

ARTHROPODS AT WOODLAND PARK ZOO PRE-VISIT INFORMATION FOR TEACHERS

If you are planning a zoo field trip and wish to have your students focus on arthropods (insects, spiders, crustaceans and their relatives) during their visit, this pre-visit sheet can help them get the most out of their time at the zoo. We have put together an overview of key concepts related to arthropods, a list of basic vocabulary words, and a checklist of arthropod species at Woodland Park Zoo. Knowledge and understanding of these main ideas will enhance your students' zoo visit. For more zoo information and activities focusing on arthropods, please call 206-548-2500 or download the Amazing Arthropods teacher packet at **www.zoo.org.**

OVERVIEW:

There are more different species of arthropods on Earth than any other group of living things. Scientists estimate that as much as 85% of the earth's species are arthropods. Over 950,000 species of insects alone have been identified, compared to 4,000 species of mammals, 5,000 species of amphibians and 8,000 species of reptiles. Arthropods are found in habitats all over the world, from wingless flies in Antarctica to crabs and shrimp that live in extremely hot hydrothermal vents at the bottom of the ocean. Woodland Park Zoo exhibits a wide variety of arthropod species (see attached checklist) in a few different areas of the zoo. An arthropods field trip to the zoo could focus on the characteristics of arthropods (see "Concepts" below), comparing/contrasting different arthropods or learning about biomes and observing the physical characteristics of arthropods in different biomes.



CONCEPTS:

Arthropods share the following characteristics:

- · An exoskeleton, which is a hard, protective covering
- Bilateral symmetry (a body plan in which similar anatomical parts (legs, eyes, etc.) are arranged on opposite sides of a median axis so that an individual can be divided into essentially identical halves)
- · Segmented body parts
- Jointed appendages (limbs or other body parts, such as antennae, that are attached to the body by a joint; hence the name arthropod, which means "jointed foot")

Although taxonomists do not always agree on how arthropods should be grouped, one generally accepted grouping places arthropods into five major classes of arthropods:

1. Crustacea: lobsters, crayfish, barnacles, crabs and sowbugs. Crustaceans breathe with gills. They have two body regions, two pairs of antennae, several pairs of appendages that serve as mouthparts, and five to ten pairs of legs. Crustaceans are predominately marine, however some live in fresh water or on land.

- 2. Arachnida: spiders, harvestmen, ticks, mites and scorpions. Arachnids are primarily terrestrial, have two body regions (the cephalothorax and abdomen), eight legs and simple eyes. For sensory perception, arachnids rely on the many hairs covering their body instead of antennae.
- 3. Chilopoda: centipedes. The body of a centipede is divided into multiple segments, with each segment having one pair of legs. Centipedes live on land, have antennae and are carnivorous, feeding mainly on insects. Centipedes inject a paralyzing poison into their prey, which can be harmful to humans.
- 4. Diplopoda: millipedes. The body of a millipede is composed of many segments with each segment generally having two pairs of jointed legs. All millipedes are terrestrial scavengers, feeding on decaying plant matter, but not animal matter.
- 5. Insecta: insects. Insects are characterized by three distinct body regions (head, thorax and abdomen), three pairs of legs and one pair of jointed antennae. Insects develop through a process called metamorphosis, which is a changing of form. There are two types of metamorphosis: incomplete and complete. In incomplete metamorphosis, the insect goes through three stages of development: eqg, nymph, adult. The immature insect resembles the adult and only small changes occur, such as increase in size or development of wings. In complete metamorphosis, the insect goes through four stages of development: egg, larva, pupa, adult. The immature insect does not resemble the adult of the species. Often, the word "bug" is used to describe not only all insects, but many arthropods as well. True bugs are actually insects in the order Hemiptera. Bugs have mouthparts that pierce and suck, but these mouthparts are used to eat a variety of food. Some bugs, such as many water bugs, prey on other animals by stabbing them with their mouthparts and sucking out the fluids inside. Other bugs, such as aphids and cicadas, use their piercing mouthparts to penetrate plants and their sucking mouthparts to suck up sap. True bugs undergo incomplete metamorphosis.



Arthropods are beneficial in many ways:

- · Food sources for many animals, including humans
- · Pollinators of plants
- Decomposers of dead plants and animals, which releases nutrients into the soil for plants to use
- Providers of products, such as shellac, dye and honey.

VOCABULARY:

Abdomen (ab-do-men): third or end part of an insect's body. The abdomen is attached to the thorax or the cephalothorax

Adaptation: Any change in the structure or functioning of an organism that is favored by natural selection and makes the organism better suited to its environment.

Antennae (an-ten-ee) [singular: antenna]: sensory organs on most arthropods' head. The antennae are used to smell, taste, feel and sometimes hear

Camouflage: The natural coloring or patterning of an animal that allows it to blend in with its surroundings.

Cephalothorax (seh-pha-lo-thor-axe): the fused head and thorax of arachnids and crustaceans

Chrysalis (kris-a-liss): the pupal stage of moths and butterflies

Cocoon: a protective covering for developing pupae of moths. The cocoon is spun from silk fibers produced by the larvae

Complete metamorphosis: the insect goes through four stages of development: egg, larva, pupa, adult. The immature insect does not resemble the adults of the species. (See incomplete metamorphosis for comparison.)

Decomposers: Organisms that consume the remains of dead organisms and, in doing so, break down the tissues into simpler forms of matter that can be used as nutrients for other living organisms.

Ecosystem: A natural unit consisting of all plants, animals, and microorganisms (biotic factors) in an area functioning together with all of the nonliving physical (abiotic) factors of the environment.

Entomologist: scientist who studies insects and other arthropods

Exoskeleton: a hard, protective covering found on arthropods

Incomplete metamorphosis: The insect goes through three stages of development: egg, nymph, adult. The immature insect resembles the adult. Only small changes occur; for example: an increase in size or the development of wings. (See complete metamorphosis for comparison.)

Larva [plural: larvae (lar-vee)]: an immature insect after emerging from the egg, often restricted to insects in which there is complete metamorphosis

Metamorphosis (me-ta-mor-pho-sis): the change in body form between the end of immature development and the adult phase

Organism: A living thing such as an animal, plant, fungus, or microorganism. In at least some form, all organisms are capable of reacting to stimuli, reproduction, growth and maintenance as a stable whole.

Parasite: An organism that lives on or in another organism, gaining its nutrition at the expense of the host organism.

Pupa (pyoo-pa) [plural: pupae (pyoo-pee)]: in complete metamorphosis, the inactive stage of insect development during which the larva transforms into the adult form

Pupate (pyoo-pate): the process of transforming from the larval state into the adult form

Spiracle: an external opening of the tracheal system. Spiracles are located along the sides of the body in many arthropods.

Thorax: the middle of three sections of an insect body. The legs and wings are attached to the thorax.

PRE- AND POST-ASSESSMENT:

The following activity will provide you with an understanding of your students' current knowledge of arthropods. In order to encourage their creativity and expression, remind students that the accuracy of the information is not important. They are not being tested on what they know. Rather, this exercise is a way to reveal our preconceptions and often misconceptions about a topic. After your students have participated in their zoo field trip focusing on arthropods, repeat the activity and compare student work from before and after.

ARTHROPODS CONCEPT MAP

Materials: paper, pencils

Ask students to take out one sheet of paper and a pen or pencil. Have them write the word "Arthropod" in the center of their page, and draw a circle around it. Now, allow them at least five to 10 minutes to construct a concept map of their ideas and connections about the topic "Arthropod." They can write down factual information they believe to know about the subject, memories about the subject, questions about the subject, or impressions about the subject. Encourage students to draw thoughtful connections between the sections of their concept map. Have students write their names and the date on their pages and turn them in to you. After your zoo visit or at the end of your study of arthropods, return the concept maps to your students. Have them redraw their concept map on the backside of their page, following the above procedure. Ask students to reflect on if and how their concept map has changed? Discuss as a class what ideas were confirmed or possibly changed or corrected for students as a result of this unit.



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Polyphemus flower beetle

eater

Leaf insect

Golden orbweaver

Peruvian orange-striped bird

*Pacific dampwood termite

*Red swamp cravfish

CHECKLIST OF ARTHROPODS AT WOODLAND PARK ZOO

Giant water bug

Sunburst diving beetle

White-eyed assassin bug

Flamboyant flower beetle

"Bug" World (species change frequently)

- □ *Sowbug □ Green lynx spider
- □ *Cross orbweaver □ Giant vinegaroon
- □ Yellow-spotted millipede
- American cockroach
- □ Western horse lubber
- Darkling beetle
- **Tree Snail Laboratory**
- Partula Tahitian tree snail

Tropical Rain Forest

Pinktoe tarantula

*Found in Washington

Note: This list is current as of March 2017. The zoo's collection is subject to change.

Questions about this information or your zoo visit? Please call 206-548-2424 or visit our website at <u>www.zoo.org</u>.

