**BENEFICIAL ANTHROPODS**

**SYRPHID, HOVERFLY OR FLOWER FLIES**

Syrphid flies are regularly found where aphids are present in agricultural, landscape, and garden habitats. Adults of this stingless fly hover around flowers, have black and yellow bands on their abdomen and are often confused with honeybees. Syrphid flies undergo complete metamorphosis with 3 larval instars. Females lay their whitish to gray oblong eggs, each measuring 1 mm (1.32 inch), singly on their sides usually near aphids or within aphid colonies. Larvae are legless and maggot shaped and vary in color and patterning but most have a yellow longitudinal stripe on the back. They can be distinguished from caterpillar larvae by their tapered head, lack of legs and their opaque skin, through which internal organs can be seen. Larvae vary in length from 1 to 13 mm (1/32 to 1/2 inch) depending upon their developmental stage and species. Pupa are oblong, pear-shaped, and green to dark brown in color. Pupation occurs on plants or on the soil surface.

Adult syrphid flies feed on pollen and nectar, while it is the larval stage that feeds on insects. Larvae of predaceous species feed on aphids and other soft-bodied insects and play an important role in suppressing populations of phytophagous insects. Larvae move along plant surfaces, lifting their heads to grope for prey, seizing them and sucking them dry and discarding the skins. A single syrphid larva can consume hundreds of aphids in a month. Not all syrphid fly larvae are predaceous, some species feed on fungi.

**LADY BEETLE**

Reproduction

Ladybugs reproduce sexually. Each species of ladybug has its own pheromones for attracting a mate. When they find each other, the male grips the female from behind and holds on tight. They can copulate (stay together) for more than 2 hours at a time. Female ladybugs can store a male's sperm for 2-3 months before laying eggs. Ladybugs tend to lay their eggs where food is abundant.

**Egg – Embryonic Stage:**

Once she has mated, the female ladybug will lay a cluster of 10-50 eggs on a plant with suitable prey for her offspring to eat when they hatch. Usually, she'll choose a plant infested with aphids. Between spring and early summer, a single female ladybug may produce up to 1,000 eggs.

Scientists believe ladybugs lay both fertile and infertile eggs in the cluster. When aphids are in limited supply, the newly hatched larvae will feed on the infertile eggs.

Larvae typically emerge from their eggs in about 4 days, although species and environmental variables such as temperature may shorten or lengthen this time frame.

**Larva – Larval Stage:**

Ladybug larvae look somewhat like tiny alligators, with elongate bodies and bumpy exoskeletons. In many species, the ladybug larvae are black with brightly colored spots or bands.

In the larval stage, ladybugs feed voraciously. A single larva can consume dozens of [aphids](http://insects.about.com/od/truebugs/p/Aphididae.htm) per day. Larvae feed on other soft-bodied plant pests as well, including scale insects, adelgids, mites, and insect eggs. Ladybug larvae don't discriminate when feeding, and will sometimes eat ladybug eggs, too.

The newly hatched larva is in its first [instar](http://insects.about.com/od/entomologyglossary/g/def_instar.htm). It feeds until it grows too big for its cuticle, at which time it will molt. After molting, the larva is in the second instar. Ladybug larvae usually molt through four instars, or larval stages, before preparing to pupate. The larva will attach itself to a leaf or other surface when it is ready to pupate.

**Pupa – Pupal Stage:**

In its pupal stage, the ladybug is usually yellow or orange with black markings. The pupa remains still, attached to a leaf, throughout this stage. The ladybug's body undergoes a remarkable transformation, directed by special cells called histoblasts. The histoblasts control a biochemical process through which the larval body is broken down and reformed into the adult ladybug.

Depending on the species and environmental variables such as temperature, the pupal stage may last 3 to 12 days.

**Adult – Imaginal Stage:**

Newly emerged adults, or imagos, have soft exoskeletons, making them vulnerable to predators until their cuticles harden. They also appear pale and yellow when they first emerge, but soon develop the deep, bright colors for which ladybugs are known.

Adult ladybugs feed on soft-bodied insects, just as their larvae do. Adults overwinter, usually hibernating in aggregations. They mate soon after becoming active again in the spring.

**Life Cycle**

Lady beetles overwinter as adults, often in aggregations along hedgerows, beneath leaf litter, under rocks and bark, and in other protected places including buildings. In spring, the adults disperse in search of prey and suitable egg laying sites. This dispersal trait, especially strong in migratory species such as the commercially available convergent lady beetle, can affect the reliability of control by released adult beetles.



Female lady beetles may lay from 20 to more than 1,000 eggs over a one to three month period, commencing in spring or early summer. Eggs are usually deposited near prey such as aphids, often in small clusters in protected sites on leaves and stems. The eggs of many lady beetle species are small (about 1 mm; 1/25"), cream, yellow, or orange, and spindle-shaped. They resemble those of Mexican bean beetle and Colorado potato beetle, but are usually smaller.

Lady beetle larvae are dark and alligator-like with three pairs of prominent legs. Depending on the species and availability of prey, larvae grow from less than 1 mm (1/25") to about 1 cm (3/8") in length, typically through four larval instars, over a 20 to 30 day period. Large larvae may travel up to 12 m (about 40') in search of prey. The larvae of many species are gray or black with yellow or orange bands or spots.

The last larval instar remains relatively inactive before attaching itself by the abdomen to a leaf or other surface to pupate. Pupae may be dark or yellow-orange. The pupal stage may last from three to 12 days depending on the temperature and species. The adults emerge, mate, and search for prey or prepare for hibernation, depending on the availability of prey and time of year. Adults may live for a few months to over a year. The more common species typically have one to two generations per year.

**BRACONID WASP**

Life Cycle

An adult female lays her eggs inside a host organism by piercing its skin with her long sting-like ovipostor.  Her ovipositor injects the eggs inside the host, where, once hatched,  they will eat the host's viscera (internal organs) while developing.  The host (amazingly!) remains alive during this process.

When the wasp larvae are ready for the next stage of development, they eat their way out of the caterpillar. They then spin themselves into the tiny white cocoons you see hanging on the outside of the hornworm.  Here they will pupate until they are ready to emerge as adult cocoons.  The caterpillar soon dies after this.

**ASSASIN BUGS**

**Reproduction**

Assassin bugs reproduce sexually and asexually. They also have incomplete metamorphosis. The female assassin bug does not need to have her eggs fertilized but can be. Once the female lays her eggs, she dies soon after. Then the brown, tube shaped eggs hatch after about one week. The new assassin bugs molt after two weeks and in six to nine weeks become of age.

The male will ride on top of the female until she has oviposition, this is mate guarding. The males will also guard the eggs unlike most insects. Assassin bugs are one of eleven types of insects that do that. Male assassin bugs guard eggs because this is more attractive to females than males without eggs. This is because it shows the females that the male will care for the eggs

Life Cycle

Assassin bugs lay their eggs during the warmer months between May and October on leaves or in the soil. The eggs resemble brown barrels and are found standing in tight, upright clusters. The eggs hatch in the spring time in the nymph stage. Nymphs look very similar to adults except that they have yet to develop wings. Nymphs go through five instars, or short development stages, where they shed their exoskeleton in order to grow. During these instars, which can last up to three months, assassin bug nymphs develop wings and become adults. They will live as adults for another 6-12 months.

**Predatory Mites**

**Life Cycle**

Predatory mites have five stages in their life cycle—egg, six-legged larval stage, protonymph, deutonymph, and adult. Most beneficial species have a life cycle very similar to what is outlined below.

Eggs are oval, clear, larger than spider mite eggs (which are round), and typically laid on the underside of leaves. They are laid individually and the larvae hatch in 2-3 days

Larvae have three pairs of legs (six total) and begin-feeding on prey immediately after hatching. After feeding on one or two prey for one or two days they molt to the protonymph stage.

Protonymphs and deutonymphs are first and second stage nymphs, respectively, that increase in size and have four pairs of legs (eight total). Each stage consumes prey over one or two days, getting slightly larger and eventually molting to adulthood.

Adult females consume about two prey per day for about five to six weeks. They deposit an average of 33 eggs during that time. Males consume about one prey per day for about four to five weeks. Predatory mites have multiple generations per year and develop from egg to adult in 6 – 12 days. Western predatory mites go into diapause (dormancy) when there are less than 11 hours of daylight. There are, however, non-diapausing strains that can be used effectively in greenhouses during short winter days. Adults overwinter in protected places, such as bark, leaves or soil debris.

**Green Lacewing**

Reproduction

 After mating, females lay dozens to hundreds of small eggs underneath leaves, each stuck on the end of a fine hairlike shaft that keeps it up off the surface of the leaf. They lay their eggs on plants with infestations of aphids to serve as food for the hatchlings.

Life Cycle



Lacewings go through complete metamorphosis (egg, larva, pupa, adult) and have at least two generations per year. The life cycle takes about 4 weeks depending on temperature. A female lacewing can deposit over 200 eggs. In 4 to 5 days, the eggs will hatch into small alligator-like larvae.

Lacewing larvae are brownish and can have dark reddish-brown stripes and spots (Fig. 3). They have large jaws for grasping prey and injecting a paralyzing venom. Lacewing larvae, sometimes called aphid lions, typically feed on soft-bodied insects such as aphids, mealy bugs, thrips, mites, leaf hoppers, whiteflies, caterpillars, other immature insects, and sometimes each other. The larvae develop three instars in 2 to 3 weeks, and are 9.5 mm long when full grown. Larvae will spin a silken pale cocoon that is loosely attached to foliage. During the pupal stage they develop wings and reproductive organs.

After 5 to 7 days the adult will emerge from the cocoon and begin to mate. Adult lacewings have chewing mouthparts, are about 8- 9 mm long, and feed mostly on nectar and pollen. They can survive for about 5 to 6 weeks and are considered weak flyers. Lacewings are often found in crops highly infested with aphids, such as sweet corn, potatoes, cole crops, tomatoes, peppers, eggplants, asparagus, leafy greens, apples, strawberries, and alfalfa. Adults are also highly attracted to lights at night.