



# SCORPIONS

## Introduction

Scorpions have long been of interest to humans primarily because of their ability to give painful and sometimes life threatening stings. Scorpions are also an important and beneficial component of many ecosystems and they are one of the oldest known terrestrial **arthropods**. Fossil scorpions found in Paleozoic strata 430 million years old appear very similar to present day species.

Scorpions are venomous arthropods in the class **Arachnida**, relatives of spiders, mites, ticks, solpugids, pseudoscorpions and others. There are currently 1400 recognized species of scorpions worldwide. Scorpions have an elongated body and a segmented tail that is tipped with a venomous stinger. They have four pairs of legs and pedipalps with pincer-like pincers on the end, which are used for grasping.

## Range and Habitat

Scorpions are commonly thought of as desert animals, but in fact, they occur in many other habitats, including grasslands and savannahs, deciduous forests, montane pine forests, intertidal zones, rain forest and caves. Scorpions have even been found under snow-covered rocks at elevations of over 12,000 feet in the Himalayas of Asia.

## Description

As arachnids, scorpions have mouthparts called chelicerae, a pair of **pedipalps**, and four pairs of legs. The pincer-like pedipalps are used primarily for prey capture and defense, but are also covered with various types of sensory hairs. The body is divided into two main regions, a cephalothorax and an abdomen. The **cephalothorax** is covered above by a carapace (or head shield) that usually bears a pair of median eyes and 2 to 5 pairs of lateral eyes at its front corners (a few cave and litter-dwelling scorpions are completely eyeless).

The abdomen consists of 12 distinct segments, with the last five forming the metasoma what most people refer to as the "tail". At the end of the abdomen is the

**telson**, which is a bulb-shaped structure containing the venom glands and a sharp, curved stinger to deliver venom.

On its underside, the scorpion bears a pair of unique comb-like sense organs called the **pectines**; these are usually larger and bear more teeth in the male and are used to sense the texture and vibration of surfaces. They also serve as chemoreceptors (chemical sensors) to detect pheromones (communication chemicals).

The "long-tailed" African Scorpion (*Hadogenes troglodytes*) reaches a length of over 8 inches, and is probably the longest scorpion in the world. Some of the African and Asian Emperor Scorpions routinely reach (and probably exceed) 7 inches. The largest scorpions in the United States are members of the genus *Hadrurus* (giant desert hairy scorpions), obtaining a length of about 5 inches. Giant desert hairy scorpions also occur in Arizona.

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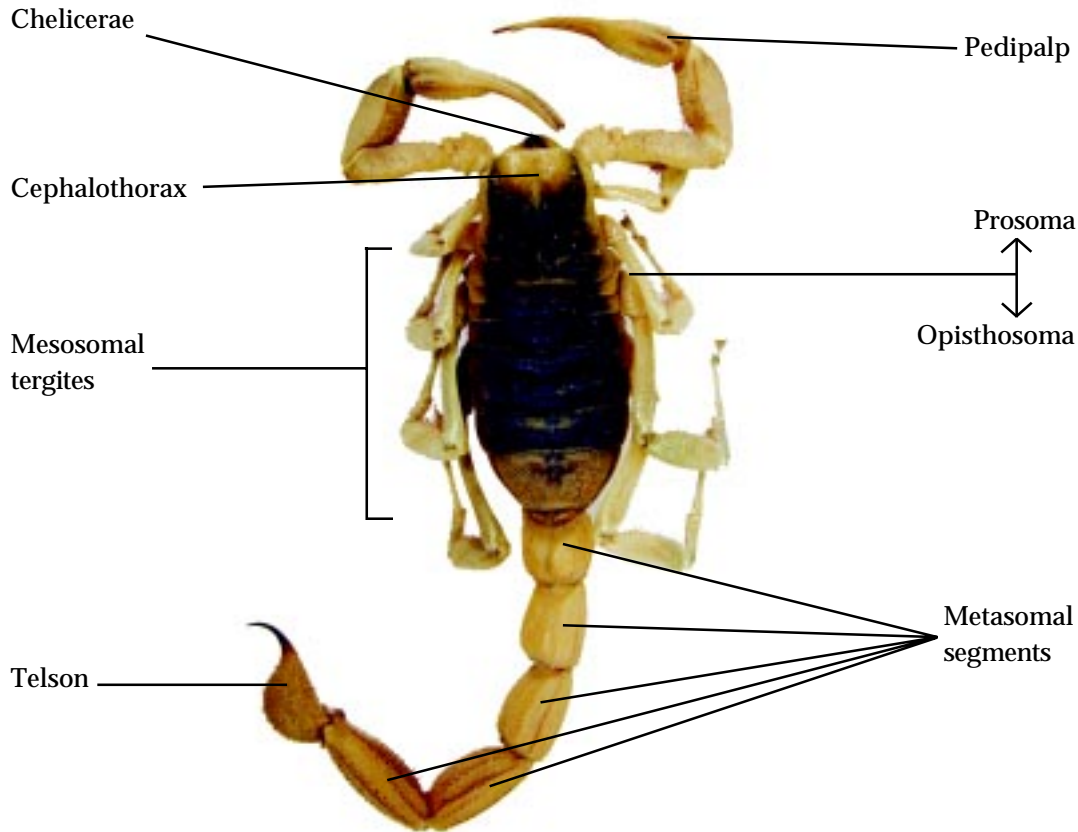
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This information has been reviewed by university faculty.  
[ag.arizona.edu/pubs/insects/az1223.pdf](http://ag.arizona.edu/pubs/insects/az1223.pdf)



*Desert hairy scorpion*

## Behavior

Scorpions are nocturnal or diurnal, predatory animals that feed on a variety of insects, spiders, centipedes, and other scorpions. The larger scorpions occasionally feed on vertebrates, such as small lizards, snakes, and mice. Prey is detected primarily by sensing vibrations with the pectine organs. The pedipalps have an array of fine sensory hairs that sense air-borne vibrations; the tips of the legs have small organs that detect vibrations in the ground. Most scorpions are ambush predators who detect prey when it comes within reach.

The surfaces of the legs, pedipalps, and body are also covered with thicker hairs (setae) that are sensitive to direct touch. Although they are equipped with venom for defense and prey acquisition, scorpions themselves fall prey to many types of creatures, such as centipedes, tarantulas, insectivorous lizards, snakes, birds (especially owls), and mammals (including shrews, grasshopper mice, and bats).

As with many predators, scorpions tend to forage in distinct and separate territories, returning to the same area each night. They may enter homes and buildings when their territory has been disrupted by construction, tree removal or floods, etc.

Scorpions have many adaptations for desert living. They have extra layers of lipids (fats) on their exoskeleton (external skeleton) that minimizes water loss. Most are active at night, and spend their days where it is cool and moist under rocks, wood, tree bark or in burrows. Although scorpions have been seen drinking directly from water reservoirs, they derive most of their water from their food (although this varies by species).

As with most arthropods their activity is linked to temperature. Generally speaking, scorpions are active if nighttime temperatures are above 70°F. They tend to be less active during winter and the hottest part of the summer during daylight hours.

## Life Cycle

Scorpions have a complex mating ritual in which the male uses his pedipalps to grasp the female's pedipalps. The male then leads her in a "courtship dance". The details of courtship vary from species to species, with some even exhibiting a deliberate and prolonged "sexual sting" by the male. The sperm from the male is contained within a structure called a **spermatophore**, which is deposited by the male on a surface over which the female is pulled. The male sweeps his pectines over the ground surface to help locate a suitable place to deposit his spermatophore. The female draws the sperm into her genital pore, which is located near the front ventral (under) side of her abdomen.

Scorpions have a long gestation period (from several months to over a year, depending on species) in which the young develop as embryos in the female ovariuterus or in specialized diverticula that branch from the ovariuterus. The young are born live and ascend their mother's back. She assists them by making a "birth basket" with her folded legs to catch them as they are born and to provide them with a means to climb to her back. A few Old World species do not form birth baskets.



*Female bark scorpion with young on her back*

On average, a female gives birth to about 25-35 young. They remain on her back until they molt for the first time. The white colored young have been seen to climb down off the mothers back, molt then return to the mothers back for another 4-5 days before leaving for good, usually within one to three weeks after birth. Once they climb down, they assume an independent existence, and periodically molt to reach adulthood. Typically five or six molts over two to six years are required for the scorpion to reach maturity.

The average scorpion probably lives three to five years, but some species may live up to 25 years. A few scorpions exhibit social behaviors beyond the mother-

young association, such as forming over-wintering aggregations, colonial burrowing, and perhaps even living in extended family groups that share burrows and food.

## Scorpion Venom

The venom of scorpions is used for both prey capture, defense and possibly to subdue mates. All scorpions do possess venom and can sting, but their natural tendencies are to hide and escape. Scorpions can control the venom flow, so some sting incidents are venomless or only mild envenomations. Scorpion venoms are complex mixtures of neurotoxins (toxins which affect the victim's nervous system) and other substances; each species has a unique mixture. Despite their bad reputation, only one species in the western U.S. (the bark scorpion, *Centruroides exilicauda*) and about 25 others worldwide have venom potent enough to be considered dangerous to humans.

The world's most dangerous scorpions live in North Africa and the Middle East (species in the genera *Androctonus*, *Buthus*, *Hottentotta*, *Leiurus*), South America (*Tityus*), India (*Mesobuthus*), and Mexico (*Centruroides*). In some of these areas, scorpion stings may be a significant cause of death, but reliable data on human mortality are not readily available. Some studies suggest typical mortality rates up to about 4% in hospital cases, with children and the elderly being most susceptible. Death by scorpion sting, if it occurs, is the result of heart or respiratory failure some hours after the incident. During the 1980's Mexico averaged about 800 deaths each year. However, in the past 20 years there have been no reported fatalities in the US due to scorpion stings.

## Scorpions in Arizona

About 40-60 species occur in Arizona, although many are undescribed. The bark scorpion (*Centruroides exilicauda*) is the only species in Arizona of medical importance.



*Arizona bark scorpion*

### ARIZONA BARK SCORPION

In the USA the bark scorpion is found in southeastern California, Arizona, Nevada, southern Utah, and southwestern New Mexico. It is also found throughout the Baja Peninsula and western Sonora in Mexico. The typical "bark" or "crevice" scorpion is encountered in a variety of situations. It is most commonly found under rocks, logs, tree bark, and other surface objects. The bark scorpion (1-3 inches in length) is the most commonly encountered house scorpion. They are common throughout many habitats but almost always in rocky areas.

Most scorpion species are solitary in nature. The exception to this is bark scorpions, which may overwinter in aggregates of 20-30. The bark scorpion is also one of relatively few species that are able climbers.

The venom of the bark scorpion may produce severe pain (but rarely swelling) at the site of the sting, numbness, frothing at the mouth, difficulties in breathing (including respiratory paralysis), muscle twitching, and convulsions. Death is rare, especially in more recent times. **Antivenin** is available for severe cases. Certain people, however, may be allergic to the venom and can experience life-threatening side effects when stung (as occurs with bee stings). No cases of anaphylaxis have been reported in Arizona. Additional information can be found in **Venomous Animals of Arizona** by Bob Smith.

### DESERT HAIRY SCORPION

Another species found in Arizona is the desert hairy scorpion (*Hadrurus arizonensis*). This species is twice as large as the bark scorpion at maturity (up to 5 inches long). They are often found in low sandy areas throughout the state.



*Desert hairy scorpion*

Desert hairy scorpions usually eat insects, spiders, centipedes, small vertebrates and other scorpions.

### STRIPE-TAILED SCORPION

Another genus frequently found is the devil or stripe-tailed scorpion group (*Vaejovis* spp.). There are several Vaejovid species found in Arizona. They are intermediate in size (1-2 inches in length) and are more robust than bark scorpions.



*Stripe-tailed scorpion*

The stripe-tailed scorpion is typically found under many surface objects (including sleeping bags, shoes, etc.) where it digs a short burrow or "scrape" for protection. This species is normally an obligate burrower, digging burrows about one meter deep in gravel soils.

## Management of Scorpions

High numbers of scorpions can become a problem under some circumstances. If a reduced population is desirable several steps can be taken.

Scorpions are difficult to control with insecticides alone. Therefore, the first control strategy is to modify the area surrounding a house or structure:

- Remove all harborages such as: trash, logs, boards, stones, bricks and other objects from around the building.
- Keep grass closely mowed near the home. Prune bushes and overhanging tree branches away from the structure. Tree branches can provide a path to the roof for scorpions. Minimize low growing ground cover vegetation.
- Store garbage containers in a frame that allows them to rest above ground level.
- Never bring firewood inside the building unless it is placed directly on the fire.
- Install weather-stripping around loose fitting doors and windows.

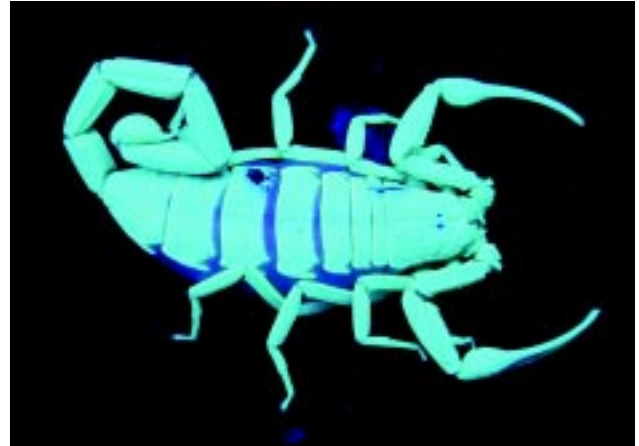
- Plug weep holes in brick veneer with steel wool, pieces of nylon scouring pad or small squares of screen wire.
- Caulk around roof eaves, pipes and any other cracks into the building.
- Keep window screens in good repair. Make sure they fit tightly in the window frame.
- By managing the scorpion food source, you will manage the scorpion population.

## Blacklighting

Scorpions fluoresce or glow under ultra-violet light so they are easy to find with the aid of a black light during the night. Nighttime scorpion hunting is a lot of fun but make sure that you wear high-top boots and have long tongs if you want to capture the scorpions to move them.

Using BLB bulbs you can construct your own portable U.V. light. Homeowners wishing to construct an inexpensive blacklight should purchase a 6-volt camping lantern with a 6-inch fluorescent tube, from a camping supply store or department store. The tube can then be replaced with an ultraviolet bulb available at many lighting stores. This kind of light will show scorpions 1-2 feet from the light. The approximate cost of constructing the 6 volt blacklight will be \$30. Another option is to obtain a 12 volt fluorescent fixture, such as an emergency auto lighting stick and a 12 volt rechargeable battery pack available at electronics supply stores. Replace the bulb with a 12 volt, 8 watt ultraviolet bulb from a lighting store. This is a more powerful system and will cost more to construct, but will allow nighttime viewing of scorpions from 4-5 feet away. The approximate cost of constructing the 12 volt blacklight will be \$200.

Once located, collect the scorpions using long forceps or tongs and keep them in a sealable, sturdy container. As these wonderful creatures are such a benefit to our environment please consider collecting and releasing the scorpions into the natural desert rather than killing them. If collected scorpions are to be destroyed, crush the individuals then use a flyswatter or long forceps to remove the bodies. Chemical spraying during the day is largely ineffectual.



*Bark scorpion viewed under U.V.light*

**Never look directly at an ultraviolet light, damage to the eye can occur.**



*Bark scorpion viewed under normal daylight.*

## Scorpion-like Creatures

Besides true scorpions, there are a number of other arachnids that look similar and at first glance may be confused with scorpions.



*Pseudoscorpion*

Pseudoscorpions are arachnids with a body length of approximately 1/8th inch. The pedipalps give them a strong resemblance to true scorpions. Natural habitats for pseudoscorpions include under leaf litter and mulch, in moss, under stones and beneath tree bark. They have also been reported in bird nests and between siding boards of buildings. Pseudoscorpions are predaceous and can inflict a venomous bite.



*Solpugid, sun spider or windscorpion*

Solpugids are pale-tan arachnids. The body can be up to an inch and a half in length, with a pair of heavy pinchers dominating the front end. They have four pairs of long legs and pedipalps in front that are used in touching and smelling. They run fast and climb well. Solpugids subdue their prey with their pinchers, which lack poison glands.



*Whipscorpion or vinegaroon*

Whipscorpions are found in the southeastern oak zone of Arizona eastwards across the southern U.S. to Florida. They have a substantial but flat body 2-3 inches in length, with large spined, arm-like pedipalps in front. They are arachnids but have no venom. Whipscorpions are predators, active at night. The whip-like tail is used in defense and individuals can squirt acetic acid (vinegar) produced from a rear gland.



*Tailless whipscorpion*

The front of this animal is similar to the whipscorpion, with heavily spined, grasping arms. They also have a pair of very long and limber front legs, which are used to touch and smell. Tailless whipscorpions are dark brown in color and the width across its very flattened body can exceed an inch. They are predators and have no venom. As their name implies they lack a tail.

Pseudoscorpions, solpugids, whipscorpions and tailless whipscorpions do not sting like scorpions, control is unnecessary and they provide excellent control of cockroaches. Do not intentionally handle them as they are delicate creatures.



## Tips for Professionals

Wettable powder formulations provide better residual control for crawling pests when applying perimeter sprays.

When using pyrethroids or other insecticides labeled for scorpion control, be sure to use the highest permissible label rate.

When applying pesticides directly onto individual scorpions, apply judiciously. Apply pesticides around the foundation of the building and up to 1 foot above ground level on the exterior walls. Also apply pesticides around doors, window eaves and other potential points of entry. Follow directions on the package for dosage, mixing and application methods.

Pesticides registered October 2000 for scorpion control include the following: permethrin (Prelude®, Dragnet®), cyfluthrin (Tempo®), cypermethrin (Demon®), lambda-cyhalothrin (Demand CS®), deltamethrin (Suspend®).

Other pesticides are registered for the management of scorpions but are not listed as they are under investigation in accordance with the Food Quality Protection Act (FQPA) of 1996. FQPA requires the Environmental Protection Agency (EPA) to reassess all existing pesticide tolerances considering the best available data on aggregate exposure to the pesticide, the cumulative effects from pesticides sharing a common mechanism of toxicity, exposure to children and potential as an endocrine disrupter. The organophosphate and carbamate insecticides share the ability to depress the levels of cholinesterases enzymes in the blood and nervous systems of insects, animals and humans. All of the organophosphate and carbamate insecticides are regulated currently by EPA on the basis of threshold effects.

**Always read pesticide labels very carefully before application.**

**Daytime spraying is largely ineffective. The most effective scorpion management method is nighttime blacklight collecting.**

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