

# Aquatic Insect Parts and Pieces

**Adapted from:** An original Creek Connections activity.  
Creek Connections, Box 10, Allegheny College, Meadville, Pennsylvania 16335.

**Grade Level:** all

**Duration:** 45 minutes

**Setting:** classroom

**Summary:** Students draw sections of imaginary macroinvertebrates in order to learn the main body sections of insects.

**Objectives:** Students will learn main body sections of insects and create insects body sections of their own.

**Related Module Resources:**

- “Create a Macroinvertebrate” activity and other macroinvert. Activities
- Macroinvertebrate Fact Sheets
- Books/Field Sheets: Macroinvertebrates [folder and box]
- Reference Collection: bugs
- Videos: Creatures of the Pond and SOS For Americas Streams

**Vocabulary:** macroinvertebrate, adaptation, thorax, abdomen

**Materials (Included in Module):**

- Blank art page with section blocks for Head, Thorax, Abdomen, and Tail (some pre-cut section blocks may be found in envelope)
- Visual aids

**Additional Materials (NOT Included in Module):**

- Art supplies
- Scissors

**ACADEMIC STANDARDS (ENVIRONMENT AND ECOLOGY)**

7<sup>th</sup> Grade

- 4.1.C Explain the effects of water on the life of organisms in a watershed.
- explain how the physical components of aquatic systems influence the organisms that live there in terms of size, shape and physical adaptations
- 4.6.A Explain the flows of energy and matter from organism to organism within an ecosystem.
- describe and explain the adaptations of plants and animals to their environment
  - identify the relationship of abiotic and biotic components and explain their interaction in an ecosystem
- 4.7.A Describe diversity of plants and animals in ecosystems.
- identify adaptations in plants and animals

10<sup>th</sup> Grade

- 4.1.C Describe the physical characteristics of a stream and determine the types of organisms found in aquatic environments
- explain the habitat needs of specific aquatic organisms
- 4.6.A Explain the biotic and abiotic components of an ecosystem and their interaction.
- 4.7.A Explain the significance of diversity in ecosystems.
- identify a species and explain how its adaptations are related to its niche in the environment
- 4.7.B Explain how structure, function and behavior of plants and animals affect their ability to survive.
- describe an organism’s adaptations for survival in its habitat

12<sup>th</sup> Grade

- 4.6.A Analyze the interdependence of an ecosystem.
- analyze the relationships among components of an ecosystem

**BACKGROUND:**

Aquatic insects can be found in every part of or type of waterway and are a varied group, but they all have one thing in common – at one stage during their life cycle, they rely on water.

**Macroinvertebrates** are organisms without internal skeletons that can be seen with the unaided eye (often considered larger than 0.5mm). Reference to the term “aquatic macroinvertebrates” can include arthropods (insects in all life cycle stages, nymph, larva, pupa, or adult or crustaceans or arachnids), mollusks, and worms. Examples of aquatic macroinvertebrates include mayfly nymphs, stonefly nymphs, dragonfly larvae, midge larvae, crayfish, leeches, aquatic worms, and water beetles. Some of these creatures are called **benthic** (bottom-dwelling) macroinvertebrates, which means they live in, move along, or attach themselves to the waterway bottom or substrate. Not all aquatic

macroinvertebrates remain on the bottom though – some swim through the water or live on the surface.

An **arthropod** is in the phylum arthropoda and is characterized by a segmented body, an exoskeleton, and jointed appendages. These appendages can be modified for feeding, walking, feeling, swimming, etc. The three main classes of arthropods are insects, arachnids, and crustaceans.

All organisms in the class Insecta have a few characteristics in common.

- one pair of antennae
- three distinct body regions (head, thorax, and abdomen)
- three pairs of jointed legs on the thorax
- no jointed legs on the abdomen
- often one or two pairs of wings on the thorax

The first region of an insect is the **head** and it is usually capsulelike, can have many fused segments to it, and contains the feeding apparatus and sensory organs. The mouth parts of all insects are composed of four distinct parts: **labrum** (plate-like upper lip), **mandibles**, **maxillae**, and **labium** (lower lip). The maxillae and labium often possess a pair of finger-like structures (sometimes looking like short antennae) called the maxillary **palp** and the **labial palp**. All these mouth parts differ in size and shape between insects and are sometimes identification characteristics. **Antennae** are long, usually filamentous, typically segmented, paired sensory appendages attached to the head that can vary in size and shape. There is usually a pair of **compound eyes**, complex eyes composed of many separate light-sensitive lenses called facets that can form an image. In addition to compound eyes, many insects also possess two or three small eye spots near the top or center of the head called **ocelli**. Some larva lack compound eyes and just have a cluster of small eye spots called **stemmata**.

The second region is the **thorax** and it is composed usually of three segments. The **prothorax** is **anterior** (the front end of an organism, toward the front) and therefore the first thoracic segment. The **mesothorax** (second or middle segment) with “meso” meaning middle or central. The last thorax segment is the **metathorax**, which is **posterior** (of or pertaining to the rear, or tail, end). The thorax is where the appendages for locomotion (legs) will be for insects. Segmented insect legs vary in size and shape but are composed of 6 parts: coxa, trochanter, femur, tibia, tarsus, and tarsal claw. One or two pairs of wings will be found on most adult insects with the fore wings usually attached to the mesothorax and the hind wings attached to the metathorax. Wing pads can be found on larva or nymphs as the location of where the wings will develop.

The third body region is the **abdomen**, which is usually the longest and composed of the several segments. Sometimes the number of segments is an identification characteristic. It may have many different types of appendages or external structures, but not legs. These may include **prolegs** (or fake legs that are unsegmented), gills, breathing tubes or siphons, filaments, hairs, or bristles. These appendages can have a number of different functions – for breathing, swimming, anchoring to the substrate, or leverage. Attached

to abdomen, some adult and immature insects also have “tails,” sometimes called **cerci**. Also located on the abdomen are the reproductive organs of insects.

Knowing the body part of adult and immature insects helps make identifying the organisms easier. Identifying insects to more specific taxonomic categories (like genus and species) requires recognizing subtle differences in body parts.

**OVERVIEW:** Students will create real or fictitious aquatic insects to illustrate and label the main body parts.

**PROCEDURE:**

*NOTE: This activity can be done in conjunction with or be replaced by the “Create a Macroinvertebrate” Activity, which adds the concept of adaptations to the lesson.*

1. Discuss the major body sections of insects with the students. Depending on the level of the class, you can keep the body sections to a minimum (head, thorax, abdomen, tail) or go into more detail with the enclosed diagrams and background. Comparisons could be made between different types of insects.
2. Photocopy and distribute the blank art sections pages (Head, Thorax, Abdomen, and Tail) uncut. There are a few different versions of this page, which can be used interchangeably for the activity.
3. Inform students that they are going to draw an aquatic macroinvertebrate (either real or fictitious) keeping each body section of it within the appropriate art section. *Tell students whether to draw the bug as viewed from above or from the side – you decide which.* **Make sure the body lines they draw end at the black arrows on the edge of the paper pieces.** Allow students to complete these to an artistic level that you want.
4. When their drawing is complete, you may want to the students to label body parts and/or provide background information about their organism. You may elect to collect the illustration for your review and/or have students share their illustrations with the rest of the class.
5. When you are finished with reviewing the students work, have the students cut apart each of the body sections along the straight line.
6. When the sections are cut apart, they can be combined with the parts that other students have made (change heads with someone else or an abdomen, etc). If they used the black arrows appropriately, the parts and pieces should be interchangeable like a flip book - creating some very unusual insects perhaps.

### **DISCUSSION:**

Make sure the students recognize the main body sections of insects. For more advanced classes, discuss how some of the smaller body parts they drew would be similar to those on real insects.

What are the main characteristics of all organisms in class Insecta? *See background section.* Did their illustrations include all of these characteristics?

### **EVALUATION:**

- Body sections and parts correctly labeled on their aquatic macroinvertebrate illustration
- Recognize the main body sections of insects on a generalized insect illustration
- Label more specific body parts of insects on a generalized insect illustration

### **EXTENSIONS AND MODIFICATIONS:**

- Create fact sheets for each organism (real or fictitious). List its name, what it eats, what eats it, how it breathes, where it lives, how it moves, and how it gets its food. Include other attributes as appropriate – perhaps a drawing and explanation of its life cycle and/or human actions that affect the population of the insect.
- Create a banner or hang the odd combination of insect on the wall.

### **NOTES (TEACHERS, PLEASE WRITE ANY SUGGESTIONS YOU HAVE FOR TEACHERS USING THIS ACTIVITY IN THE FUTURE):**

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