

Insects and other Arthropods

Grades 3-6

1 hour

Learning objectives:

To identify 3 characteristics specific to insects

To differentiate between insects and other arthropods

To learn the difference between complete and incomplete metamorphosis

Background:

Insects are invertebrates which belong to a subdivision of animals called “**Arthropods**”, meaning **animals with jointed legs and an exoskeleton** (outer covering). Arthropods include insects as well as non-insects such as spiders, millipedes, centipedes, ticks, mites and crayfish. “**Insect**” is the subdivision of Arthropods which includes creatures with the following characteristics:

Three main body parts: head, thorax and abdomen.

Antennae on the head.

Three pairs of legs. Six legs.

Usually, two pairs of wings. Four wings. There are exceptions such as ants and houseflies. Flies have two wings, and ants and termites only have their wings when they swarm.

Metamorphosis is a fascinating adaptation. It is the process insects go through to change from an egg to a mature adult. Most insects undergo complete metamorphosis in which they go through four stages: egg, larva, pupa and adult. Butterflies, bees, wasps, moths, ants, beetles and flies undergo complete metamorphosis. Incomplete metamorphosis occurs in insects such as dragonflies, damselflies, grasshoppers, mayflies and cicadas.

They all start out as eggs and end up as adults. It’s what happens in the middle that is different.

Complete metamorphosis larva look wormlike and with each molt as they grow they remain wormlike and do not resemble the adult form until they emerge from the pupa. A pupa is a protective covering inside which, the insect’s cells reorganize themselves into the adult form.

Incomplete metamorphosis larva (typically called nymphs), also molt, shed their exoskeleton, many times as they grow into adults. But these insects begin to resemble the adult form a little more with each new “skin”. Until at last they emerge as fully grown adults. Sometimes the hollow exoskeletons of cicadas and dragonflies can be found clinging to plants.

Materials:

Insect sweep nets

Specimens: preserved insects to use as examples

Bug collection boxes, and jars.

Magnifying lenses

Large containers for butterflies, dragonflies or other big critters

Before the class arrives, arthropods that live in rotting logs or leaf litter can be collected, especially if the weather or time of year makes collection difficult.

Walk to an area where all can be seated, usually the pavilion at Big Pine Shores. Briefly introduce the topic.

Explain complete and incomplete metamorphosis.

Describe the difference between insects and non-insect. (Insect characteristics listed above). Describe the difference between adult and larva.

Put the students in groups of two or three (as equipment allows), and give them a sweep net. Define the space where they are allowed to sweep. Insects usually fly up. Demonstrate how to use the net to capture critters and hold the net closed. Let them collect for 10 – 15 minutes. Have the students return to the pavilion where they will assist you as the critters are transferred to collection boxes and jars. Try to identify while you have their attention.

Gather the students again. Review the characteristics of an insect and see if they all have insects or something else. If you can, identify and share information about the collected critters. Look for wing pads to determine how mature a nymph may be. Decide if it is a larva or adult. Preserved samples can be shown when needed. **Arthropods** do not undergo metamorphosis in quite the same way as insects, but they may be young or adult. Use magnifiers as needed. Return all critters to the same general area where they were collected.

Key to frequently seen spiders.

Banana spiders: Black and Yellow Garden spider (*Argiope aurantia*)
Golden Silk spider (*Nephilia clavipes*)

Long-jawed Orb Weaver (family: Tetragnathidae)
Venusta Orchard spider (*Leucauge venusta*)
Spiny Orb-weaver (*Gasteracantha cancriformis*)
Wolf spider (family: Lycosidae)

The following chart lists some insects that you may collect.

Complete metamorphosis (Orders)	Incomplete metamorphosis (Orders)
Coleoptera – Beetles	Hemiptera – scale, aphids, whitefly, cicadas, leafhoppers, true bugs
Diptera – flies	Orthoptera – grasshoppers, crickets
Hymenoptera – ants, bees, sawflies, wasps	Mantodea – praying mantises
Lepidoptera – butterflies, moths	Some Blattodea – cockroaches, termites
Megaloptera – alderflies, dobsonflies, fisherflies	Dermaptera – earwigs
Neuroptera – lacewings, antlions,	Odonata – dragonflies, damselflies
Siphonaptera – fleas	Phasmatodea – stick insects
Trichoptera - caddisflies	Ephemeroptera – mayflies
	Plecoptera - stoneflies