



SPIDER PROGRAM (kindergarten to grade 5)

The Swan Lake Spider Program is a one-hour presentation that can be delivered in your classroom or at Swan Lake Christmas Hill Nature Sanctuary.

For classroom presentations please provide the following:

- *Large easy-to-read student nametags
- *Place to display charts
- *A list of student questions (optional)
- *3 centres: desks clustered or tables (one could be on the floor)

Swan Lake nature programs strive to support Teachers in the classroom:

Big Ideas:

- Plants and animals have observable features (K)
- Living things have features and behaviours that help them survive in their environment (gr.1)
- All living things have a life cycle (gr.2)
- Living things are diverse, can be grouped, and interact in their ecosystems (gr.3)
- All living things and their environment are interdependent (gr.4)

Content:

- Behavioural adaptations of animals in the local environment (gr.1)
- The ways organisms in ecosystems sense and respond to their environment (gr.4)
- Digestive, excretory, respiratory and circulatory systems (gr.5)

GOALS

The goals of this program are for students to:

- a) Appreciate and respect spiders and the important role they play in the environment
- b) Understand more about spiders: their anatomy, how they catch food and eat, the uses of silk and the spider's life cycle
- c) Observe living spiders, local and exotic
- d) Compare some of the different kinds of spiders on Vancouver Island

PRESENTATION

The presentation will involve elements of the following with a focus on the **importance of spiders** as food for other animals and as predators of insects. A student will be dressed-up as a spider to help cover the following general topics:

- a) Body of the spider: external and internal parts
- b) Exoskeleton, movement and shedding
- c) Breathing and Circulation
- d) Senses
- e) Silk and its uses
- f) Digestive system: what and how the spider eats

g) How to tell male from female spiders

There will also be an exploration of the following:

1. Live exotic spider: **Tarantula**, lenses, exoskeletons (chair for presenter needed) **Please note that students will not be permitted to hold the tarantula or other spiders.**

2. **Live local spiders:** Black Widow, False Black Widow, House spider etc., using hand held lenses for observation and photos

3. **Silk and Senses:** egg sacs, cobwebs, photos of spinnerets, leg hairs, eyes, different kinds of websites, tuning fork to vibrate “threads”, making-an-orb-web sequence cards

CONCLUSION

This is the time for any further questions and a general wrap-up.

POSSIBLE VISITORS

1. **Rosebud**, the female Chilean Rose Tarantula (*Grammostola rosea*)

This kind of tarantula is native to Bolivia, Northern Chile and Argentina in the desert or scrubland areas. There are two colour phases of the Chilean Rose: Rosebud is a tan to brown overall colour with pink hairs and a pink cephalothorax. The other phase has red hairs all over its body. Chilean Rose Tarantulas are quite docile and grow to about 4.5 to 5.5 inches or 12 to 14 cm. Males have a shorter life, but the females can live up to 20 years or so in captivity. They do not need much space, surviving in 5 gallon terrariums. Rosebud eats about 1 cricket a week, and needs water in a dish. She is kept in a room at about 76° F or 22° to 26°C.

2. **Western Black Widow** (*Latrodectus hesperus*)

These spiders can be found at Island View Beach in the rocky areas behind the beach. There are several areas in Victoria that would provide good habitat for these spiders. Although Black Widows are one of the most venomous spiders in the world, very few people are bitten by this spider because it is extremely shy and reclusive. The typical Black Widow (*L.mactans*) with the complete red hourglass on the under surface of the female's abdomen, is found in more tropical places. This Western Black Widow (and also the Northern) has an incomplete red hourglass although some do not even have the hourglass.

3. **Other local spiders** may include the false black widow, the Garden spider, House spider, or Jumping spider.

Payment:

An invoice will accompany the confirmation letter you receive. Payment is due at the time of the program, and cheques should be made out to **Swan Lake Nature Sanctuary** and given to the programmer: **VISA or MC** payments may be phoned in. Receipts will be sent by fax or e-mail upon request.

Change of Dates and/or Times:

If you wish to change the date or time of your program please contact us at **250.479.0211** or at programs@swanlake.bc.ca. We will do our best to accommodate your request, depending on available times and dates.

SPIDER INFORMATION

Remarkable Spiders

- spiders are related to scorpions, mites, ticks and other arachnids
- 35,000 species have been discovered, but there are possibly two to five times that number.
- one of the most successful animal - have been around over 300 million years and live in almost every kind of habitat
- all are predators - undoubtedly their success is based on many uses they have for silk

Spiders: Insects' Relatives

- Most spiders have eight eyes and see in all directions at once.
- Spiders are distant cousins of insects and like insects they wear their skeletons on the outside of their body.
- Like insects spiders lay eggs. There is no larval stage – incomplete metamorphosis.
- If all of the young spiders (spiderlings) stayed in the place where they hatched, they would have to fight each other for food. In fact, they might even eat each other. They need to be able to travel far away and disperse from each other but how? Spiders don't have wings but they do have a way to fly through the air when they need to. They produce fine strong strands of silk from six spinnerets on their abdomen. The silk is liquid, but it dries as soon as the air touches it. When spiders want to travel, they raise their abdomens and send out strands of silk. The silk thread is caught by the breeze and the spider is carried off through the air. This is called **ballooning**. Although most of them only go up a few hundred meters, ballooning spiders have been found 4200 m (14,000 ft.) up in the air.

Spider Anatomy

- basically consists of two body parts joined by a narrow waist

(i) Cephalothorax

- combined head and thorax
- contains the brain and carries the eight legs, the two leg- like palps, the jaws or chelicerae (each with a moveable fang to inject venom) and simple eyes - usually eight in number but variously arranged and develop according to family
- most spiders have limited vision and rely mainly on touch

(ii) Abdomen

- contains heart, digestive tract, reproductive organs, respiratory opening and silk glands
- at the end of the abdomen are the spinning organs - spinnerets (numbering two, four or six)
- males carry a pair of accessory sex organs on the end of palps
- genital openings of both male and female is located on the underside of the abdomen
- **legs**
- made up of seven segments, having many hairs to detect the slightest vibration
- each leg ends in a tiny claw and sometimes a dense brush of hair gives adhesion on vertical surfaces

Life Cycle

- newly hatched spiders resemble tiny adults
- in growth from spiderlings to adult : 5-10 moults
- lost or damaged limbs can be regenerated during a moult
- most live for one or two years though female tarantulas and trap door spiders can survive for up to twenty

The Various Uses of Silk

- besides the construction of webs, spiders have many other uses for silk
- the web-less hunters build no webs at all but employ silk in various other ways
- in some species of crab spiders, the male ties up the female with silk, the bridal veil, prior to mating
- before copulation, male spiders make a special sperm web (or line) onto which they deposit a couple of drops of sperm to be taken up in the syringe-like palp organs

Courtship

- males and females of a given species are often strikingly different in appearance
- adult males are easily recognizable by their conspicuously enlarged palps
- as a rule, females are larger than males of the same species but sometimes the male is so small that he is able to avoid being taken for food and can climb without fear over the female's body
- courtship is lengthy; its purpose to replace the female's predatory instinct with the desire to mate
- females are often detected by the scent left on their draglines
- male web spinner introduces himself by plucking the strands of the female's web
- he is usually afraid of the female but after making the right vibrations he approaches sometime he waits for days and may make his move only when she is occupied with an insect or about to make her final moult
- in spiders with good vision (wolf spiders) and brightly coloured jumping spiders, the males *dance* before the females, waving their legs and palps and putting on special poses
- in many species an excited drumming of the palps occurs

Reproduction

- sperm is transferred to the female by inserting the tip of the palp into the female's genital opening and squeezing the reservoir
- the female and male organs fit together (in the same species) like a **lock and key**
- after mating, the males need to be careful to avoid being eaten by the females
- female lays her eggs in one or more silken sacs, each containing just a few to a thousand or more in larger species
- depending on the species, the cocoon may be suspended in a web or enclosed in a retreat, attached below a leaf, placed in a crevice or buried in soil. Often they are cleverly camouflaged. Wolf spiders carry their egg sacs around with them, usually attached to the spinnerets. (Sometimes a bereaved spider would accept false substitutes such as the cocoons of other spiders, cork balls etc.)
- some spiders carry their cocoon in their jaws
- young spiderlings emerge after a few weeks or often not until the following spring; they resemble miniature adults.
- in some species, there is parental care until they leave the nest, but in others the young are on their own from birth
- often spiderlings disperse on airborne lines of silk

Enemies of Spiders

- spiders have many enemies for example: birds, lizards, geckos, mammals, ants, centipedes, scorpions and other spiders
- there are also myriads of insect and worms which parasitize the spiders or their eggs
- there are even spider - hunting wasps

Building an Orb Web

- complicated connections, angles and tensions- the two-dimensional orb web is an amazing feat of engineering, usually constructed at night and relying on touch alone
- type of web constructed by about 3,000 species of spiders, mostly in the family Araneidae
- often it is possible to identify the species from particular details of the web
- to start construction the spider moves from her hiding place to take up a prominent position. Using the breeze, a silk line of the finest filament is wafted out, but in calm conditions, the line may be initiated by dropping down on a dragline. After climbing back up, the resulting loop of line is floated up on to the air. The spider waits, as if fishing, until the first line, the **spanning thread**, touches and adheres to an object across the gap
- feeling the thread fixed, she tightens it and runs across, back and forth, creating a start cable of many strands: the **bridge thread**
- then from the middle of the bridge thread, the spider attaches a line, drops down and fixes it below. Under tension the resulting **Y** structure marks the centre (**hub**) and first three **radii** of the future orb web
- after fixing some **mooring thread** (guy lines) the next stage establishes the radii (10-80) which radiate from the hub to near the edge of the orb
- each radius is produced twice, the first temporarily on the outward movement; then cut and replaced by a permanent line, laid in the return to the hub
- hub is reinforced and surrounded by three or four circular threads: the **strengthening zone**
- from this zone, **the temporary spiral** is laid out towards the edges of the orb. It ties the radii together and serves as a non-sticky guide-line when the permanent **sticky spiral** is put down on the return to the hub (simultaneously cutting out the temporary spiral)
- **free zone** in middle where spider can dodge
- entire web can take about an hour, the sticky spiral being the longest operation
- combined length of thread in webs is about 60 - 200 ft (20 - 60 m) for a garden spider
- when web is completed, the spider settles on the hub, operating to a retreat where it touches the web with a single thread held by a foot
- spider continually adjusts and loads tension
- spiders construct 100 webs in a lifetime

How Webs Capture Prey

- webs are designed primarily to catch insects
- orb webs need to be capable of preventing escape of flying or jumping insects for at least 5-10 seconds, until the spider arrives to attack
- spiders make repairs to their webs
- why don't spiders stick to their own webs? As far as possible, spiders walk on the non-sticky radii but in addition, the legs are groomed with an oily coating which does not stick to the web. However, a spider may get stuck if it happens to be in the web of another kind of spider or if it is picked up and thrown back into its own web

Production of Silk

- one to six different kinds of spinning glands (greatest number in orb weavers). Each type of gland secretes a particular kind of silk and leads to particular spinneret. One gland produces the sticky silk, one produces the dragline silk and another the swathing silk.
- spider silk is very strong but extremely fine. For an equal diameter, spider silk is stronger than steel and about as strong as nylon. It is however, much more resilient and can stretch several times before breaking - twice as elastic as nylon and more difficult to break than rubber
- dragline silk is especially strong - approximately twice that of silk from the silkworm
- great diversity of webs

- some are designed to catch flying insects, jumping insects and get other crawling insects
- many orb-weavers renew their webs daily; whereas most sheet-weavers continue to add to the sheet long after it has been built
- some spiders make an unusual orb - ladder web. The web looks like an unfinished orb and is made of *non-stick* silk. These sorts of webs are more effective at catching moths than the regular orb web.

Most Feared Spiders

- Brazilian wandering spider's - leg span of about five inches (12 cm)
- common in urban areas, where they find abundant food (cockroaches and other insects)
- live beneath fallen trees, wood piles - hunt actively at night - overcome prey with strength of their venom; they do not construct webs
- will often enter a house and find a hiding spot during the day such as in shoes and under furniture and door knobs
- this spider is aggressive to humans - does not retreat when molested and can leap up the handle of a broom used to fend it off; bite causes intense pain
- unlike the Brazilian wandering spider, many spiders whose bites are dangerous are actually timid and quite unimpressive (i.e. black widow)

Black Widow Spiders

- when disturbed black widows often fall from their webs and pretend to be dead
- usually only bite when accidentally pressed against the body of the victim; however bite can be extremely painful, not so much at site of penetration as in the chest, lower abdomen and legs
- many muscles go into spasm & cramps
- pain has been described as being similar to having one's flesh torn away by a pack of wild dogs
- victims who have previously suffered painful injuries or difficult child birth have said the pain was tolerable compared with the agony of a black widow spider bite
- in medical terms, the symptoms of a bite are systemic with accelerated heart beat, increased blood pressure, difficult breathing and paralysis. If death does occur it's because the breathing muscles are paralysed and victim suffocates.
- venom 15 times more potent than that of a rattlesnake, however, injected in minute quantities and so mortality is low: less than 5% compared to 15 - 20% for rattlesnake bite

The Poisoned Kiss

- because spiders use their jaws or chelicerae they bite not sting
- spiders' fangs are jabbed into skin and held there for several seconds while venom glands are squeezed by muscles to deliver the toxic liquid via ducts which open at the ends of fangs
- spider bite is distinguished by the double puncture mark
- only one family of spiders lacks venom glands (Uloboridae)
- all spiders are venomous - if not always for humans then at least to their insect prey
- close to 35,000 known species of spiders in the world, perhaps 500 or so are capable of inflicting a significant bite on humans

Bad News for Insects

- Spiders made their first appearance on earth about 300 million years ago. This was about the time the first flying insects appeared. In fact, some people who study insects think that they developed wings to try to get away from spiders.
- Spiders eat huge amount of insects - the weight of insects eaten by spiders each year is probably greater than the total weight of all the people living on earth.