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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)[8]. 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 bodies[15]. 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.

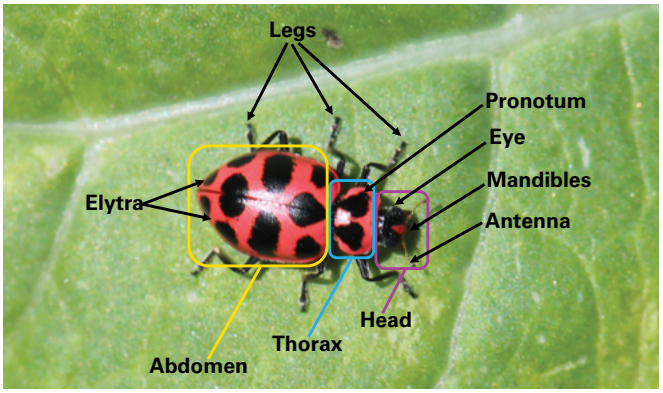

Figure 1. General anatomy of an adult lady beetle.

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 adult[10]. 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 source[10].

The second life stage of the lady beetle is its larval form (Figure 2). This stage is broken into multiple instars[e] 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 adults[10].

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

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, SDSU Extension.

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 length[11].

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

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

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, 2). These species include the multicolored Asian lady beetle *(Harmonia axyridis)* (Figure 5, 6), convergent lady beetle *(Hippodamia convergens)* (Figure 7, 8), sevenspotted lady beetle *(Coccinella septempunctata)*

(Figure 9, 10), spotted lady beetle *(Coleomegilla maculate)* (Figure 11, 12), parenthesis lady beetle *(Hippodamia parenthesis)* (Figure 13, 14), and polished lady beetle *(Cycloneda munda)* (Figure 15, 16). Along with the six commonly observed lady beetles, there are three other South Dakota native species that are rarely seen due to considerable population declines (Table 1, 2). They are the two-spotted lady beetle *(Adalia bipunctata)* (Figure 17, 18), transverse lady beetle *(Coccinella transversoguttata richardsoni)* (Figure 19, 20) and nine-spotted lady beetle *(Coccinella novemnotata)* (Figure 21, 22). It is believed that the declines are caused by competition with introduced species like the sevenspotted lady beetle[4,6,7]. If any of the three previously listed species are encountered, please leave them be and, if possible, take clear pictures and send the pictures to Dr. Varenhorst (adam.varenhorst@sdstate.edu) or to The Lost Ladybug Project (lostladybug.org). Other observed lady beetle species in South Dakota can be seen by scanning this QR code[5]:

If there is a species of lady beetle that you cannot identify, the visual guide on Discover Life may provide some help by scanning this QR code:

Figure 6. Asian lady beetle larva with prominent, orange spikes on its back. Photo courtesy of Gerald J. Lenhard, Louisiana State University, Bugwood.org.

Figure 7. Adult convergent lady beetle with 13 total spots on wings and two white, converging lines on pronotum. Photo courtesy of Adam Varenhorst, SDSU Extension.

Figure 8. Convergent lady beetle larva. Photo courtesy of Susan Ellis, Bugwood.org.

Figure 9. Adult sevenspotted lady beetle with seven total spots on wings and white spots on each side of pronotum. Photo courtesy of Adam Varenhorst, SDSU Extension.

Figure 10. Sevenspotted lady beetle larva. Photo courtesy of Russ Ottens, University of Georgia, Bugwood.org.

Figure 11. 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, SDSU Extension.

Figure 12. Spotted lady beetle larva. Photo courtesy of Tom Murray, BugGuide.net.

Figure 13. Adult parenthesis lady beetle with pronounced parenthesis shape on back of each wing. Photo courtesy of Whitney Cranshaw, Colorado State University, Bugwood.org.

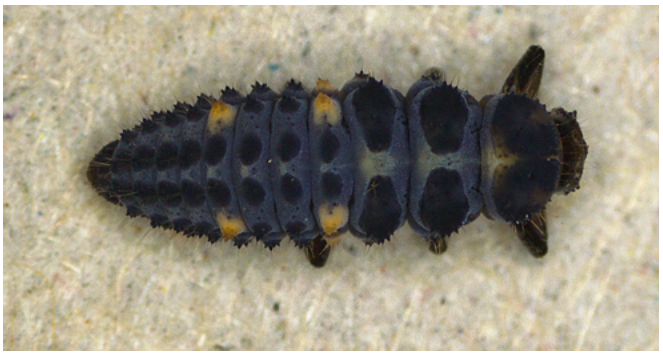

Figure 14. Parenthesis lady beetle larve. Photo courtesy of Eric Beckendorf, USDA-ARS.

Figure 15. Adult polished lady beetle with no spots present on elytra and white "W or M" on black pronotum. Photo courtesy of Adam Varenhorst, SDSU Extension.

Figure 16. Black, polished lady beetle larva with white markings throughout. Photo courtesy of Tom Murray, BugGuide.net.

Figure 17. Adult two-spotted lady beetle with two, black spots across its elytra. Photo courtesy of Mary C. Legg, Bugwood.org.

Figure 18. Two-spotted lady beetle larva. Photo courtesy of Whitney Cranshaw, Colorado State University, Bugwood.org.

Figure 19. Adult transverse lady beetle with long, black line that transverses across both elytra. Photo courtesy of Whitney Cranshaw, Colorado State University, Bugwood.org.

Figure 20. Transverse lady beetle larva. Photo courtesy of Bradley Higbee, Paramount Farming, Bugwood.org.

Figure 21. Adult nine-spotted lady beetle with nine, black spots covering its elytra. Photo courtesy of Whitney Cranshaw, Colorado State University, Bugwood.org.

Figure 22. Nine-spotted lady beetle larva. Photo courtesy of James Bailey, BugGuide.net.

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:
Harmonia axyridis	Asian lady beetle	White with black "W"	Orange to red with none to many black spots
Hippodamia convergens	Convergent lady beetle	Black with two, white lines converging towards center and white border	Yellow to orange with 13 black spots
Coccinella septempunctata	Sevenspotted lady beetle	Black with two white spots on either side	Dark to light orange with seven black spots
Coleomegilla maculate	Spotted lady beetle	Red to pink with two black spots	Red to pink with ten black spots
Hippodamia parenthesis	Parenthesis lady beetle	White with rough, black "W"	Orange with variable number of black spots and two, black parenthesis shapes at rear
Cycloneda munda	Polished lady beetle	Black with white "W or M"	Orange with no spots

Table 2. Distinguishing markings among six commonly and three rarely observed lady beetle larvae within South Dakota.

Species of Lady Beetle Scientific Name	Common Name	Body color:	Body markings:
Harmonia axyridis	Asian lady beetle	Black	Prominent, orange spikes throughout middle
Hippodamia convergens	Convergent lady beetle	Light gray	Black spots throughout with some orange spots at middle and orange/black markings near head
Coccinella septempunctata	Sevenspotted lady beetle	Light gray	Black spots throughout with larger, orange markings at middle and orange area near head with four black spots
Coleomegilla maculate	Spotted lady beetle	Orange	Black spots/markings throughout
Hippodamia parenthesis	Parenthesis lady beetle	Gray	Black spots throughout with four orange spots at middle
Cycloneda munda	Polished lady beetle	Black	White spots/markings throughout
Adalia bipunctata	Two-spotted lady beetle	Gray	Black spots/markings throughout with orange highlights
Coccinella transversoguttata richardsoni	Transverse lady beetle	Black	Eight orange spots across body
Coccinella novemnotata	Nine-spotted lady beetle	Light gray	Black spots throughout with some orange spots at middle and orange/black markings near head

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[1,2,13,14,16]. 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 annually1[0].

Promoting Lady Beetle Growth and Artificially Increasing Populations

Generally, diverse landscapes produce larger numbers and species of natural enemies leading to higher pest predation[5]. 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 field[12]. 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 populations (e.g., convergent lady beetles) can also be attempted, although this is only recommended in an enclosed system, like a greenhouse, as lady beetles are highly dispersive[3].

Broad-spectrum foliar insecticides reduce both the pest and beneficial insect populations, which includes lady beetles[17]. 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.

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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

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