Illinois Wildlife Preservation Fund Grant
Final Report
Project 06-L24W *Illinois Spiders* Poster

In July 2005, the Illinois Department of Natural Resources' (IDNR) Division of Education was awarded a $2,000.00 grant from the Illinois Wildlife Preservation Fund for the purpose of producing a new poster, *Illinois Spiders*. This poster was to become a part of the *Illinois Flora, Fauna, Habitats and Culture* series of posters, supplemental educational resources that can be used at all grade levels.

Text for the poster was written by Valerie Keener of the IDNR Division of Education with support and review from Dr. Petra Sierwald of the Field Museum in Chicago. The one-time right to use 25 spider images was purchased from Dr. Hank Guarisco, Sternberg Museum of Natural History, Fort Hays State University, Hays, Kansas. Design and layout was provided by Dee Proctor of the Illinois Information Services Graphics Division, Central Management Services (CMS), State of Illinois. Following a competitive bidding process by CMS, the printing bid was awarded to Illinois Graphics, Bloomington. Posters were received by the IDNR in mid-July 2006.

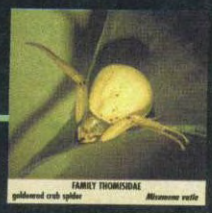
Illinois Spiders helps to supplement the Illinois State Board of Education's Illinois Learning Standards in Science (12A how living things function, adapt and change; 12B how living things interact with each other and with their environment). It may also be used to support Illinois Learning Standards in English Language Arts, Social Science and Fine Arts, depending upon how the instructor utilizes the poster. The front side of the poster depicts 25 spider species that are found in Illinois and provides their taxonomic classification. The poster's reverse side contains the following sections: spider anatomy; life history; webs; spiders and humans; spider facts; family descriptions; glossary; references; and resources. Posters are available through the IDNR online order form (http://dnr.state.il.us/lands/education/CLASSRM/edmats02.htm) and are distributed by the IDNR Division of Education at teacher conferences, ENTICE workshops and other events statewide. Ten thousand copies of the poster were printed. In the first two weeks of its availability, more than 2,000 posters have been shipped from the inventory.

Grant funds were used to help pay for the printing of the poster. Total printing cost was $2,740.00, with $2,000.00 from the Illinois Wildlife Preservation Fund Grant and the remainder from the IDNR Division of Education's general revenue ENTICE funds. ENTICE funds were used to pay for the photographic rights ($1,300.00), and general IDNR funds paid the design and layout costs (invoice not yet received). Personnel costs were paid by the IDNR.

The IDNR Division of Education is very grateful for the support of the Illinois Wildlife Preservation Fund.

Illinois SPIDERS

FAMILY AGELENIDAE
barn funnel weaver — *Tegenaria domestica*


FAMILY THOMISIDAE
goldenrod crab spider — *Misumena vatia*

FAMILY SALTICIDAE
jumping spider — *Phidippus mystaceus*

female

male

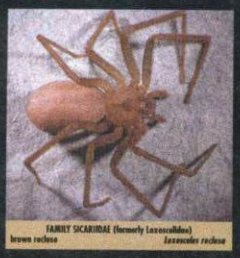
FAMILY THERIDIIDAE
northern black widow — *Latrodectus variolus*

FAMILY THERIDIIDAE
common house spider — *Achaearanea tepidariorum*

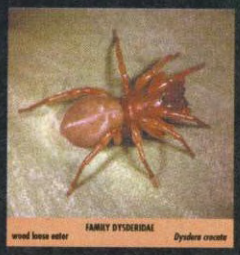
FAMILY ARANEIDAE
yellow garden spider — *Argiope aurantia*

FAMILY MITURGIDAE
longlegged sac spider — *Chebracanthium inhibit*

FAMILY LYCOSIDAE
wolf spider — *Schizocosa avida*


FAMILY SICARIIDAE (formerly Loxoscelidae)
brown recluse — *Loxosceles reclusa*

FAMILY SALTICIDAE
zebra jumper — *Salticus scenicus*


FAMILY DYSDERIDAE
wood louse eater — *Dysdera crocata*

FAMILY SALTICIDAE
bold jumper — *Phidippus audax*

FAMILY PISAURIDAE
six-spotted fishing spider — *Dolomedes triton*

FAMILY ANYPHAENIDAE
garden ghost spider — *Hibana gracilis*

FAMILY THERIDIIDAE
false widow — *Steatoda triangulosa*

FAMILY THOMISIDAE
whitebanded crab spider — *Misumenoides formosipes*

FAMILY TETRAGNATHIDAE
longjawed orbweaver — *Tetragnatha guatemalensis*

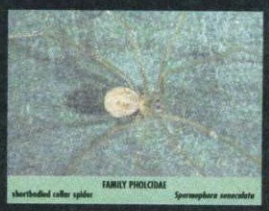
FAMILY THOMISIDAE
crab spider — *Xysticus ferox*

FAMILY ARANEIDAE
arrowshaped micrathena — *Micrathena sagittata*

FAMILY SALTICIDAE
jumping spider — *Phidippus clarus*

FAMILY THOMISIDAE
color crab spider — *Misumenops color*

FAMILY SALTICIDAE
Pike slender jumper — *Marpissa pikei*


FAMILY PHOLCIDAE
shortbodied cellar spider — *Spermophora senoculata*

FAMILY THOMISIDAE
crab spider — *Xysticus ancitifex*

FAMILY THOMISIDAE
crab spider — *Misumenops oblongus*

Spiders belong to a large animal group, the **arthropods**, all of which have jointed legs and an **exoskeleton**. Other arthropods include insects, millipedes, centipedes, ticks, harvestmen, scorpions and crustaceans. The arachnid group of arthropods, composed of the spiders, scorpions, harvestmen and ticks, all have eight legs and some of them have **book lungs**. Spiders are unique, though, in having **spinnerets** at the end of their abdomen. Spiders also have complex reproductive structures. More than 630 species of spiders have been identified in Illinois so far. Spiders are found in nearly all Illinois habitats, even on and sometimes in water, and are important predators of insects.

** Text words in **bold** are defined in the glossary*

Species List

Spiders are not represented in actual size nor in correct proportion to other species.

All photos © Hank Gilpin

Family Agelenidae	barn funnel weaver	*Tegenaria domestica*
Family Anyphaenidae	garden ghost spider	*Hibana gracilis*
Family Araneidae	yellow garden spider	*Argiope aurantia*
	arrowshaped micrathena	*Micrathena sagittata*
Family Dysderidae	wood louse eater	*Dysdera crocata*
Family Lycosidae	wolf spider	*Schizocosa avida*
Family Miturgidae	longlegged sac spider	*Chebracanthium inhibit*
Family Pholcidae	shortbodied cellar spider	*Spermophora senoculata*
Family Pisauridae	six-spotted fishing spider	*Dolomedes triton*
Family Salticidae	Pike slender jumper	*Marpissa pikei*
	bold jumper	*Phidippus audax*
	jumping spider	*Phidippus clarus*
	jumping spider	*Phidippus mystaceus*
	zebra jumper	*Salticus scenicus*
	Pike slender jumper	*Marpissa pikei*
Family Sicariidae (formerly Loxoscelidae)	brown recluse	*Loxosceles reclusa*
Family Tetragnathidae	longjawed orbweaver	*Tetragnatha guatemalensis*
Family Theridiidae	common house spider	*Achaearanea tepidariorum*
	northern black widow	*Latrodectus variolus*
	false widow	*Steatoda triangulosa*
Family Thomisidae	goldenrod crab spider	*Misumena vatia*
	whitebanded crab spider	*Misumenoides formosipes*
	color crab spider	*Misumenops color*
	crab spider	*Misumenops oblongus*
	crab spider	*Xysticus ancitifex*
	crab spider	*Xysticus ferox*

This poster made possible by:

Illinois Department of Natural Resources
Division of Education

Field Museum of Natural History

Illinois Wildlife Preservation Fund

Assistance provided by:

Dr. Petra Sierwald, Field Museum of Natural History

Funding for this project was made possible in part by contributions to the Illinois Wildlife Preservation Fund.

Anatomy

A spider's body is divided into two main sections: the **prosoma** (or **cephalothorax**) and the **abdomen**. The prosoma is the front part of the body and is composed of the fused head and thorax covered by the hard **carapace**. The bottom covering of the prosoma is the sternum. Eyes, legs, pedipalps, mouthparts, brain and stomach are all attached to or in the prosoma. The abdomen contains the heart, most of the digestive tract, the reproductive organs, **book lungs** and the silk glands that open on the **spinnerets** at the end of the abdomen. The prosoma and abdomen are joined by a narrow stalk, the pedicel.

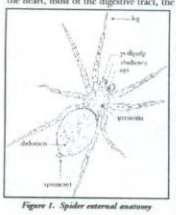


Figure 1. Spider external anatomy

Eight walking legs are present in spiders. Each leg has seven segments. The segment most distant from the body has two or three claws. Hunting spiders often have thick brushes of specialized hairs at the end of the legs that allow them to cling to smooth surfaces.

Pedipalps look like short legs and are used to clean and handle prey, assist in web building, hold the egg sac, communicate, and store and transfer sperm (males). The two **chelicerae** are positioned in front of the mouth. Each has a fang and opening of the poison duct. The fang pierces prey and poison is injected. Almost all spiders have poison glands.

Most spiders have eight eyes in characteristic patterns. The eyes of most species only detect movement but may be arranged to detect movement in all directions.

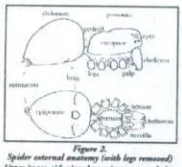


Figure 2. Spider external anatomy (with legs removed) Upper image, side view; Lower image, ventral view

Spiders have two types of respiratory organs, the book lungs and the tracheae. The book lungs consist of thin lamellae for gas exchange and look like the pages of a book. Many spiders have one pair of book lungs while others have two pairs. The slit-shaped openings to the book lungs are on the ventral side of the abdomen near the pedicel. Tracheae are hollow tubes with many branches for moving oxygen to the organs and carrying carbon dioxide away. The tracheae open in a spiracle, located close to the spinnerets in most spiders.

Each spinneret has several or numerous spigots, which are openings for the silk glands. Different types of silk are made in different types of silk glands and for different reasons: webs; snare; retreat; egg sac; dragline. Most spiders have six spinnerets.

Spiders use complex organs to transfer the sperm from the male to the female. The male sperm-transfer organ is located at the end of the pedipalp. The female has a set of ducts and sperm-storage containers between the book lungs on the ventral side of the abdomen. The female reproductive organ, the epigynum, can be seen as a darkened spot on the abdomen.

Since the exoskelton is hard, it does not grow as the spider grows and must be shed. The molting process occurs periodically, usually eight to 12 times before reaching adulthood. If the spider feeds a lot and grows rapidly, molting occurs fairly often, as much as every few weeks. Before molting, the spider stops feeding. It molts in a retreat or suspended by a silk thread. Spiders are very vulnerable to predators when molting.

Illustrations by Dr. Petra Sierwald.

Life history

Spiderlings exiting the egg sac look like adults, only smaller, and can build webs and hunt immediately. They feed, grow and molt until reaching adulthood, when the reproductive organs are mature. At this point, most males stop hunting and feeding, although females continue to eat.

Adult males spin a small, triangular web on which they release a drop of semen (containing sperm). The semen is placed in the male reproductive organ in the pedipalp. Males search for females who are ready to mate, guided by chemicals released by the female. When a receptive female is found, the male must communicate to her through courtship that he wants to reproduce, or he takes a chance on being her next prey item. Depending on the species, he may send vibrations as signals (pull on threads of the web, drum his legs on the substrate) or wave his legs and pedipalps. Once he receives the proper reply, he proceeds to transfer the sperm from the pedipalp into the openings of the epigynum. The female makes a silken egg sac and deposits hundreds of eggs in it. The egg sac may be carried with her, deposited in a safe place, or, in some species, guarded. If insects are abundant and weather conditions are favorable, females may make several egg sacs in one season.

Sometimes the female eats the male after he finishes transferring the sperm. Most adult spiders die soon after reproduction. In cool climates, spiders may overwinter in the egg stage. Some hibernate as immatures. The natural life span is one or two years.

Webs

All spiders are predators, but not all of them build webs to catch prey. Those that do build webs have three claws at the tip of each of the eight legs. Most have four to six different types of silk glands in the abdomen. Silk is liquid protein that becomes solid when it is drawn out of the spigots on the **spinnerets**.

There are many different types of webs. Orb webs are those most often thought of as typical spider webs. The orb web is anchored to plants by frame threads. Radii are placed from the center to the edge, like spokes on a wheel. Then a temporary spiral is added, soon to be replaced by a sticky spiral. Insects fly into the sticky web, are trapped and then captured by the spider. The prey may be wrapped in silk and eaten later. Orb-weaving spiders replace their web once every 24 hours. Some orbweavers may build only half of a web. The bola spiders use a single thread of silk with a drop of sticky glue at the end to swing against flying insects.

Cob web spiders build irregularly shaped webs that may be placed in plants or even in houses. Insects get caught in the threads, and the spider runs out to throw sticky silk on the prey.

Funnel webs are built as a horizontal triangle that ends in a funnel where the spider hides. Sheet web spiders build a flat sheet web with other web threads above and below it.

Photo © Hank Guarisco.

Glossary

abdomen • rear body section of a spider; contains the **spinnerets**, intestines, **book lungs**, tracheae, silk glands and the internal reproductive organs

arthropod • animal with jointed legs and an **exoskeleton**; insects, spiders, ticks, centipedes, millipedes, crayfish, lobsters, mites and scorpions

book lungs • one (rarely two) pair of lungs opening on the ventral side of the **abdomen**; they have many thin structures for gas exchange that resemble the pages of a book

carapace • hard one-piece covering of the top of the **prosoma**

cephalothorax • also known as the prosoma, it is the front section of the spider with the fused head and thorax; contains the **chelicerae**, pedipalps and legs

chelicerae • mouthparts of spiders; movable base and movable fang with poison gland opening near the tip

exoskeleton • hard outer covering of **arthropods**

prosoma • also known as the **cephalothorax**, it is the front section of the spider with the fused head and thorax; contains the chelicerae, pedipalps and legs

spinnerets • structures at the end of the abdomen for releasing silk from the silk glands

venom • a toxin produced in poison glands of most spiders; usually acts on the nervous system of the prey

venomous • organism capable of producing **venom**

References

American Arachnological Society Committee on Common Names of Arachnids. 2003. *Common names of arachnids*. http://arabsq.org/articles/acn5.pdf

Field Museum of Natural History. 2005. http://www.nwgb.edu/biodiversity/gbspiders/index.htm. Field Museum of Natural History, Chicago, Illinois.

Levi, H. W. and L. R. Levi. 2002. *Spiders and their kin*. St. Martin's Press, New York. 160 pp.

Macnamara, P. 2005. *Illinois insects and spiders*. The University of Chicago Press, Chicago, Illinois. 118 pp.

Sierwald, P. et al. 2005. *The spider species of the Great Lakes states*. Indiana Academy of Sciences. 114(2): 111-206.

Sierwald, P. and C. Maier. 1992. *Amazing spiders*. Delaware Museum of Natural History, Wilmington, Delaware. 84 pp.

Sierwald, P., C. Washer, and S. Voss. 1995. *Spiders! A guide for elementary teachers and students to accompany the exhibition Spiders!* Smithsonian Institution, Washington, DC. 118 pp.

Teck, D. 1996. *Venomous spiders of Illinois*. Illinois Department of Natural Resources, Springfield, Illinois. 2 pp.

Spiders & humans

Spiders are very beneficial to humans, particularly through insect control. Silk threads of cob web spiders have been used in optical instruments. Spider **venom** is used in research for drug development. Spiders have also been used to study the effects of weightlessness in space and the hazards of drug use.

Most spiders do not bite humans. Although some spiders are large enough to puncture human skin, the bite in most cases causes no problems at all. There are only two spiders in Illinois that are considered to have a dangerous bite: the brown recluse (*Loxosceles reclusa*) and the black widow (*Latrodectus mactans*). No bites to humans have been attributed to the northern black widow (*Latrodectus variolus*), a species that lives in forests.

The brown recluse may live in houses. Bites generally occur when clothing, bedding or towels containing the spider come into contact with human skin. Some bites show no severe effects. Others may cause a red welt to rise, followed by a crust that falls off. It may take several months for the wound to heal. This long-legged species has a dark brown marking in the shape of a violin on the **cephalothorax**.

The black widow builds a web under objects in outbuildings, trash piles and other similar locations. Male black widow spiders roam about and do not bite, but the female generally stays at the web and will bite if provoked. The bite may not be noticed, but severe abdominal pain, sweating, swollen eyelids, muscle pain and other symptoms will arise. The person usually recovers within a few days. Antivenin is available. The female of this species is about a half-inch long with black coloration and a red hourglass shape on the **abdomen**.

If bitten by any spider, try to catch the spider and preserve it. Do not pick up the spider. Put a container over it to entrap it. Once it is settled inside the container, turn the container over, add rubbing alcohol to kill and preserve the spider for later identification, and cover the container with a lid. Call your local poison control center or physician should you have any reaction to the bite.

Spider facts

- Spider reproductive organs are so unique that they can be used to identify all of the more than 40,000 spider species in the world.
- Wolf spider females carry their spiderlings on their **abdomen**.
- Cob web spiders feed their spiderlings by regurgitating food droplets for them.
- Some spiderlings travel by ballooning. They climb to the top of shrubs or tall grasses and release silk from the **spinnerets**. Wind currents pick them up and disperse them. In the fall of the year on sunny, windy days, masses of ballooning spiders are often seen.
- Spiders are prey for many other species. To reduce their risk of being eaten, spiders are often camouflaged to match their surroundings. They may also drop out of the web and play dead. Warning coloration is used by other spiders, such as the brightly contrasting black and red coloration of the black widow.
- The mud dauber wasp catches spiders, stings and paralyzes them, then takes them into the mud chambers of her nest. This wasp will place a single egg on each living spider. When the eggs hatch, the larvae feed on the spider, eventually killing it. Other fly and wasp species attack spider egg sacs.
- Fishing spiders can stay under water for up to 40 minutes.
- A jumping spider can jump 20 times its own body length.
- When a web is taken down by a spider, the old web material is eaten. Studies have shown that the protein from the old, eaten web can reappear in newly produced silk in about 30 minutes.
- Spiders spit digestive enzymes on or in prey to digest tissues. They suck in the resulting liquid and the prey's body fluids.

Family descriptions

FUNNEL WEB SPIDERS — **FAMILY AGELENIDAE**
These spiders sit at the end of their funnel-shaped web as they wait for insects. Webs are often seen in late summer and early fall close to the ground and covered with dew. The female dies in fall after depositing her eggs in an egg sac.

barn funnel weaver — *Tegenaria domestica*

SAC SPIDERS — **FAMILY ANYPHAENIDAE**
Sac spiders build a sac-shaped retreat for hiding and molting. They hunt without the use of silk. Members of this family have two leg claws and the tracheae open in the middle of the **abdomen**'s underside.

garden ghost spider — *Hibana gracilis*

ORBWEAVING SPIDERS — **FAMILY ARANEIDAE**
The spiders in this group build orb webs. The familiar yellow garden spider is a member of this family. This large spider prefers to build its web in prairie grasses and sometimes gardens. The female has black front legs while the other legs are black with a brown section near the body. Males have black legs.

yellow garden spider — *Argiope aurantia*
arrowshaped micrathena — *Micrathena sagittata*

DYSDERID SPIDERS — **FAMILY DYSDERIDAE**
These nocturnal spiders have six eyes. They have four book lungs with four breathing slits visible on the ventral side of the abdomen.

wood louse eater — *Dysdera crocata*

WOLF SPIDERS — **FAMILY LYCOSIDAE**
Wolf spiders are very common and have four small eyes below four large eyes. They hunt on the ground, in leaf litter, in trees and on the water. Some dig tunnels or burrows.

wolf spider — *Schizocosa avida*

SAC SPIDERS — **FAMILY MITURGIDAE** (formerly Clubionidae)
Many sac spiders are **venomous**. Humans bitten may have a fever and tissue decomposition around the bite.

longlegged sac spider — *Cheiracanthium mildei*

DADDY-LONG-LEGS SPIDERS — **FAMILY PHOLCIDAE**
Commonly found in houses, these spiders are similar in appearance to another group of arachnids known as daddy-long-legs (harvestmen, have two eyes, body in one section) that are not spiders at all.

shortbodied cellar spider — *Spermophora senoculata*

NURSERYWEB SPIDERS — **FAMILY PISAURIDAE**
Waiting patiently or actively hunting are both methods used by nurseryweb spiders to capture prey. They are large arachnids, and some hunt on water. They may eat tadpoles and small fishes as well as insects. The female carries the egg sac with her and constructs a nurseryweb when the spiderlings are due to hatch. The spiderlings stay in the nurseryweb, guarded by their mother, for about one week and then disperse.

six-spotted fishing spider — *Dolomedes triton*

JUMPING SPIDERS — **FAMILY SALTICIDAE**
Jumping spiders have excellent vision and pounce on their insect prey. The males dance as part of their mating behavior.

Pike slender jumper — *Marpissa pikei*
bold jumper — *Phidippus audax*
jumping spider — *Phidippus clarus*
jumping spider — *Phidippus mystaceus*
zebra jumper — *Salticus scenicus*

RECLUSE SPIDERS — **FAMILY SICARIIDAE** (formerly Loxoscelidae)
These six-eyed spiders use a sheet web to capture insects. Often living in houses, the brown recluse has a venomous bite. Bites generally occur when people put on clothing or use a towel in which a recluse is resting.

brown recluse — *Loxosceles reclusa*

LONGJAWED SPIDERS — **FAMILY TETRAGNATHIDAE**
These spiders have large fangs that are used in mating. They build orb webs over water. Some are commonly found along creeks and ponds, where they eat many mosquitoes and midges.

longjawed orbweaver — *Tetragnatha guatemalensis*

COB WEB WEAVERS — **FAMILY THERIDIIDAE**
The sticky threads are outside the spider's retreat, often connected to the substrate. Males court females by vibrating web threads.

common house spider — *Achaearanea tepidariorum*
northern black widow — *Latrodectus variolus*
false widow — *Steatoda triangulosa*

CRAB SPIDERS — **FAMILY THOMISIDAE**
These spiders resemble crabs in the way their legs are positioned. Instead of using a web, they wait in flowers then capture prey directly.

goldenrod crab spider — *Misumena vatia*
whitebanded crab spider — *Misumenoides formosipes*
celer crab spider — *Misumenops celer*
crab spider — *Misumenops oblongus*
crab spider — *Xysticus ancificus*
crab spider — *Xysticus ferox*

These descriptions apply to the families and species depicted on the front of this poster. Not all spider families nor species found in Illinois are included here.

Resources

More information about spiders is available from the developers of this poster. The Illinois Department of Natural Resources' (IDNR) Division of Education provides materials and programs on a variety of topics, including spiders. The *Biodiversity of Illinois* series of CD-ROMs from the IDNR Division of Education includes images and life history information about spiders found in the state. The CD-ROMs are available to teachers by written request on school letterhead. Mail request to the address listed below. The CD-ROMs may also be borrowed from lending locations throughout Illinois. For a list of lending locations, go to http://dnr.state.il.us then click on the "Education" button in the right side bar. Many additional resources may be accessed through the IDNR online order form for educational materials (http://dnr.state.il.us/lands/education/classrm/edmats02.htm). Scientists at the Field Museum of Natural History (FMNH) study spiders and maintain a research collection of spider specimens. Educational materials may be borrowed from the Harris Loan Center of the FMNH.

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312-665-7755 Harris Loan Center
http://fm1.fieldmuseum.org/helc/?n=4 Harris Loan Center

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