

MADERA CANYON ARTHROPODS

Arthropods are all invertebrate animals without a backbone. They have segmented bodies, an armor-like **exoskeleton** covering their bodies and paired, jointed appendages. The group includes such diverse animals as crabs, lobsters, ants, butterflies, spiders, scorpions, centipedes and millipedes.

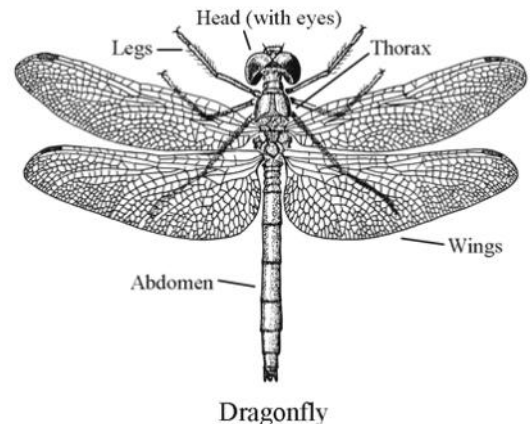
At the most basic level, the arthropod body is divided into three distinct parts. The **head** is composed of the most forward segments. The **thorax** contains the middle segments. The **abdomen** is made up of the final body segments. In some arthropod groups this simple body plan has been modified. The exoskeleton is a fairly hard, waterproof covering made of **chitin** (like our fingernails). It protects the animals' internal organs and helps protect them from dehydrating water loss. Muscles attached inside the exoskeleton provide locomotion for movement. To grow, arthropods must shed their rigid exoskeleton periodically in a process called **molting**.

In Madera Canyon and the Sky Islands, the main arthropod types that occur are insects and arachnids (spiders, scorpions, mites and their relatives). There are also a few of the "many-legged" arthropods, chilopods (centipedes) and diplopods (millipedes), as well as a few crustaceans (pillbugs and a number of freshwater shrimp-like creatures). These animals are essential parts of the canyon's web of life.

Insects

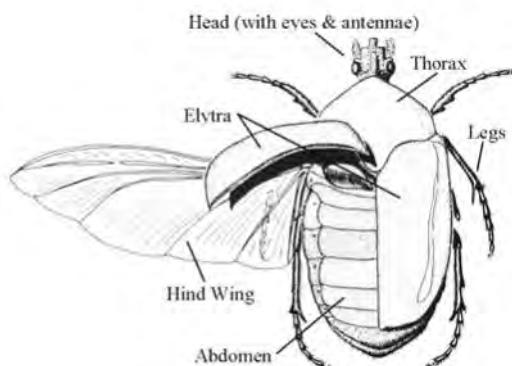
Insects are perhaps the most numerous and successful group of animals living today. They are the largest group of land-dwelling arthropods and found in almost all the hospitable environments on earth except the ocean. Insects include ants, bees, wasps, termites, beetles, true bugs, moths, butterflies, flies, dragonflies, fleas, grasshoppers, crickets, cicadas, cockroaches, mantids and many other less well-known groups. Hundreds of insect species inhabit the Sky Islands of SE Arizona.

The **dragonfly** at right, is an example of the basic insect body plan. The body is divided into 3 main parts: head, thorax and abdomen. The head has two **compound eyes**, three small, simple eyes (**ocelli**) and two **antennae** (very small in dragonflies). The thorax has three segments with one pair of legs each (six legs total) and two pairs of wings. In some insects groups the wings are modified or absent. In **beetles** the first pair of wings is modified into shield-like coverings called **elytra**. In **flies** the second pair of wings has evolved into small, knob-like balance organs called **halteres**. In **ants** and **termites**, workers always lack wings. The insect abdomen is composed of not more than eleven segments. In many groups the final segments are modified

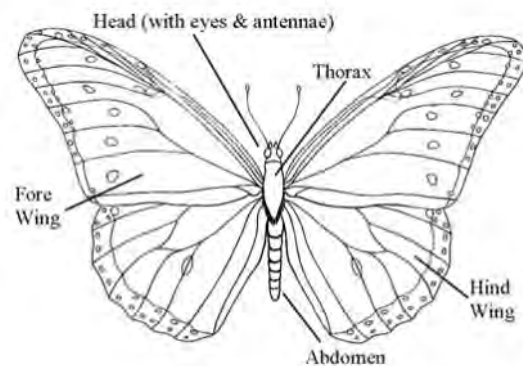


Dragonfly

Below are examples of more insects and their general body plan (also see docent manual photo pages):

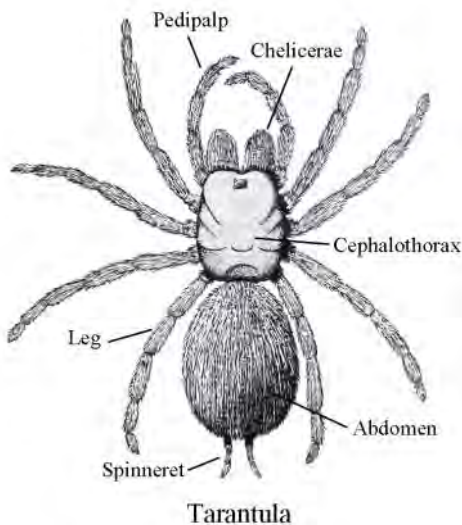


Scarab Beetle



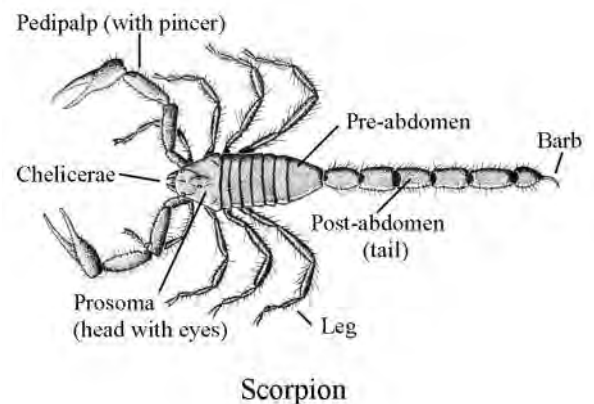
Queen Butterfly

Arachnids are another group of diverse arthropods. These are the spiders, scorpions, pseudoscorpions, sun spiders, whip scorpions, ticks, mites, harvestmen (daddy longlegs) and their relatives. Scorpions are the oldest known land arthropods with fossils dating back to 400 million years ago. All arachnids have **four pairs of walking legs**, **chelicerae** (appendages with claws or fangs), **pedipalps** (leg-like appendages for locomotion, feeding, sensory organs or reproduction), **ocelli** and no antennae. The body is divided into two divisions- the **cephalothorax** (head and thorax fused together) and **abdomen**. Despite having all these characteristics in common, the different groups of arachnids differ greatly in appearance and their appendages can look very different depending how they have been modified for use. Though there are many kinds of arachnids in Madera Canyon and the Sky Islands,



Spiders are the most plentiful and recognizable arachnids. They are carnivores and feed mainly on insects. Some capture their food by hunting; others spin webs of **silk** and trap their prey. A spider's abdomen is oval and unsegmented; it is attached to the cephalothorax by a slender waist. The cephalothorax has four pairs of simple ocelli and chelicerae modified as **fangs** equipped with **poison glands**. The fangs inject **poison** and **digestive enzymes** into prey. The pedipalps are short sensory appendages used for touch, as well as holding and manipulating food. Specialized bulbs on the pedipalps of male spiders transfer sperm to the female during mating. The four pairs of walking legs are also attached to the cephalothorax. At the posterior of the abdomen are the **spinnerets** which spin silk from glands in the body. Many spiders are able to spin several different types of silk which are used for different purposes.

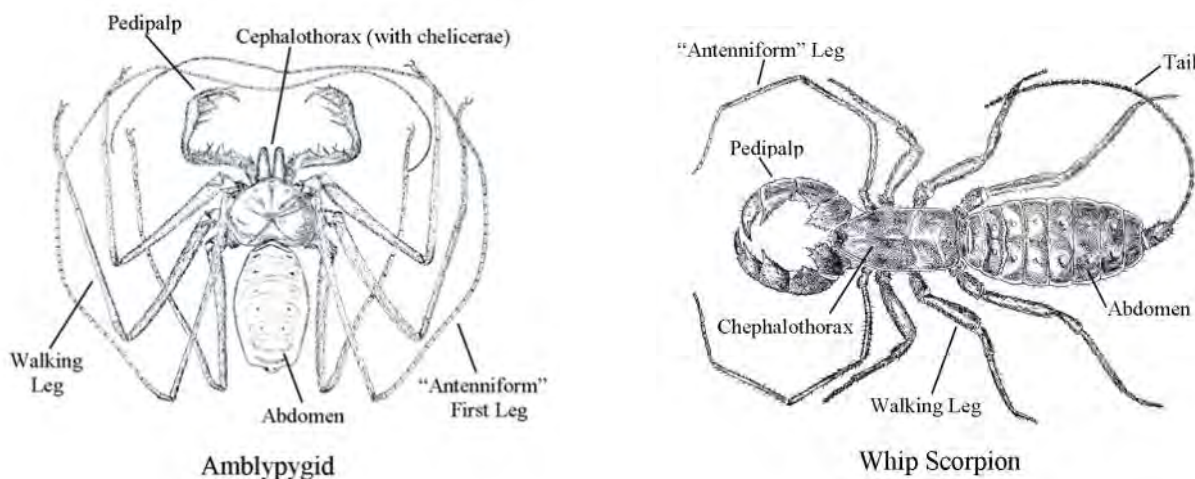
Scorpions are common, but nocturnal and hide away by day under wood, stone and in burrows. The short cephalothorax of scorpions is called a **prosoma**. The prosoma has a pair of claw-like chelicerae and pedipalps tipped with **pincers** for grasping prey. In the middle are two large eyes; two to five pairs of small lateral eyes line the margins. The legs arise from the underside of the prosoma. The abdomen is elongated and divided into two regions. The first five abdominal segments are termed the **pre-abdomen**. The five segments of the tail, or **post-abdomen**, are narrow and end in a stinging apparatus with a pair of venom glands and a barb (stinger). Prey is detected primarily by vibration and grasped by the pincers. The tail and barb, raised and curved forward over the body, stab the prey and inject venom. The stinger is also used defensively. Food items are torn apart by the chelicerae.



Pseudoscorpions are tiny and live in leaf mold, moss, soil or under bark and stones. They closely resemble scorpions without a tail and barb. **Sun spiders** (solifugids) are large arachnids that superficially look like spiders with a segmented abdomen. Their pedipalps are long and tipped with an adhesive (glue) organ used to capture prey. Sun spiders have huge chelicerae attached at the front of the head, giving them the appearance of having a pair of fearsome jaws. Primarily nocturnal in our area, these arachnids can run with surprising speed (see photo on Arthropod Photo Page).

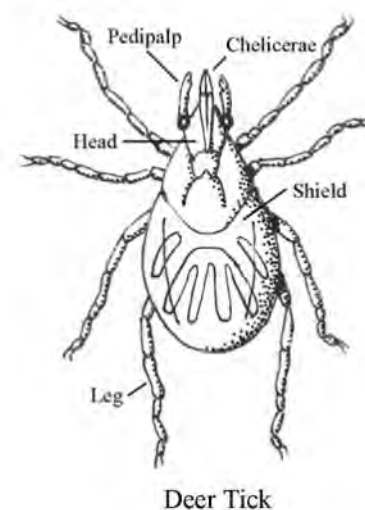
Whip scorpions, sometimes called vinegaroons, also closely resemble scorpions. Their heavy pedipalps are modified into pincers and the first pair of legs are elongated for sensory/tactile use ("antenniform" legs), instead of walking. The tail is long, thin and whip-like without a stinger. When disturbed, whip scorpions elevate their abdomens and spray irritating acidic fluid in defense.

Once classified with the whip scorpions, the **amblypygids** (sorry— they have no easier name) now form their own group. They have a flattened body and long, spindly legs, looking much like a cross between a spider and an ocean crab! Their cephalothorax is spider-like with fang-bearing chelicerae, one pair of median eyes in front and two groups of three eyes each on each side. Large club-like pedipalps covered in spikes are hinged to sweep inward and hold prey against the chelicerae. Amblypygids have extremely long whip-like front legs. The “antenniform” legs are used like tactile/sensory antennae and “tap about” like a blind person’s cane. Amblypygids have no tail. Locomotion is crablike; their long legs and flattened body allow them to move well laterally side to side. Both whipscorpions and amblypygids live in Madera Canyon, but are very secretive. Primarily nocturnal, they spend their days hidden away underneath wood and stones or tucked back in crevices.



Harvestmen, commonly known as “daddy longlegs” because many species have extremely long, flexible legs, also resemble spiders. The small body appears to be a one-piece oval, as the segmented abdomen broadly joins the stubby cephalothorax without any constriction in between. Two simple eyes are located on a tubercle, or bump, in the middle of the cephalothorax. A “**repugnatorial**” gland along each edge releases acrid chemical secretions for defense. Harvestman pedipalps are usually simple and leg-like as in spiders; the chelicerae are modified into tiny triangular pincers for crushing and tearing food items. Unlike most other arachnids, some harvestman species are omnivorous, feeding on small invertebrates, dead animal matter and plant material. Harvestman live primarily in vegetation and leaf litter, on tree trunks and in crevices and caves.

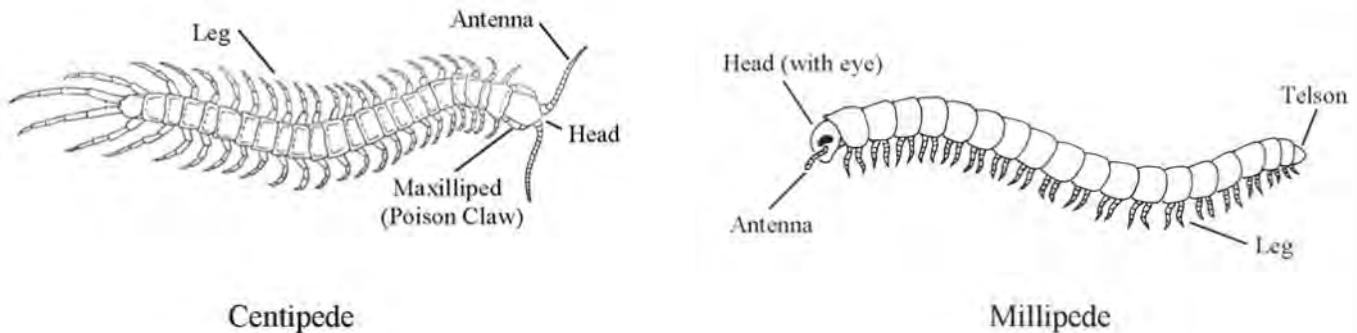
Ticks and mites form the second largest group of arachnids (the Acarina). Ticks are the larger members of the group; their bodies are flattened and shaped somewhat like small pumpkin seeds. Blood-engorged females resemble gray kernels of corn. The majority of mites are tiny, less than 1/16”, though some like the velvet mites are larger (see Arthropod Photo Page). The shapes of mites range from simple and tick-like to some of the most bizarre, “alien-looking” creatures on the planet. A main physical characteristic of the whole group is the apparent lack of body divisions; abdominal segmentation has disappeared and the abdomen is fused with the cephalothorax and covered with a **carapace** (or **shield**). The pedipalps and chelicerae are quite variable in structure depending upon their function, particularly in mites. The shape and length of legs in mites also varies greatly. Ticks are terrestrial parasites on vertebrate animals; they possess specialized hooked mouth parts for feeding on blood. Mites inhabit just about every habitat/microhabitat including soil, fresh and salt water, on and in other animals, polar regions, deserts and



hot springs. They are extremely abundant in moss, leaf litter, rotten wood and detritus. Mites also have diverse feeding habits and include herbivores, carnivores, omnivores, predators, scavengers, external parasites, internal parasites and more! **Chiggers**, a problem locally during the monsoon season, are larval mites that feed on blood; the adult mites are herbivores that eat plant material!

Myriapods: the “many legs”

Centipedes (chilopods) have long, flattened bodies made up of a head followed by many segments. The head has a pair of sensory antennae, a cluster of simple eyes on each side and two legs modified into **poison claws** (or **maxillipeds**) for capturing prey and defense. They have no pedipalps or chelicerae like arachnids. Instead, several simple, small appendages (a pair of grinding **mandibles** and two pair of **maxillae**) around the mouth assist in feeding. Behind the head **each segment has one pair of walking legs**. Despite their name, centipedes generally have no more than 30 legs! Centipedes are active, nocturnal predators that move rapidly and feed mainly on insects and other arthropods.



Millipedes (diplopods) also have long bodies with a head followed by many segments. But instead of being flattened, millipedes tend to have rounded bodies, looking more like a passenger train or elongated school bus. The head bears a pair of antennae, two clusters of simple eyes, a pair of grinding mandibles and one pair of maxillae (see centipedes). **The body segments of millipedes are actual fused “double segments” and each has two pairs of walking legs.** The total number of legs varies by the number of segments found in a particular species. Millipedes do not have poison claws and tend to be slow, plodding scavengers, feeding mainly on living and decaying vegetation, also on animal remains. Many millipedes have “**repugnatorial**” or stink glands on their segments which secrete a cocktail of noxious chemicals for defense. Also mainly nocturnal, millipedes hide away under things or in animal burrows.

Crustaceans

When we hear the word “crustacean” most of us think of marine animals like lobster, crab and shrimp, but there are terrestrial and freshwater crustaceans that live in Madera Canyon and the Sky Islands. Crustaceans usually have segmented bodies divided into a cephalothorax and abdomen covered on the upper side in a rigid “shell” or **carapace**. They have a pair of grinding mouthparts called **mandibles**, two pairs of **maxillae** for feeding and two pairs of sensory antennae (one much bigger than the other). The abdomen tends to have one pair of appendages (such as legs) per segment, but modification has occurred in many species.

Isopods, also known as **pillbugs** or rollipollis, resemble short millipedes, but are actually land-dwelling crustaceans. They do not have a distinct cephalothorax and almost every body segment is covered in its own individual carapace; when disturbed isopods roll up into an armored ball. These animals have compound eyes on short stalks, large sensory antennae and seven pairs of walking legs. Isopods live beneath stones, wood, bark and leaf litter; they are omnivorous scavengers of dead plant and animal remains. Other isopods are marine animals that live in the ocean.

In Madera Creek, a variety of tiny “shrimp-like” freshwater crustaceans reside. **Fairy shrimp, water fleas, copepods, seed shrimp, tadpole shrimp** and others live and carry out their life cycles in the waters of the seasonal stream and ephemeral pools. These animals tend to be so small that a magnifying glass or microscope is needed to see and study them!

Madera Canyon Insects
Page 1



Tarantula Hawk
(*Pepsis* Wasp)



Carpenter Bee
(female)



Paper Wasp



Flame Skimmer Dragonfly



Filigree Skimmer Dragonfly



Damselfly



Leaf-footed Bug



Cicada



Assassin Bug



Golder Flathead Borer Beetle
(on Velvet-pod Mimosa)



Tan Soldier Beetle



Serpentine Calligraphy Beetle
(on Globemallow)

Madera Canyon Insects
(Page 2)



Tiger Beetle



Mesquite Twig-girdler
Longhorn Beetle



Pleasing Fungus Beetle



Beyer's Leaf-chafer
Scarab Beetle



Glorious Leaf-chafer
Scarab Beetle



LeConte's Leaf-chafer
Scarab Beetle



Dung Beetle
(female rolling dung ball)



Grant's Rhinoceros Beetle
(major male)



Desert Blister Beetle
(female in defensive position)



Praying Mantis



Robber Fly



Jerusalem Cricket

Madera Canyon Spiders and Other Arthropods



Arizona Blond Tarantula



Green Lynx Spider



Wolf Spider



Funnel-weaving Grass Spider



Crab Spider



Solfugid (or Sun Spider)
(gravid female)



Velvet Mite



Jumping Spider



Striped-tailed Scorpion



Giant Desert Centipede
(one pair of legs per segment)



Desert Millipede
(two pairs of legs per segment)