Desert Creatures

Objective:

Students will demonstrate an understanding of the characteristics of specific living things, their structure, function and life cycle. Students will identify how specific desert creatures exist and impact their environment.

Grades: 3-5

Key Vocabulary:

- **Taxonomy**
- **Cephalothorax**
- **Pedipalps**
- **Chitin**

Related Literature:

Insects
Laurence Mound

Insects – National Audubon Society
Christina Wilson

The Insect Book
Connie Zakowski

Performance Objectives:
Grade 3: Strand 4: Concept 2 PO1, 2
Concept 3 PO1, 3, 4; CCSS 3.W. 2
NGSS 3-LS1. B; 3–LS2.D
Grade 4: Strand 4: Concept 1 PO2
NGSS 4-LS1.1; 4-LS1.A; CCSS 4.W. 2
Grade 5: Strand 4: Concept 3 PO1
NGSS 5-LS2.A; CCSS 5.W. 2

Background Information:

Life in the desert can be a challenge for people and other living creatures. So, what is a desert? A desert can be a hot, arid place with little water. It can be a dry region covered with sand dunes and cacti, and many hot deserts are in the subtropical zones. The desert of Arizona has those characteristics and even more. Scientists say a desert is a place where more water would be lost through evaporation than is gained from rain. This means that deserts are dry places, but they may not always be hot. The Arizona desert is cool in the winter months and can reach hot temperatures of over 110 degrees in the middle of the summer. Even with cool temperatures, the desert is always a dry place. Most deserts receive less than 10 inches of rain in an entire year. Arizona is one of those dry deserts with very little rain.

For many forms of life, adaptation is the primary means by which survival can happen. Even desert plants have to adjust to the dry climate, and some plants even slow their growth to fit the environment. For example, large cacti store great amounts of water in their thick stems. The saguaro cactus is a good example of a desert plant that has adapted to life in the arid regions of Arizona. The saguaro soaks up water when it rains and stores it for nourishment. The rippled outer skin of the saguaro is designed to expand as water is collected and stored. Saguaros grow slowly and can live well over 100 years.

Creatures living in the desert have ways to conserve water in their bodies and to locate more as they need it. Desert animals have had to develop ways to cool themselves and find shelter from the hottest part of the day. There are many types of animals and insects that have found a way to live in the desert regions of the world. Arizona is the desert home for many insects that flourish in the dry desert.

How do we know what is what in the insect world? Insects, like other living organisms, are scientifically classified. Many years ago, scientists felt that there were so many living organisms on earth that they had to have a way to identify one from another. That means living organisms with the same characteristics are grouped together under a specific name. The classifying of organisms is called **taxonomy**. First, the scientists gave names to the "Kingdoms" of living things. There are five Kingdoms:

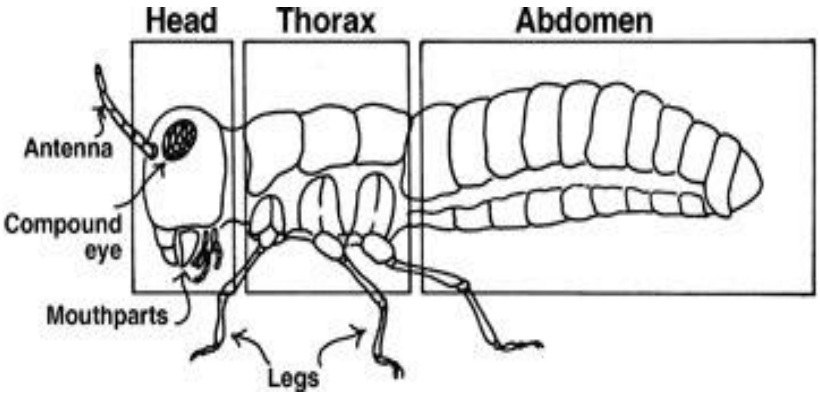
Animal Kingdom
Plant Kingdom
Fungi Kingdom
Protist Kingdom
Moneran Kingdom

Each of the Kingdoms is divided into smaller groups called Phyla. The Phylum is then divided into more specific groups called Classes, and each Class is divided into Orders. The Order is then split into Families which is divided again into each Genus and on to the most specific, the Species. As each group is divided into a smaller group, the organisms are more and more alike. For example, a horse, squirrel and rabbit are all in the Mammal Class. That is because they have more in common with each other than animals such as snakes, birds and arachnids. With that in mind, there are many differences between the horse, squirrel and rabbit. Each Kingdom has a grouping as follows:

Kingdom
Phylum
Class
Order
Family
Genus
Species

As one of the most abundant creatures on earth, insects are plentiful in the Arizona desert. On the positive side, insects are pollinators and are a part of the food chain for birds, fish and other animals. Some insects are predators of other harmful insects and play a vital part in the ecosystem of their environment. An insect is scientifically classified by specific characteristics.

All insects have three main body parts: the head, the thorax and the abdomen. The head section contains the mouthparts, and there may be a variety of types. Some mouthparts are used for chewing and biting while others may be used for sucking and stinging. The eyes are located in the head section of the insect. Some insects have two types of eyes. The "simple eyes" are very small and at the top of the head in some adults. Compound eyes are the large eyes that contain several thousand eye parts. Most insects have one pair of compound eyes. The pair of antennae is located on the head and function as sensory organs. The insect's brain is also in the head section of the body.



The thorax is the middle of the body and is used to help the insect move. The legs and wings (if there are wings) are attached to the thorax. The abdomen is usually the largest part of the insect and contains the internal organs. Insects have an exoskeleton, which is made of a hard substance called chitin, on the outside of their body. The hard outer skeleton helps protect and support the insect's body. Insects also have six jointed legs and a claw at the end that is used for moving, climbing and carrying food. Some of the insects found in the Arizona desert are ants, bees, grasshoppers, termites and cicadas. (See "Label the Insect" handout.)

All insects lay eggs. Some insects go through a complete metamorphosis during their life cycle. There are four stages to the life cycle beginning with the egg. Soon after the egg is laid it will hatch into a larva stage. The larva grows and sheds its skin several times. After reaching a certain size, the larva then becomes a pupa

inside a small cocoon. The greatest metamorphosis takes place in the cocoon and the adult insect emerges to take its place in the insect world.

To organize the different types of insects, they are divided into categories and identified by their characteristics. For example, in looking at the honeybee, and knowing there are other types of bees, the identification and classification of a honeybee is as follows:
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Hymenoptera
Family: Apidae
Genus: Apis
Species: Mellifera
Common name: Honeybee

Deserts are also the home for different types of arachnids, commonly known as spiders. Arachnids have a hard exoskeleton that helps keep moisture inside the body and protects the outside of the body. That is a perfect combination for a spider living in the desert. Arachnids are distinctly different from insects. Spiders have two body parts and eight legs. The first segment of the spider is called the **Cephalothorax**. This part is like the head of the spider and has two short feelers called "**pedipalps**" (palps). The palps help the spider eat and sense the environment. The eyes, mouth fangs, brain, stomach and glands to make poison are in the first segment of the spider. The second segment is the abdomen of the spider. The back end of this segment is where the spinnerets are located for the spider to use in producing the silk to spin a web.

The Arizona desert is home to many types of arachnids. One of the largest of those arachnids is the tarantula. Desert tarantulas like to live in warm areas and have a very long life span. Some tarantulas live in underground burrows and others live on top of the ground. When a tarantula finds a suitable place for a home, it will use its silk to line the opening and walls of the burrow. This behavior may help protect them and their eggs from predators. Desert tarantulas have an exoskeleton that sheds at times when the tarantula grows. The hairy legs of the tarantula make it look large and fierce, and the hairs are sensitive to touch, temperature and smell. Most tarantulas eat insects, beetles, grasshoppers and other small creatures on the desert floor. Because they are considered meat eaters, they are called **carnivores**.

The life cycle of the tarantula begins with the female laying her eggs. She may lay up to 1,000 eggs in an egg sac and guard them over the six weeks until they hatch. Once the eggs hatch, the young spiders live in the nest for a few days. The young tarantulas that survive emerge from the nest and enter the desert world.

(Photo by Adriane Grimaldi)

Another common arachnid in the Arizona desert is the scorpion. Scorpions are related to spiders and are not insects. Scientists believe that scorpions have been on earth for millions of years. There are many different species of scorpions, and they can live in deserts, rain forests, mountains, grasslands and even by the seashore. Scorpions adapt to their environment and are able to climb up surfaces, crawl under rocks and move around very quickly.

Scorpions have a pair of claws (pedipalps) at the front of their body and a stinger at the end of their tail. Scorpions have a paralyzing sting when injected into its prey. Scorpions have eight legs and a tiny claw at the end of each leg. They have an exoskeleton that protects their body. Most of the scorpions living in the Arizona desert are light tan in color and are called "bark scorpions."

Scorpions give birth to live young who are carried on the mother's back until they are large enough to be on their own. Scorpions are carnivores which means that they are meat eaters with a diet mainly of small insects. Scorpions can go a long period of time without eating and can live as long as 25 years.

Scorpions are different from tarantulas though they belong to the same scientific class, arachnids. A scorpion's body has three segments, the head (cephalothorax), the abdomen and the tail. The head includes the mouth, eyes, and the front claws. These claws are used to help catch and hold its prey. The abdomen segment contains all eight legs and other internal organs. The five-segmented tail of the scorpion has the stinger at the end. Scorpions are durable, adaptable and well-suited for desert life.

(Public domain photo)

Sources: University of Arizona; University of Missouri; University of Michigan; New Mexico State University; KidZone; About.com Insects; National Parks Traveler, Orkin. Stock photos in public domain.

Procedures and Pre-Activities:

1. State the learning objectives to the students.
2. Read and discuss one or more books about the desert insects and arachnids.
3. Ask open-ended questions to evaluate students' prior knowledge related to the topic. Ask students to give examples of desert creatures.
4. Review the vocabulary.
5. Present the background information, pausing at times, and discuss details.
6. Explain that Butterfly Wonderland is located in the desert and has an exhibit with desert creatures.
7. Discuss the scientific classification of insects. The insect list (Insect Orders) included in this lesson will enhance the students' ability to identify different types of insects and their specific classifications.
8. After discussing the parts of the insect, have students label the insect (grasshopper) and respond to the questions.
9. Review the differences between insects and arachnids.

Reflection and Assessment:

After visiting **Butterfly Wonderland**, discuss the experience and the desert creatures.

1. Students complete the handouts, "Tarantula" and "Bark Scorpion." This activity will reinforce knowledge and assist students in the final activity.

2. The final activity is to create a new species of insect or arachnid. Students use the notes and handouts to recall specific characteristics of an insect and arachnid. The new creation must have the following:

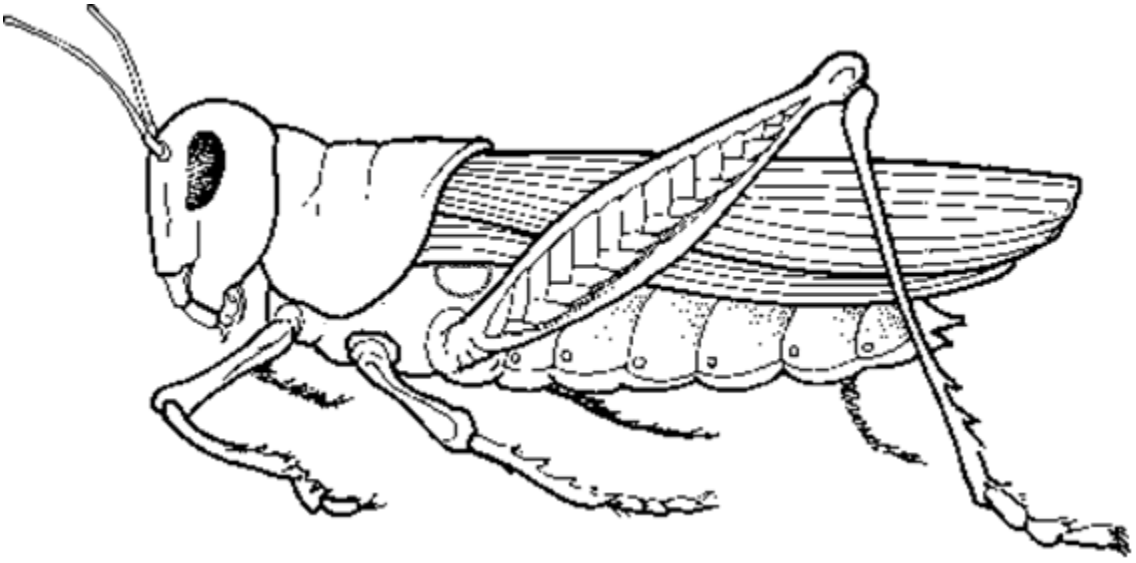
Class
Phylum
Order
Family
Genus
Species
Common name

Students complete the description of the new creature with a drawing, labeled parts, classification, habitat and impact on the local environment.

Materials:

Colored pencils (optional)

Label the parts of the insect



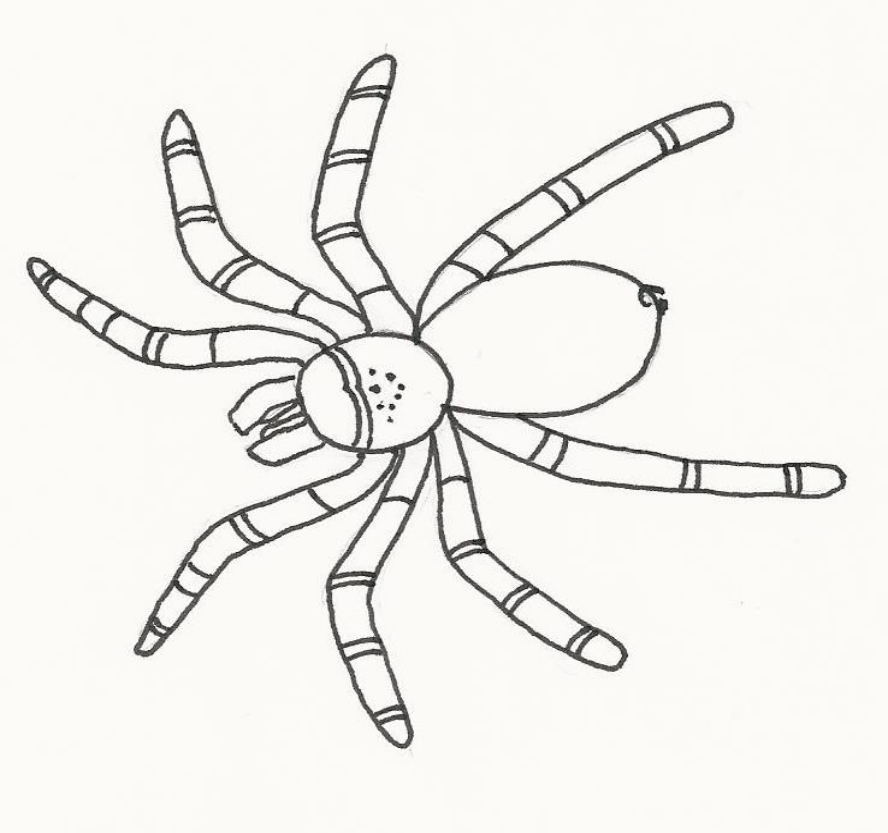
1. How does the insect use the two antennae?

2. What is special about the insect's legs?

3. On what part of the body are the legs attached?

4. How does the insect use the claw at the end of each leg?

Tarantula



Explain what you know about the following characteristics of the Tarantula:

1. Habitat:

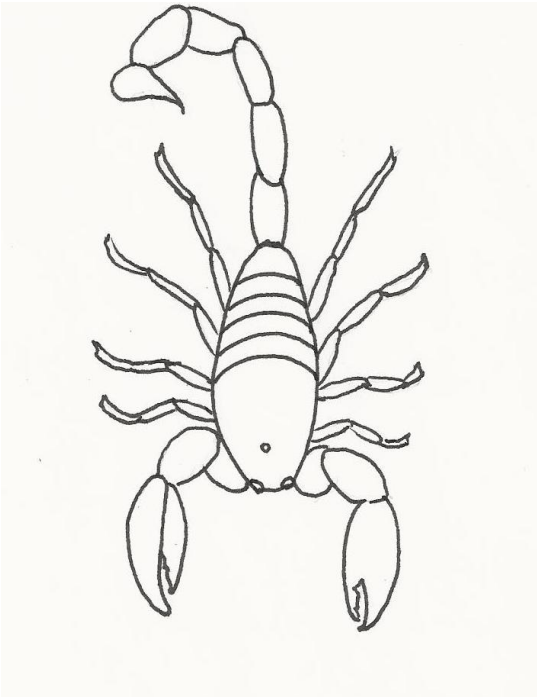
2. Diet:

3. Anatomy:

The Bark Scorpion

Label the parts of the Bark Scorpion.

In the space below, explain how the scorpion is able to survive in the Arizona desert.



Fill in the classification:

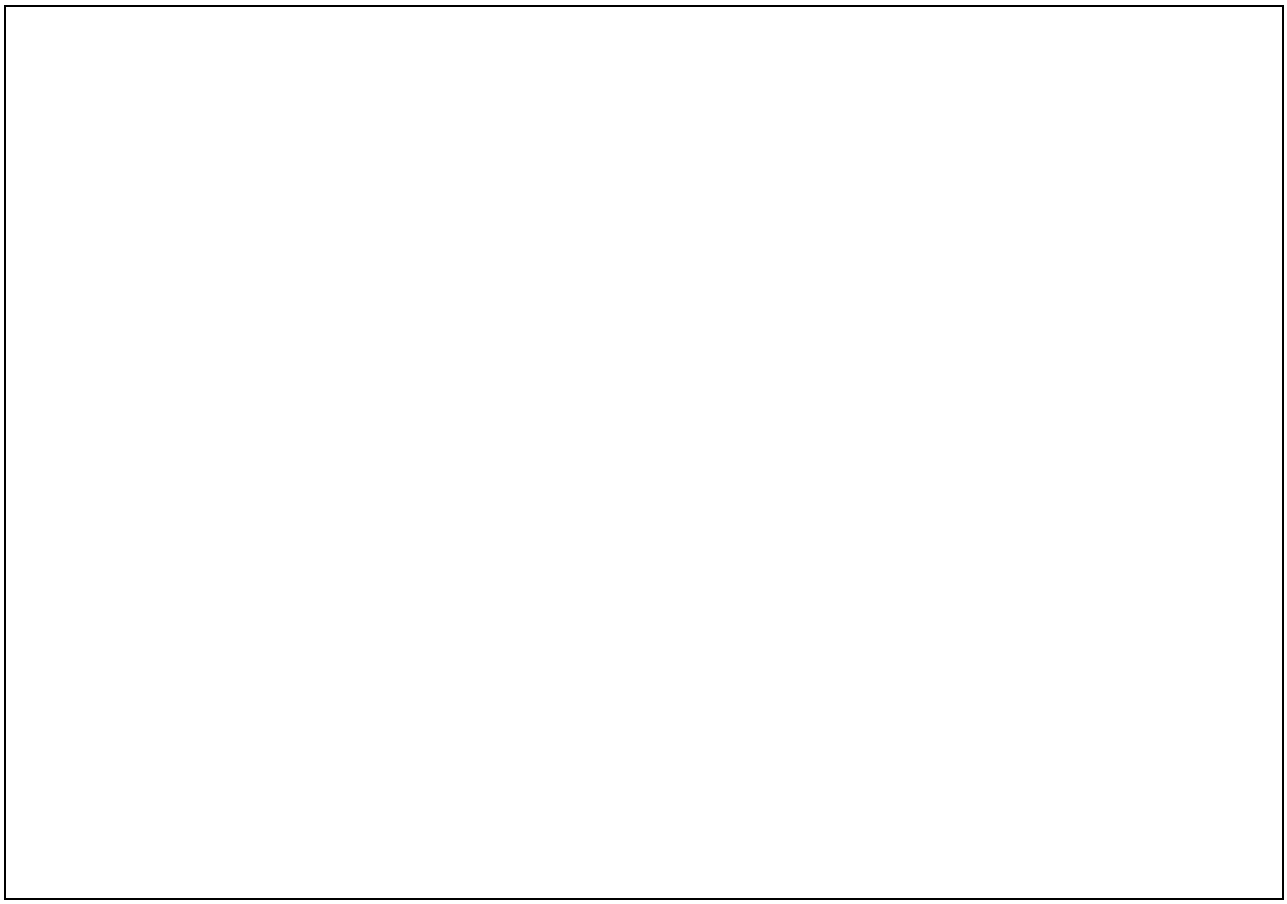
Kingdom – _____

Phylum – _____

Class -- _____

The classification continues to be more specific after “class” due to the particular kind of scorpion. For example, a bark scorpion belongs to the Family – Buthidae, the Genus - Centruroides and the Species - C. Sculpturatus. Another type, the desert hairy scorpion, belongs to the Family – Caraboctonidae, the Genus – Hadrurus and the Species – H. Arizonensis.

CREATURE CREATION



Phylum _____

Class _____

Order _____ Common Name _____

Family _____

Genus _____

Species _____

Describe the following about your "Creature Creation."

Anatomy (Include body parts and life cycle):

Habitat (Include food source, where the creature lives, how it travels):

Impact on the local environment (Include positive or negative):

Insect Orders

1. Beetle Order - Coleoptera

The order Coleoptera includes beetles.

Ground Beetle

They have two pairs of wings.

Ladybug Beetle

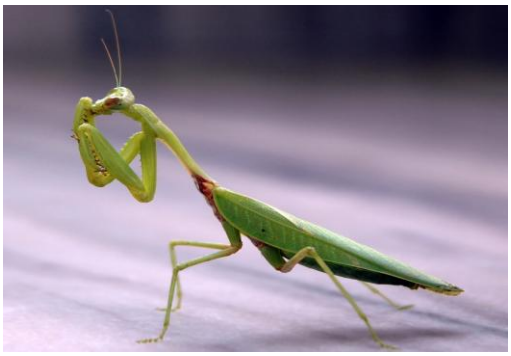
They have mouthparts to chew.

Firefly

They go through a Metamorphosis.

Whirligig Beetle

2. Mantid and Cockroach Order – Dictyoptera



They have long, thin antennae with segments.

Praying Mantis

There have two pairs of wings.

Orchid Mantis

The young are “nymphs” looking like small adults.

Cockroach

The praying mantis is a beneficial insect because it eats other “pest” insects. These insects go through a simple metamorphosis which means that the nymphs look like a smaller version of the adults. (Public domain photos)

3. True Fly Order - Diptera

These insects have one pair of wings.

Mosquito

They have piercing and sucking mouthparts.

House Fly

They undergo a complete metamorphosis.

Fruit Fly

They are considered serious pests.

Horse Fly

These insects are known for spreading diseases, including malaria, and harming some types of crops. (Public domain photos)

4. Butterfly and Moth Order – Lepidoptera

Butterflies are beautiful insects.

Swallowtail Butterfly

They have two pairs of wings.

Sulfur Butterfly

Adults have sucking mouthparts.

Monarch Butterfly

Butterflies are generally active during the day. They have wings that are covered with protective scales. Adult butterflies suck the nectar from flowering plants while the larva, young stage, has chewing mouthparts. Butterflies and moths go through a complete metamorphosis. The young caterpillars may be considered a pest because they eat plants. The adults may be considered beneficial because they are pollinators. (Public domain photos)

Luna Moth

Pandora Sphinx Moth

Polyphemus Moth

5. Mayfly Order – Ephemeroptera

Mayfly adults only survive for a couple of days. They hatch as underwater larva and fly above water to mate, lay eggs and die. They have long legs and two long tail strands. The two wings are triangle in shape with the back wing being smaller. Adults do not have mouth parts and do not eat. These insects have a simple metamorphosis. Mayflies are harmless to humans.

6. Bee, Wasp, and Ant Order – Hymenoptera

These insects live in colonies.

Bee

Many of the insects in this order have a tiny waist between the thorax and the abdomen. Some are wingless while others have wings. All have six jointed legs attached to the thorax. Many have chewing mouthparts (ants), and some have sucking mouthparts like the honeybee. They go through a complete metamorphosis. Bees are considered pollinators.

Wasp (which include yellowjacket and hornet)

Ant

7. Dragonfly Order – Odonata

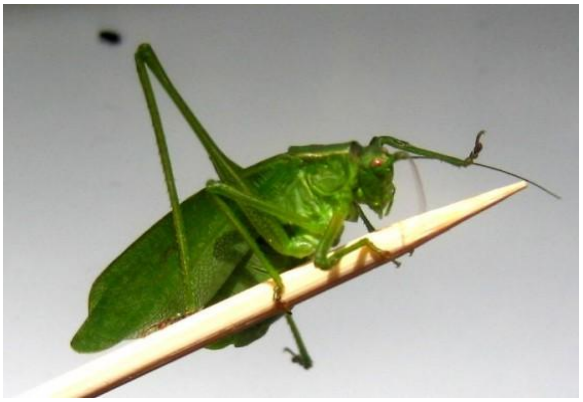
Dragonfly Order includes Skimmers, Darners and Damselfly. Their young are called naiads and live in the water. Adults are found near water areas where they can mate and lay eggs. Dragonflies are predators and have very large eyes to see movement easily. They have two pairs of long wings. They have chewing mouthparts and naiads have a piercing mouthpart used to catch prey underwater. They go through a simple metamorphosis. These insects are beneficial and eat other insects such as mosquitoes.

8. Grasshoppers and Relatives Order – Orthoptera

These insects are built for jumping.

Grasshopper

They have large back legs and some have two pairs of long wings. They have chewing mouthparts and can be destructive to plants and crops. These insects go through a simple metamorphosis with a nymph that looks like a small version of the adult.

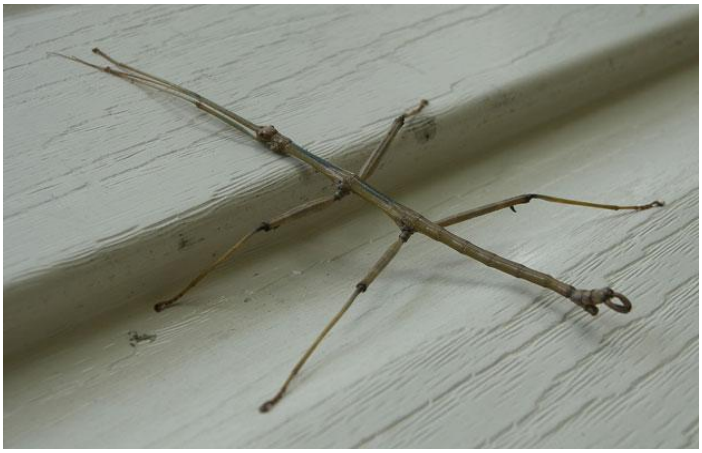

A relative to the grasshopper, the Katydid has a similar structure with very long back legs and a pair of antennae on the head.


Another jumper in the same family.

Cricket

9. Stick and Leaf Insect Order - Phasmida


Stick Insect



Walking Stick

These insects have a very long body with long legs and antennae. They blend in with their surroundings and are hard to see. They move slowly so predators have trouble finding them. Most of the adults have no wings, except for the ones found in the tropical areas. They have chewing mouthparts and undergo a simple metamorphosis. (Public domain photos)