

Lady Beetles of South Dakota

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Introduction

A common beneficial insect (i.e., provides a benefit to humans) that is found in crops and gardens throughout South Dakota is the lady beetle (also referred to as ladybird beetles or ladybugs). All lady beetles belong to the family Coccinellidae, with some species having agricultural significance in the form of a biological control. Other species are more commonly observed in non-agricultural settings, but still play a vital role. As beneficial insects providing biological control of pests, it is important to consider lady beetles when making pest management decisions. This guide will help you to monitor for, properly identify, and promote the growth of these beneficial insects.

Lady Beetle Biology

Description.

In South Dakota, there are at least 79 species of lady beetles (Coleoptera: Coccinellidae)⁶. These species vary in both size and color. Lady beetles generally range in size from 0.03 to 0.7 of an inch. Lady beetle adults may be black, brown, orange and red in color. In addition, many lady beetle species have patterns of spots or stripes present on their bodies¹². Adult lady beetles typically have a round to elliptical, dome-shaped body, which differs from the long, slender bodies of most other beetle species.

Lady beetles, like other insects, have three major body sections: the head, thorax, and abdomen (Figure 1). For lady beetles, the head is quite small and is usually not easily distinguishable from the thorax. Compound eyes, mandibles, and antennae are all found on the head. The thorax, including the pronotum^a, will often differ in color from the abdomen and may have unique

markings that can be used to identify a particular species. Although the wings of lady beetles originate from the thorax, they rest over the abdomen. The first pair of wings (forewings) are called elytra^b, and are modified, hardened wings that are used to protect the soft, membranous^c, second pair of wings (hindwings). Similar to the markings that may be present on the pronotum, lady beetles may also have markings on the elytra that can be used to identify a particular species. Like all insects, lady beetles have three pairs of legs.

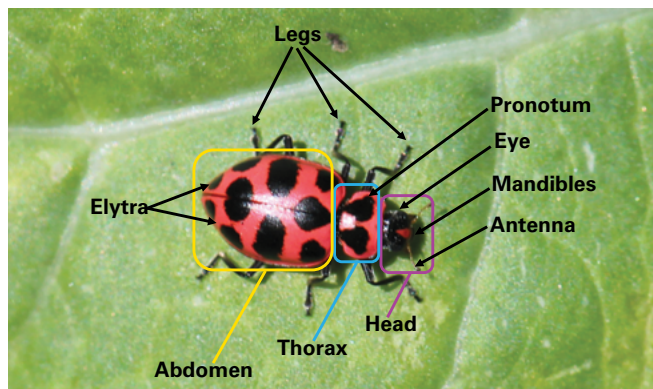


Figure 1. General anatomy of an adult lady beetle.

Life Cycle.

Lady beetles develop from an egg to an adult through a process called complete metamorphosis^d or holometabolism^d. The stages of the process are egg, four larval instars, pupa and adult⁷. Of the four stages, the larva and adult are important natural enemies of arthropod pests.

The first life stage of the lady beetle is its egg form. Lady beetle eggs are usually yellow to orange and are laid in small clusters on plant surfaces throughout the summer. Typically, the eggs are placed directly within

a pest colony (e.g., aphids) to ensure that the newly hatched first instar larvae will have an immediate food source⁷.

The second life stage of the lady beetle is its larval form (Figure 2). This stage is broken into multiple instars⁹ where the larva continues to grow and increase in size over time. The size for each instar progression is dependent on the species. Also, the color and patterns that are present on the larva are species dependent. Most agriculturally important species in South Dakota are black or grey with orange and/or yellow spots. Lady beetle larvae have been found to consume more prey than the adults⁷.



Figure 2. The 4th instar of the lady beetle larval stage. Photo courtesy of Adam Varenhorst.

The third life stage of the lady beetle is its pupal form (Figure 3). This stage is stationary, with the pupa typically being attached to plant surfaces, near pest populations. During the pupal stage, the lady beetle will undergo transformation into an adult beetle. The pupa is often orange with black markings. When the adult is fully formed within the pupal casing, it will emerge, leaving the empty pupal case behind, still attached to the plant surface.



Figure 3. The pupal stage of the lady beetle. Photo courtesy of Adam Varenhorst.

The final and fourth stage of the lady beetle is its adult form (Figure 4). The adults are the most commonly recognized life stage. Most lady beetles overwinter as adults. For example, the multicolored Asian lady beetle (Figure 5), can be a nuisance as they prefer to overwinter within buildings in large groups, while most other species overwinter near the soil surface in leaf litter and other plant debris. During spring, lady beetles will emerge in correlation with increased day length⁸.



Figure 4. The adult stage of the lady beetle. Photo courtesy of Adam Varenhorst.



Figure 5. Adult Asian lady beetle with black "W" on pronotum. Photo courtesy of Adam Varenhorst.

Management

Identifying Beneficial Lady Beetles

Lady beetles are an important natural enemy and primary predator of many insect pests found within multiple agricultural crops. Pests consumed by lady beetles include aphids, spider mites, thrips, scales, and eggs of butterflies and moths. Of the 79 species documented in South Dakota, six are commonly observed in fields and gardens (Table 1). These species include the multicolored Asian lady beetle (*Harmonia axyridis*) (Figure 5), convergent lady beetle (*Hippodamia convergens*) (Figure 6), seven-spotted lady beetle (*Coccinella septempunctata*) (Figure 7),

spotted lady beetle (*Coleomegilla maculate*) (Figure 8), parenthesis lady beetle (*Hippodamia parenthesis*) (Figure 9), and polished lady beetle (*Cycloneda munda*) (Figure 10). Less commonly observed lady beetle species can be seen by scanning this QR code⁵:



Benefits of Lady Beetles as Natural Enemies and Biological Controls

All lady beetles, especially the six listed previously, can play a major role in preventing insect pests from reaching economically damaging populations. For example, a major agricultural pest in South Dakota is the soybean aphid. Natural enemies have the ability to maintain soybean aphid populations below the economic threshold by exerting significant mortality, as demonstrated by natural enemy presence resulting in a

reduction in aphid growth by two to seven times when compared to a system where natural enemies are absent^{1,2,10,11,13}. Lady beetles from the genus *Stethorus* (within the Scymninae subfamily) have been used as a biological control for mites, saving the US agricultural industry approximately \$1 billion annually⁷.

Promoting Lady Beetle Growth and Artificially Increasing Populations

Generally, diverse landscapes produce larger numbers and species of natural enemies leading to higher pest predation⁴. Crop producers can also use habitat management to attract or retain predators, or use artificial attractants such as sugar water to attract predators to a desired field⁹. Most species of lady beetles overwinter within the soil surface. Therefore, using cover crops, practicing no-till, leaving residue on the field surface, and providing forage cover in shelterbelts and ditches may better preserve existing lady beetle populations, providing a boost in biological control for the coming summer. Artificially increasing (purchasing and releasing) lady beetle



Figure 6. Adult convergent lady beetle with 13 total spots on wings and two white, converging lines on pronotum. Photo courtesy of Adam Varenhorst.



Figure 8. Adult spotted lady beetle with ten black spots on wings and two on pronotum. Sometimes referred as pink and black lady beetle. Photo courtesy of Adam Varenhorst.



Figure 7. Adult seven-spotted lady beetle with seven total spots on wings and white spots on each side of pronotum. Photo courtesy of Adam Varenhorst.



Figure 9. Adult parenthesis lady beetle with pronounced parenthesis shape on back of each wing. Photo courtesy of Whitney Cranshaw.



Figure 10. Adult polished lady beetle with no spots present on elytra and white “W or M” on black pronotum. Photo courtesy of Adam Varenhorst.

populations (e.g., convergent lady beetles) can also be attempted, although this is only recommended in an enclosed system, like a greenhouse, as they are highly dispersive³.

Broad-spectrum foliar insecticides reduce both the pest and beneficial insect populations, which includes lady beetles¹⁴. The harm incurred from insecticide application is that the pest population may recover more quickly than the lady beetle population. Generally, if you have an emerging pest population and lady beetles are present, it may be advantageous to allow them to suppress or regulate the pest populations below action thresholds.

Table 1. Distinguishing markings among six commonly observed lady beetles within South Dakota.

Species of Lady Beetle Scientific Name	Common Name	Pronotum markings:	Abdomen markings:
<i>Harmonia axyridis</i>	Asian lady beetle	White with black “W”	Orange to red with none to many black spots
<i>Hippodamia convergens</i>	Convergent lady beetle	Black with two, white lines converging towards center and white border	Yellow to orange with 13 black spots
<i>Coccinella septempunctata</i>	Sevenspotted lady beetle	Black with two white spots on either side	Dark to light orange with seven black spots
<i>Coleomegilla maculate</i>	Spotted lady beetle	Red to pink with two black spots	Red to pink with ten black spots
<i>Hippodamia parenthesis</i>	Parenthesis lady beetle	White with rough, black “W”	Orange with variable number of black spots and two, black parenthesis shapes at rear
<i>Cycloneda munda</i>	Polished lady beetle	Black with white “W or M”	Orange with no spots

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Entomological or Related Terms

^a *Pronotum* – prominent, plate-like structure that covers all or part of the thorax

^b *Elytra* – modified, hardened forewing of a beetle

^c *Membranous* – thin, pliable, and transparent sheet of tissue

^d *Complete metamorphosis/Holometabolism* – insect development that involves four life stages: egg, larva, pupa and adult

^e *Instar* – developmental stage between two periods of molting during the development of an insect larva