

A Guide to Arthropods Bandelier National Monument



Top left: *Melanoplus akinus* Top right: *Vanessa cardui*

Bottom left: *Elodes* sp. Bottom right: Wolf Spider (Family Lycosidae)

by David Lightfoot

Compiled by Theresa Murphy Nov 2012

In collaboration with Collin Haffey, Craig Allen, David Lightfoot, Sandra Brantley and Kay Beeley

WHAT ARE ARTHROPODS?

And why are they important?

What's the difference between Arthropods and Insects?

Most of this guide is comprised of insects. These are animals that have three body segments- head, thorax, and abdomen, three pairs of legs, and usually have wings, although there are several wingless forms of insects. Insects are of the Class **Insecta** and they make up the largest class of the phylum called **Arthropoda** (arthropods). However, the phylum **Arthropoda** includes other groups as well including **Crustacea** (crabs, lobsters, shrimps, barnacles, etc.), **Myriapoda** (millipedes, centipedes, etc.) and **Arachnida** (scorpions, king crabs, spiders, mites, ticks, etc.). Arthropods including insects and all other animals in this phylum are characterized as animals with a tough outer exoskeleton or body-shell and flexible jointed limbs that allow the animal to move. Although this guide is comprised mostly of insects, some members of the Myriapoda and Arachnida can also be found here. Remember they are all arthropods but only some of them are true 'insects'.



Metallic Green Bee (*Agapostemon* sp.)
by David Lightfoot

Entomologist - A scientist who focuses on the study of insects!

What's bugging entomologists?

Although we tend to call all insects 'bugs' according to entomology a 'true bug' must be of the **Order Hemiptera**. So what exactly makes an insect a bug? Insects in the order Hemiptera have sucking, beak-like mouthparts, which are tucked under their "chin" when not in use. They also have incomplete metamorphosis- which means that even the youngest nymphs of this order will resemble miniature versions of the adults, although they may be wingless and have immature coloration. Cicadas, leafhoppers, assassin bugs, aphids and whiteflies are just a few examples of true 'bugs'.

WHAT ARE ARTHROPODS?

And why are they important?



Aphrodite Fritillary (*Speyeria aphrodite*) by David Lightfoot

Importance of Insects in the ecosystem:

Insects are called many things from “gross” to “pests” to “creepy-crawlies”, yet insects actually have many beneficial roles. They are vital in all parts of the food web and so, are important players in interactions with plants and vertebrate animals. Insects contribute to the breakdown of organic materials, helping to recycle important nutrients back into the system. They also help aerate the soil, contribute to enhanced plant diversity, and several play major roles in pollination. Insects help pollinate over two-thirds of flowering plants and are pollinators of most hardwoods important in forestry. Many insects also serve as biological controllers of weeds and fungi. Insects play a large role in our ecosystems by being food for other animals. They are an important food sources for a variety of birds, fish, reptiles, mammals and amphibians. In some parts of the world insects even make up an important part of the human diet.

Insects make up over 90% of all animals with 1-3 million unique species. Today only a million species have been identified. Scientists estimate there are at least another million if not closer to three million species of insects that are still unidentified. And scientists warn that deforestation, urbanization, an overuse of insecticides and the increasing spread of invasive vegetation are having negative impacts on many insect species. Many affected insects can now be considered threatened, endangered or at the risk of extinction. They may be small but insects are a critical part of our ecosystems, with several important roles to play. The pages that follow will tell you about some of the most interesting and most common species of insects and other arthropods at Bandelier.

ARTHROPOD RESEARCH AT BANDELIER

Bandelier is unique in having a long-term study of arthropods in partnership with the University of New Mexico. It has been ongoing for over twenty years. There are four yearly collections of 'pitfall' traps by the ecology group at Bandelier. These collections are designed for long-term monitoring of ground-dwelling arthropod diversity and population. Three sites are monitored at different elevations and vegetation types within the park. Because arthropod populations can shift dramatically from year to year the long-term nature of this study helps land managers tease out trends in these populations due to climate or land use changes that could signal broader changes to the ecosystem.

Our pitfall trap have, so far, collected around 300 different species within the park and have been able to track a large variety of those species over the past twenty years. Data collected have revealed how individual species respond to environmental changes - including weather and fire. Changes due to the El Niño Southern Oscillation weather pattern have been a particular focus of this project. This study has been able to gather data on diversity during average years and assess changes in diversity due to La Niña (dry) years and El Niño (wet) years.

All new species collected are added to Bandelier's growing arthropod collection, housed at UNM's Museum of Southwestern Biology, giving the project value in helping to build a catalog of what species can be found within the park. In fact, some previously undescribed species such as a new minute brown scavenger beetle in the family Lathridiidae and a new darkling beetle in the genus *Steriphanus* have been discovered from the pitfall traps at Bandelier. Additionally, the project has helped uncover range extensions for several species as well as state records for others.

What are Pitfall Traps?

Each pitfall trap is a cup filled partially with bright green anti-freeze and stored securely in a soup can that is buried level with the ground. Anti-freeze is used to prevent evaporation and preserve the samples. We always use a special less-toxic version of anti-freeze with a bittering agent to deter animals from drinking it. The traps are camouflaged using a rock or piece of wood to prevent insects from being tipped off by light reflecting off the anti-freeze.



ARTHROPODS AT BANDELIER

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WESTERN HARVESTER ANT

Pogonomyrmex occidentalis



by David Lightfoot

Fun Facts:

Order: **Hymenoptera**

Family: **Formicidae**

- Western Harvester Ants are responsible for the large conical mounds you will see along many of our trails.
- These ants will work purposefully to make an approximately 1 meter (3ft) area around their ant hill bare of any grass or plants.
- They feed mainly on plant seeds and are the main food source for horned lizards.
- Like bees, these ants live in colonies with a queen that produces all of the eggs for the colony.
- All the worker ants you see around a mound are sterile females with no wings.
- These ants can give you a nasty sting, so be careful especially around their mounds.

VELVET ANT

Dasymutilla spp.



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by David Lightfoot

Fun Facts:

Order: **Hymenoptera**

Family: **Mutillidae**

- These insects are actually wasps, not ants. Females are wingless and covered with dense hair, superficially resembling ants.
- Males are similar in appearance but larger, have wings, and cannot sting. Adult size ranges from 6-20 mm.
- Velvet ants are not aggressive and will generally try to escape when encountered, but be careful because their sting is

extremely painful.

- They are also known as cow killers, because the sting is that painful!
- Other species of velvet ants can be cream-colored.
- Velvet ants are nest parasitoids, parasitizing the ground nests of solitary wasps and bees. Larger red velvet ants can even parasitize tarantula hawk wasp nests.

BUMBLE BEES

Bombus spp.



by David Lightfoot

Fun Facts:

Order: **Hymenoptera**

Family: **Apidae**

- Black, yellow and sometimes orange these insects are 20-25mm as adults and make a distinctive humming sound during flight.
- These insects visit flowers to eat pollen and drink nectar.
- Bumblebees are much less aggressive than honey bees. Generally, they will not attack people unless they feel their life is threatened.
- Not all bumblebees can sting! Drones (smaller male bees that hatch in mid-summer) have no stinger at all. Stingers in the order Hymenoptera are modified egg-laying tubes. Since males don't lay eggs, they don't have a stinging structure.
- In addition to being important to agriculture, bumble bees pollinate a large number of native flowers and thus contribute greatly to normal functioning of ecosystems.

TARANTULA HAWK WASPS



by David Lightfoot

Fun Facts:

Order: **Hymenoptera**

Family: **Pompilidae**

- The New Mexico State Insect is a species of tarantula hawk wasp, *Pepsis formosa*. This State Insect was chosen by elementary school children in 1989.
- Most species have bright blue-black bodies with orange wings.
- These wasps are not social so they are generally mild-mannered.
- Tarantula hawk stings are considered to be one of the most painful insect stings in the world.

However as *Pepsis* wasps are not aggressive, it takes provocation to get one to sting you.

- When a female is ready to lay her eggs, she seeks out a tarantula and injects it with paralyzing venom. She drags the tarantula to her burrow and then lays her eggs on top of the paralyzed spider. Several days later the eggs hatch and the larvae feed on the still living tarantula.

ELEODES STINK BEETLES

Eleodes spp.

Also called Darkling beetle, Pinacate beetle or Stink bug



by David Lightfoot

Fun Facts:

Order: **Coleoptera**

Family: **Tenebrionidae**

- The beetles are large, shiny and black with hardened front wings.
 - Although commonly called stink **bugs** this species is not a bug but a member of the darkling **beetle** family.
 - Why are they called stink beetles? Some species will raise their abdomen and spray a noxious black fluid when they feel threatened.
 - Other species mimic this behavior but do not have scent glands and will not release any spray.
- Did you know? Several different species of Eleodes Stink Beetles are found within the park, with different sizes and behaviors. The most common species is *Eleodes obscurus*.
 - They are most commonly seen during the spring and summer.
 - These beetles can be found along many of the trails within the park but are especially common around the Main Loop trail and the Frijolito Loop trail. As slow walkers they are easy to spot!

JUNE BEETLES

Also called May beetle or
June bug



Photographs by David Lightfoot

Fun Facts:

Order: **Coleoptera**
Family: **Scarabaeidae**

- Although sometimes called June bugs these insects are in fact scarab beetles. June beetles are heavy-bodied, oval-shaped, with distinctive fan-shaped antennae and a body length of 25-28mm (0.9-1.1in).
- One of the most obvious species is the 10-lined June beetle (*Phyllophaga decemlineata*) featured above on the left.
- June beetles are harmless but they sometimes fly poorly and hit people who are then frightened.
- These beetles will 'squeak' when handled.
- They can often be seen during warm spring evenings and are attracted to light. Try looking for them around the light fixtures during a night walk at Banelier!

LEAF BEETLES



Lema daturaphila by David Lightfoot

Fun Facts:

Order: **Coleoptera**
Family: **Chrysomelidae**

- With 35,000 species in more than 2,500 genera they are one of the largest and most commonly encountered of all beetle families.
- Most of these beetles are small and may be hard to spot.
- Species are often specialized on a particular plant family - like the Colorado Potato beetle or the Cottonwood Leaf beetle. The one pictured above prefers plants from the Nightshade family, thus it's name which means Datura lover.

LONG HORNED BEETLES



Orthosoma brunneum Copyright © 2012 Kim Fleming

Fun Facts:

Order: **Coleoptera**

Family: **Cerambycidae**

- This family is common at Bandedier and is also called the round-headed borers.
- Long Horned beetles can be very big as adults ranging in size 20-70 mm (0.7-2.8 in).
- Several species in the subfamily Prioninae bore into trees at the park.
- Some species are attracted to dead or injured trees, as happened to many trees in the Las Conchas fire of 2011.

BOX ELDER BUG

(Boisea trivittata)



by David Lightfoot

Fun Facts:

Order: **Hemiptera**

Family: **Rhopalidae**

- This insect is an example of a 'true bug' belonging to the bug order **Hemiptera**. Although some people may mistake it for a beetle.
- These bugs commonly feed on box elder trees, which lend them their name, but they also feed on other types of tree as well.
- They are harmless but can build up to large numbers, especially in the fall when adults look for protected places (including houses) to overwinter.

BUTTERFLIES AT BANDELIER

Dainty Sulfur (*Nathalis iole*)

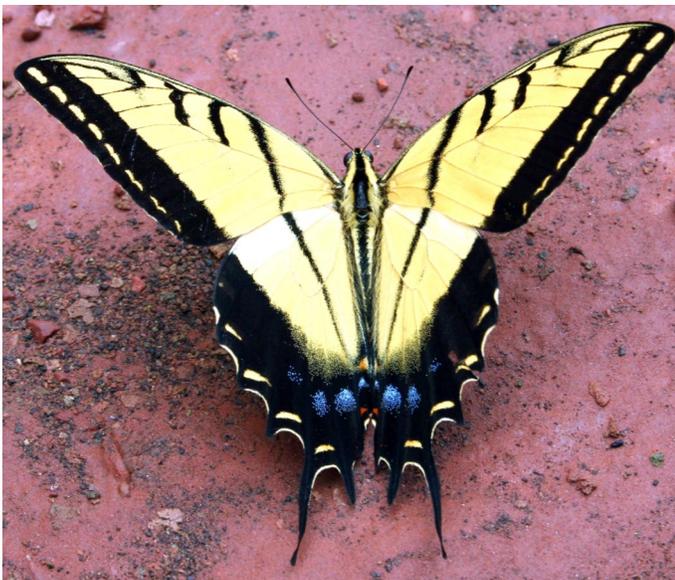
Order: **Lepidoptera**

Family: **Pieridae**

- These butterflies can be observed through the late summer into October.
- The top wings are yellow and black while the underside is pale yellow to pale green with a black spot on the forewing.
- It's wingspan is 23mm (~1 in) making it the smallest sulfur butterfly in North America.



by David Lightfoot



Papilio multicaudata by David Lightfoot

Swallowtail

Order: **Lepidoptera**

Family: **Papilionidae**

- There are two common species of swallowtail that fly through Bandelier.
- They are large yellow and black butterflies with an approximate 105 mm (4 in) wingspan.
- The two species are the Western Tiger Swallowtail (*Papilio rutulus*) and the Two-tailed Swallowtail (*Papilio multicaudata*) which is the larger of the two .
- These butterflies are common visitors in the spring and summer. They tend to emerge during the spring at lower elevations and in mid-summer at higher elevations.

BUTTERFLIES AT BANDELIER

Painted Lady (*Vanessa cardui*)

Order: **Lepidoptera**
Family: **Nymphalidae**

- The painted lady butterfly is found on every continent except South America, making it one of the most widely distributed and abundant butterflies in the world!
- A special characteristic of the painted lady is its unique screw-shaped flight pattern.
- They have a 65 mm (~2.5 in) wingspan.



by David Lightfoot



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Atlantis Fritillary (*Speyeria atlantis*)

Order: **Lepidoptera**
Family: **Nymphalidae**

- These butterflies are common at high and low elevations.
- It's wingspan ranges from 50 to 64 mm (2 to 2.5 in).
- There are a few fritillary species within the park including the Aphrodite Fritillary seen on pg 3.

BUTTERFLIES AT BANDELIER

California Sister (*Adelpha californica*)

Order: **Lepidoptera**
Family: **Nymphalidae**

- These butterflies are very territorial and patrol their areas. They have been known to chase away dragonflies and bats!



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by David Lightfoot

Mourning Cloak (*Nymphalis antiopa*)

Order: **Lepidoptera**
Family: **Nymphalidae**

- Mourning Cloaks are one of the first butterflies that you will see in the spring. They hibernate over winter and become active as soon as it is warm enough for them to fly. They often emerge in March or April.
- They have an 85 mm (3.3 in) wing-span.
- Did you know? Some people have even seen these butterflies on unusually warm days in the winter!

CICADAS



by David Lightfoot

Fun Facts:

Order: **Hemiptera**
Family: **Cicadidae**

- The nymphs live underground feeding on plant sap through tree roots.
- The adult males are the ones that sing to attract females; the calls are different for the different genera. The song has been described as a loud, shrill buzz.
- Along rivers you find species in the genus *Tibicen*. In the piñon-juniper woodlands, they are the mountain clickers, genus *Platypedia*.
- Visitors in the early summer should listen for their distinctive calls and look for the molted skins that they leave behind when they become winged adults.

CRICKETS



Gryllus sp.



Stenopelmatus fuscus
Photographs by David Lightfoot

Fun Facts:

Order: **Orthoptera**
Family Varies.

- Cricket's ears are located on the knees of their front legs.
- Since crickets sleep during the day most visitors will not spot them. However, if you take a walk at night you will hear the distinct chirp of the field cricket within the park.
- Field crickets are not well-known and the most common one at Bandelier is an unidentified species of the genus *Gryllus*!

One really unique looking cricket in the park is the **Jerusalem Cricket** (*Stenopelmatus fuscus*)

- They are large (up to 50 mm or ~2 in), wingless, burrowing crickets that do not chirp like the others.
- Despite their fearsome look, these crickets are not venomous but they can give a pinching bite.
- They are usually in their burrows during the day and venture out at night to feed, especially after a summer rain.
- They are omnivores meaning they feed on both plants and animals.

BLUE DASHER DRAGONFLY

(Pachydiplax longipennis)



by David Lightfoot

Fun Facts:

Order: **Odonata**

Family: **Libellulidae**

- As with many species in the order Odonata, the males and females look different (sexual dimorphism). While males are whitish blue with green-blue eyes, females are brown, yellow and white with green-brown eyes.
- The blue dasher is about 35-40 mm (1.4 to 1.6 in) as a mature adult.
- Most of a dragonfly's time is spent flying around patrolling and capturing prey. They are strong predators consuming many other insects, including mosquitos.
- The larvae or immature stage of dragonfly is aquatic and also a very good predator.
- They like water and can often be spotted near the stream in Frijoles Canyon.
- The adult flight season is from late June to October.

ROBBER FLY



by David Lightfoot

Fun Facts:

Order: **Diptera**

Family: **Asilidae**

- Robber Flies generally catch prey by the wing and are good at capturing grasshoppers.
- They encompass a variety of genera, with some being very good bee and wasp mimics.
- Medium to large-sized flies often perch in an exposed location and make short flights going after prey, using the 'sit and wait' predator strategy.
- They can be found worldwide during the summer.
- They are not harmful to people although if you try to grab them they may bite you.

GRASSHOPPERS



Trimerotropis pallidipennis by David Lightfoot

Fun Facts:

Order: **Orthoptera**

Family: **Acrididae**

- The most common species at Bandelier is the Pallid-winged grasshopper (*Trimerotropis pallidipennis*),
- The Pallid-winged grasshopper averages around 35 mm (~1.4 in) at adult length.
- In the summer, look and listen for the males of several species that perform mating flights in which they hover above the ground making loud snapping sounds to attract mates.
- A good place to look for grasshoppers is in open grassy areas in ponderosa pine or mixed-conifer forests.

GREEN LACEWING

Also called aphid lion



by David Lightfoot



 University of Nebraska
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Fun Facts:

Order: **Neuroptera**
Family: **Chrysopidae**

- Green Lacewings are in the genus *Chrysopsis*.
- They are very beneficial insects for gardens because they eat aphids.
- The adults are small and delicate with golden eyes. They have 2 pairs of membranous wings and are around 7-8mm (0.28-0.31 in) as adults.

- Their eggs are laid on the underside of leaves. They are distinctive white/yellow ovals suspended from the vegetation by slender stalks. A picture of their eggs is above on the right.

PRAYING MANTIDS



by David Lightfoot



MICHELLE JONES
CRESTON IA
16 APRIL 2009

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Fun Facts:

Order: **Mantodea**
Family: **Mantidae**

- The largest group of these insects is more properly called praying mantids. Mantis refers to the genus *mantis*, to which only some praying mantids belong.
- The large, common mantid species at Bandelier, is in the genus *Stagmomantis*. It is around 55mm in length and is the easiest to find as adults, in the late summer or early fall.
- Mantids are generalist predators that employ the sit and wait method. They are good at grabbing bees and flies, so flowers are a good place to look for them.
- Their egg sacs are distinctive – you may have even seen them before without realizing it. A picture of their egg sac is shown above on the right.
- When threatened, mantids will rear up and spread brightly-colored hind wings to scare predators.
- A favorite insect for many people but interestingly enough their closest relatives are cockroaches.

HUMMINGBIRD MOTHS

Also called a hawk moth or sphinx moth



by David Lightfoot

Fun Facts:

Order: **Lepidoptera**

Family: **Sphingidae**

- The ability to hover in flight has evolved only four times in nectar feeders: in hummingbirds, certain bats, hoverflies, and sphingid moths.
- One of the common hummingbird moths at Bandelier is *Hyles lineata*, the white-lined sphinx.
- Their size and ability to hover causes them to often be mistaken for actual hummingbirds.
- Most species in the group are active at dusk and pollinate night blooming flowers, like *Datura* or Angel's Trumpet, a large white flower that can be seen throughout the Southwest.

SPIDERS AT BANDELIER

There are many spiders you might find at Bandelier. On the following pages are a few of our unique or common species. Remember that spiders are not insects but are found in the class **Arachnida**. Unlike insects, arachnids only have two main body parts and have eight legs, not six. All spiders on these pages are in the Order **Araneae**.

Western Black Widow (*Latrodectus hesperus*)

Order: **Araneae**

Family: **Theridiidae**

- Black Widows make complex webs called a space web. These webs look messy but are actually very effective at catching prey.
- Almost all spiders are venomous but very few are actually dangerous to people, widows are one of the exceptions. The bite of this spider is a neurotoxin poison and all bites must be treated by a doctor as soon as possible.
- Although black widows are fairly common in the area they are quite shy and will usually stay hidden inside their web unless their web is disturbed.



- The males are much smaller than the females (males 3-7mm vs females at 5-10mm) and they retain the coloration of an immature widow.
- When mature, females have a distinctive black color with a red hour glass on the underside of it's abdomen. Variation does exist in the shape of the hour glass and in the appearance of other red stripes along their abdomen and legs.
- Immature widows and males are usually light brown with pale diagonal stripes on each side of the abdomen.

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SPIDERS AT BANDELIER

Orb Weavers

Order: **Araneae**
Family: **Araneidae**

- Orb Weavers (to right) make the classic circular webs that people associate with spiders.
- One member found at Bandelier goes by several names: cat-faced spider, or western barn spider, or pumpkin spider (*Araneus illaudatus*). These spiders are tan to orange in color and sometimes the abdomen has cat ears or a face.
- In the fall the adult females are large (0.5 in.) and noticeable. The males are much smaller. These spiders make large orb webs in trees and shrubs and around houses, as well.
- Like most spiders, Orb Weavers can make up to seven different kinds of silk. Each type of silk is chemically distinct and has a different function - from web spinning to protecting eggs.



Araneus illaudatus Copyright © 2007 stobrian

Wolf spiders

Order: **Araneae**
Family: **Lycosidae**

- There are many species of wolf spider at Bandelier.
- These spiders hunt for their prey and have excellent vision.
- You may see them running across the ground during the daytime.
- A common species found in the pinyon-juniper woodland is *Schizocosa mccooki* and several *Pardosa* species are common at higher elevations.
- If you look closely, you may see females with their egg sacs attached to their spinnerets. Although they spin egg sacs they do not spin webs as they are hunters who actively seek after their prey.



by David Lightfoot

SPIDERS AT BANDELIER

Tarantula- *Aphonopelma* spp.



Copyright © 2010 Patrick Randall

Order: **Araneae**

Family: **Theraphosidae**

- Common large, hairy tarantulas are of the genus *Aphonopelma*. Species within this genus are hard to tell apart.
- Tarantulas are common at Bandelier during the fall when males seek out the burrows of the females. Most of the tarantulas you see will be wandering males.
- Greatly feared due to their large size, tarantulas are not very venomous and are actually very shy of people, although their bites can sometimes cause a bad allergic reaction.
- Tarantulas will defend themselves when they feel threatened by throwing needle-like, barbed hairs at their attackers. These hairs will cause skin irritation but are not harmful.
- Tarantulas do not make traditional webs, but they do use silk for other reasons. For example, females line their burrows with silk and place a few strands around the mouth of the burrow to help detect passing prey.

HARVESTMEN



Photographs by David Lightfoot

Fun Facts:

Order: **Opiliones**

Family Varies.

- Though similar in appearance they are not actually spiders but belong to the Order Opiliones. In fact, these arachnids are more closely related to scorpions than spiders!
- The most common species found at lower elevations is *Trachyrhinus marmoratus* and up higher it is *Togwoteeus bi-ceps*. Both of these are found in the Family Sclerosomatidae.
- As they do not possess silk glands, harvestmen can't form webs.
- Harvestmen have been found living in all types of habitats from forests and grasslands to wetlands, mountains, caves, and anthropogenic habitats.
- Contrary to popular urban myth harvestmen are not venomous and are not harmful to people.

PALLID WIND SCORPION

Also called Sun Spider



Photograph by David Lightfoot

Fun Facts:

Order: **Solifugae**
Family **Eremobatidae**

- Wind Scorpions are of the class **Arachnida** but their order, **Solifugae**, is a different order from spiders (order Araneae) and scorpions (order Scorpiones).
- Most Wind Scorpions are in the genus *Eremobates*. They all look very similar.
- They're common, not venomous, but can have an attitude, so they should be treated cautiously.
- They mostly eat soft-bodied arthropods even though they look ferocious.
- You can often see them out at night.

CENTIPEDES & MILLIPEDES

Like spiders, centipedes & millipedes are arthropods but are separate from the class Insecta.

Centipedes

Class: **Chilopoda**

Several orders and families.

- Centipedes are wormlike arthropods with many body segments and 15 to 177 pairs of legs.
- Our most common centipedes are Stone Centipedes. They are small (20-25mm) and often hidden under rocks or logs.
- However the desert centipede, *Scolopendra polymorpha*, which as an adult can be quite large (112mm) and has been spotted along our piñon-juniper trails.
- Centipedes are venomous predators and have a pair of adapted fang legs called forcipules. They can give a nasty bite but are not dangerous to humans.
- Centipedes hunt at night and hide during the day.



by David Lightfoot

Millipedes

Class: **Diplopoda**

Several orders and families.

- These wormlike animals have even more legs than centipedes. In each body segment, millipedes have two pair of legs attached while centipedes normally have one pair.
- At Bandelier we have *Oriulus venustus* in ponderosa pine and *Aniulus diversifrons* in mixed-conifer forests. They look very similar, small brown millipedes that may be hard to spot.
- Millipedes are scavengers, eating decaying leaves and other decomposing matter, unlike centipedes. This means they are often found in damp places under leaves or logs.
- They do not bite, are generally slow moving and are harmless to humans. Though several species can produce foul-smelling fluids if they feel threatened.
- Hikers can also look for the white, coiled remains of their exoskeletons.



by David Lightfoot

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REFERENCES

- BBC. (2012). *Nature Wildlife: Painted lady*. Retrieved November 1, 2012, from British Broadcasting Corporation (BBC): http://www.bbc.co.uk/nature/life/Vanessa_cardui
- Bessin, R. (2004, January). *Velvet Ants*. Retrieved November 1, 2012, from University of Kentucky- College of Agriculture: <http://www.ca.uky.edu/entomology/entfacts/ef442.asp>
- Cartron, J.-L. E., Lightfoot, D. C., Mygatt, J. E., Brantley, S. L., & Timothy, L. K. (2008). *A Field Guide to the Plants and Animals of the Middle Rio Grande Bosque*. Albuquerque: University of New Mexico Press.
- CISEO. (n.d.). *Darkling Beetle/Mealworm Information*. Retrieved 11 1, 2012, from The University of Arizona Center for Insect Science Education Outreach : insected.arizona.edu/mealinfo.htm
- Classification*. (2010, May). Retrieved 11 1, 2012, from Insects & other Arthropods: <http://www.kendalluk.com/class.htm>
- DuHamel, J. (2010, July 16). Tarantula Hawks Deliver The Big Sting. *Tucson Citizen*, <http://tucsoncitizen.com/wryheat/2010/07/16/tarantula-hawks-deliver-the-big-sting/>.
- Eaton, E. R., & Kaufman, K. (2007). *Kaufman Field Guide to Insects of North America*. New York: Houghton Mifflin Harcourt.
- Encyclopedia Britannica. (2012). *June beetle*. Retrieved November 1, 2012, from Encyclopedia Britannica: <http://www.britannica.com/EBchecked/topic/308170/June-beetle>
- Giese, E., & Lightfoot, D. (2005). Fauna of the Sandia Mountains: Arthropods. In R. Julyan, & M. Stuever, *Field Guide to the Sandia Mountains* (pp. 129-142). Albuquerque: University of New Mexico Press .
- Hayashi, C. (2012, January 1). The secrets of spider silk. *CNN*: <http://www.cnn.com/2012/01/01/opinion/hayashi-spider-silk/index.html>.
- Iowa State University Entomology. (n.d.). Retrieved November 1, 2012, from Bug Guide: <http://bugguide.net>
- Kitching, I. J. (2002). The phylogenetic relationships of Morgan's Sphinx, *Xanthopan morgani* (Walker), the tribe Acherontiini, and allied long-tongued hawkmoths (Lepidoptera: Sphingidae, Sphinginae). *Zoological Journal of the Linnean Society*, 471–527.
- Lung, M., & Sommer, S. (2001). *Pachydiplax longipennis*. Retrieved November 1, 2012, from Idaho Museum of National History: <http://imnh.isu.edu/digitalatlas/bio/insects/drgnfly/libefam/palo/palo.htm>
- National Geographic. (n.d.). *Praying Mantis*. Retrieved November 1, 2012, from National Geographic: <http://animals.nationalgeographic.com/animals/bugs/praying-mantis/>
- Regan, J. M. (n.d.). *CENTIPEDES 101*. Retrieved November 1, 2012, from Northwest Wildlife Online: <http://www.northwestwildlifeonline.com/CENTIPEDES%20101%20article.htm>
- Sladen, F.W.L. (1989). *The Humble Bee*. Logaston Press .
- Smith, L. (2010). *The role of insects in the eco-system* . Retrieved November 1, 2012, from Lambert Smith's Insecta: http://www.insecta.co.za/index.php?option=com_content&view=article&id=56&Itemid=64