Fishflies and Alderflies

Order **Megaloptera**: Three-pairs of legs; large pinching jaws; eight-pairs of filaments attached to the sides of the abdomen. Fishflies family *Corydalidae* have a two-hooked tail, whereas Alderflies family *Stalidae* have a single tapered tail and are usually much smaller and lighter in color. (M-VL)

Net-spinning caddisflies

Order **Trichoptera**: Similar characteristics as above but the abdomen usually has more abundant gills, especially the Common netspining caddisfly. Net-spinner’s retreat is made of a variety of streambed materials loosely held together by fine strands of silk. Free-living caddisfly does not build a case or net. (S-L) (M) Families above left-right: *Hydropsychidae*, *Philopotamidae* and *Rhyacophilidae*.

True flies

Order **Diptera**: Usually the body is segmented with some type of visible features either along the body, or at the head or tail regions (i.e. head, tails, prolegs, whelpes etc.). Note: This order is the only aquatic insect without fully developed legs in the larval stages.

Dipterans are very diverse order with many aquatic varieties. Common kinds are described here.

**True flies continued.**

Illustration’s courtesy of Cacapon Institute and artist Jennifer Gillies; used with permission
Crane fly
Order **Diptera** family **Tipulidae**: No legs, no visible head; plump body with lobes along the segments; may have structures that look like tentacles, lobes or one bulb at the end of the body. (S-VL)

Black fly
Order **Diptera** family **Simuliidae**: Body has a bowling-pen shape (lower is wider than the upper); there are multiple brushes/fans on the head and a ring of hooks on the abdomen. (VS-M)

Watersnipe fly
Order **Diptera** family **Athericidae**: Plump body, looks very much like a caterpillar; on the underside there are structures that look similar to legs but are not segmented; the tail is forked and fringed with hairs. (S-L)

Non-Insect groups

**Crayfish**
Class **Crustacea** order **Decapoda**: Five pairs of legs, the first two usually have large claws; large flipper-like structure at the end of the abdomen. (M-VL) (M)

**Scud/Sideswimmer**
Class **Crustacea** order **Amphipoda**: Seven pairs of legs, the first two may be claw-like; body is somewhat higher than it is wide. Usually swims with a sideways motion. (S-M)

**Aquatic sowbug**
Class **Crustacea** order **Isopoda**: Seven pairs of legs, the first two may be claw-like; very long antenna; body is wider than it is high, giving the animal a fairly flattened appearance. (S-M)

**Clams and Mussels**
Class **Bivalvia**: Fleshy body enclosed between two-hinged shells; the shape and ridge spacing of the shells can determine different kinds. **Mussels** are usually larger than **Clams** and have dark colored oblong shells. (VS-VL) (M)

**Operculate snails**
Class **Gastropoda** sub-class **Prosobranchia**: Fleshy body enclosed by a single shell, which is usually coiled in an upward spiral. The opening of the shell is covered by an operculum (door). (VS-L) (M)

**Non-operculate snails**
Class **Gastropoda** sub-class **Pulmonata**: Fleshy body enclosed by a single shell, which is sometimes coiled upward but also may lie flat or have a conical shape. The opening of the shell is not covered by an operculum. (VS-L) (M)

**Aquatic worms**
Phylum **Annelida** class **Oligochaeta**: Body is long with numerous segments along its entire length; has no visible head or tail. (VS-VL)

**Leeches**
Phylum **Annelida** class **Hirudinea**: Body is long and thin or slightly widened; 34 segments along its length, but there appears to be many more. (S-VL)

**Flatworms**
Class **Turbellaria**: Soft elongate body without segment; head triangular shaped with eyes on top, which give the animal a cross-eyed appearance. (VS-L)

Learn more at: [https://go.wv.gov/sos](https://go.wv.gov/sos)

Sizes illustrated not proportional.

Identification of benthic macroinvertebrates (BMIs) is easier when viewed in the same orientation as the illustrations. Most illustrations are drawn in top and side views; the water penny is shown in underside view. Use morphological features as your basis for identification; the size and color are often variable and influenced by environmental factors. The (M) indicates that multiple kinds may be collected from within the order or class.

**Size categories** (size range in mm): > 50 Very large (VL); 50 - 30 Large (L); 29 -10 Medium (M); 10 - 5 Small (S); < 5 Very small (VS)

Note: This field guide will help you identify common aquatic invertebrate classes, orders, and a few families. You should always use a more complete guide for verification and family level identification. With practice, you will be able to identify a wide variety of families in the field.