

Invertebrate Notes

Invertebrate Phyla:

Arthropoda

Subphylum:
Trilobita--
trilobites
(extinct)



Trilobite

Subphylum:
Chelicerata--
horseshoe
crabs, spiders,
scorpions,
mites, & ticks



Horseshoe
crab

Subphylum:
Mandibulata--
crustaceans, insects,
millipedes,
centipedes



Millipede

About **97%** of all animals are invertebrates. Invertebrates are animals which **do not have a backbone**. There are **nine phyla** of invertebrates: Porifera, Cnidaria, Platyhelminthes, Nematoda, Rotifera, Mollusca, Annelida, Arthropoda, & Echinodermata.

Arthropods

The members of the phylum **Arthropoda** all have **jointed appendages**. In fact, the word "arthropod" means jointed leg. There are more species of arthropods than any other phylum.

Arthropods have these characteristics:

- a. hard **exoskeleton** which is usually composed of substance called **chitin**
- b. go through **periodic ecdysis** (molting) as they shed or molt their exoskeleton
- c. they have specialized **body segments** (head, thorax, cephalothorax, & abdomen)
- d. **jointed appendages** such as legs, antenna, and mouthparts.
- e. **open circulatory system** (blood is pumped out of blood vessels into the body)

The phylum **Arthropoda** is divided according to their type of **appendages**. The subphylum **Chelicerata** possess **chelicerae** or fangs and no antenna, while the subphylum **Mandibulata** have antenna and **mandibles** or jaws. **Crustaceans** have pincers called **chelipeds**. The subphylum **Trilobita** are an extinct group with a head and trunk with a pair of legs on each segment. **Terrestrial** arthropods like **insects, millipedes, & centipedes** have a system of hollow air tubes called **tracheae** as their respiratory system. **Aquatic chelicerates** like the **horseshoe crab** have **book gills**, while **terrestrial chelicerates** such as **spiders, ticks, mites, & scorpions** use **book lungs**. Book lungs have numerous blood vessel lined surfaces which look like the pages in a book & get oxygen from air. Crustaceans respire through **gills**. Gills are folded tissue which is lined with blood vessels which remove oxygen from water.

Terrestrial mandibulates are **uniramous** with one-branched appendages, but **aquatic mandibulates** like crustaceans are **biramous** or two-branched. Arthropods have a brain and nervous system and possess a variety of sensory receptors such as simple eyes called **ocelli** or compound eyes, **tympanic membranes** for hearing, and **antenna** that can smell and taste. Excretory structures in arthropods vary, but terrestrial arthropods have **Malpighian tubules** to filter nitrogenous wastes.

The subphylum **Chelicerata** (ki-LISS-uh-ruh) include the class **Xiphosura** or horseshoe crabs which have a **cephalothorax** and **abdomen**, live in **marine** environments breathing through book gills, lack antenna, but have chelicera & 4 pairs of walking legs. The class **Arachnida** containing spiders, scorpions, mites, and ticks are also chelicerates that lack antenna, have **chelicera (fangs)** and 4 pairs of legs, but they live in terrestrial habitats and breathe through book lungs or trachea. Chelicerates also have appendages on their head called **pedipalps** that are sensory and can help move food into their mouth. Unlike most arthropods, **spiders** do not see well; however, they are good at detecting movement. Spiders have glands called **spinnerets** on the posterior end of their abdomen that produce **silk** to make webs. When prey is caught in a spider's web, it is the movement which alerts the spider to the captured prey. Most spiders also have hairs on their body to assist them in feeling movement. Spiders **poison** their prey once they are caught in their webs. Spiders are very beneficial because they catch and eat insects. Two spiders which are dangerous are the **black widow** and the **brown recluse**. Both of these spiders have distinct markings on the underside of their abdomen. Spiders differ from insects in having **eight, not six legs**, having **simple eyes** and not compound eyes, and having only **2 body regions (cephalothorax & abdomen)** instead of 3 regions (head, thorax, & abdomen).

The subphylum **Mandibulata** contains the class **Crustacea**. Most crustaceans live in the water and include **crabs, shrimp, lobster, crayfish, & barnacles**. Terrestrial crustaceans include **pillbugs and sowbugs**. Crustaceans have a pair of **antenna** to smell and detect chemicals and a shorter pair of **antennules** used for balance. They have 2 body regions (cephalothorax and abdomen), and their mouthparts include **mandibles, maxilla, and maxillipeds**. They also have pincers called **chelipeds** to help them catch food. Aquatic crustaceans have a shell called a **carapace** that they regularly shed as they grow to produce a larger one. Crustaceans are economically important to man as a food source.

The classes **Chilopoda** and **Diplopoda** are also in the subphylum **Mandibulata**. **Chilopoda** or **centipedes** are **poisonous predators** feeding on other terrestrial arthropods. Centipedes have fangs, venom glands, and a pincer on their tail. They have a single pair of legs per body segment. **Diplopoda** or **millipedes** are **vegetarians** or scavengers feeding on decaying vegetation that have two pairs of legs per body segment.

The class **Insecta** in the subphylum **Mandibulata** includes all of the insects. This is the **largest and most successful group** of arthropods. Insects usually have **six legs**, a **pair of antenna**, and a **pair of wings** although some species may be wingless such as silverfish and termites. Flies have their second pair of wings modified into a balancing structure called **halteres**. Insect's mouths usually have four parts - the **mandible** or **jaw, maxilla, labium or lower lip, and labrum or upper lip** and are adapted for a particular food. For example, grasshoppers have **chewing** mouthparts for eating grass, mosquitoes have **sucking** mouthparts for sucking blood, butterflies have **siphoning** mouthparts for getting nectar from flowers, and the house fly has **spongy mouth parts** for soaking up liquid food. **Wings and legs are attached to the midsection** or **thorax**, antenna, eyes, and mouthparts are attached

to the head, and the abdomen on females may have an egg-laying tube called the **ovipositor**. Insects communicate by producing sounds and by making chemicals called **pheromones**. **Tympanic membranes** on the abdomen and **sensory hairs** detect sound waves. **Spiracles** line the sides of the insect's abdomen and open into their breathing tubes or trachea. Insects may go through stages (**metamorphosis**) in their life cycle. Butterflies, bees, flies, and beetles go through the **egg, larva, pupa, and adult stages**. This is known as **complete metamorphosis**. Dragonflies and grasshoppers go through **egg, nymph, and adult stages** known as **incomplete metamorphosis**. Insects such as silverfish and fleas do not go through metamorphosis. Metamorphosis and molting are controlled by **hormones**.