

Ladybeetles as Biological Control Agents in Citrus¹

J. P. Michaud, C. W. McCoy and S. H. Futch²

Ladybeetles of many species are valuable biological control agents of many pests in Florida citrus groves. Some exotic species, such as the vedalia beetle and the mealybug destroyer, are highly specialized feeders that have been successfully introduced to many countries in classical biological control programs. Others are native species that have not been as well studied.

The true diet breadth of most of the generalist feeders is not fully known, but for some we now know which pest insects are preferred as prey, and which prey support their development and reproduction. All species are worthy of recognition, conservation, and encouragement by the citrus grower.

Here we describe some of the more abundant and important species currently active in Florida citrus. Most ladybeetles tend to be abundant in citrus groves in spring as they emerge from over-wintering sites, and again in the fall when they feed on insects attacking late season flush.

Groves in flower are particularly attractive as most ladybeetles enjoy feeding on the pollen and nectar of citrus flowers. Many species remain

dormant through summer and winter months to avoid both extremes of temperature and periods of low prey availability.

Multicolored Asian ladybeetle -- *Harmonia axyridis* Pallas

This introduced ladybeetle is the largest, and currently the most abundant, of all ladybeetles in Florida citrus (Fig. 1). It is highly variable in appearance (spots or no spots) and coloration (yellow, orange, or red). Although aphids and psyllids are preferred prey, it is a very generalist predator that consumes scale insects, mealybugs, leafminers, eggs of moths and butterflies, eggs and larvae of beetles (including weevils), and even spider mites. *Harmonia* is also an aggressive competitor that will attack and eat the larvae of other ladybeetles. It has been implicated in the displacement of native ladybeetles in various habitats throughout North America. It has already had a negative impact on the abundance of the blood-red ladybeetle in Florida and its potential impact on other native ladybeetles has not been determined. Its habit of forming large overwintering aggregations in houses has not added to its popularity in urban settings. However, *H. axyridis* is possibly the most important generalist predator of

1. This document is HS-873, one of a series of the Horticultural Sciences Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date March 2002. Reviewed October 2008. Visit the EDIS Web Site at <http://edis.ifas.ufl.edu>.

2. J.P. Michaud, post doctoral associate; C.W. McCoy, professor; and S.H. Futch, Extension Agent IV; Citrus REC, Lake Alfred, Florida; Horticultural Sciences Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 32611.

citrus insect pests currently active in Florida groves and appears quite resistant to many of the agrochemicals used in citrus.



Figure 1. Multicolored Asian ladybeetle larva and adult. Credits: Russell F. Mizell, University of Florida

Blood-red ladybeetle -- *Cycloneda sanguinea* L.

This species was formerly the dominant aphid-feeding ladybeetle in citrus prior to the invasion of *H. axyridis* (Fig. 2). Despite its name, it is typically orange in coloration and without any spots on its wing covers. The white outline on its pronotum (part behind the head) gives it the appearance of wearing white-rimmed sunglasses. Although its numbers have declined, it remains an important biological control agent of both green and brown citrus aphids, and of the Asian citrus psyllid. Spider mites and the crawler stage of many scales and mealybugs may also be consumed.



Figure 2. Blood-red ladybeetle larva and adult.

Southern 2-spotted ladybeetle -- *Olla v-nigrum* Mulsant

The southern 2-spotted ladybeetle is easily mistaken for the twice-stabbed ladybeetle, but is larger and has white markings on the edge of its pronotum (Fig. 3). It is renowned as a mite feeder and also feeds on aphids, although its larvae cannot complete development on either green or brown citrus aphid. Its abundance in Florida citrus has recently increased in response to the invasion of

Asian citrus psyllid that represents an excellent food source for this species.



Figure 3. Southern 2-spotted ladybeetle larva and adult.

Twice-stabbed ladybeetle -- *Chilocorus stigma* (L.)

The twice-stabbed ladybeetle is one of the most important scale insect predators in Florida citrus groves (Fig. 4). Few other insects can chew through the armored coverings of Florida red scales, their preferred prey, and females hide their eggs beneath empty scale coverings. Because scale insects are generally under good biological control by a combination of predators and parasites, these beetles are rarely abundant.



Figure 4. Twice-stabbed ladybeetle larva and adult.

Vedalia beetle -- *Rodolia cardinalis* (Mulsant)

Around the turn of the century, cottony cushion scale was a serious pest in Florida citrus, and the vedalia beetle was imported from Australia, via California, to help control it (Fig. 5). It is a highly specialized predator that feeds on little else. Since cottony cushion scale is now quite rare in Florida, the vedalia beetle is also rare, although it persists at low density throughout Florida citrus groves. The vedalia beetle is one of the most widely recognized examples of successful classical biological control in citrus.



Figure 5. Vedalia beetle larva and adult.

Metallic blue ladybeetle -- *Curinus coeruleus* Mulsant

This ladybeetle was imported from Mexico in the 1950s and appears to be restricted to southeastern regions of the state, being most abundant in the Indian River district (Fig. 6). These beetles gleam iridescent blue in the sunlight, making them difficult to mistake for any other species. Although it is primarily a scale feeder, it can also be found on aphid colonies and it performs very well on a diet of Asian citrus psyllid. Its low food requirements and preference for high temperatures enable it to remain active throughout the summer when little food is available and most other large coccinellids are inactive.



Figure 6. Metallic blue ladybeetle larva and adult.

Little red ladybeetle -- *Exochomus childreni* Mulsant

The little red ladybeetle is a native species that is most abundant in central Florida (Fig. 7). Although primarily a scale feeder, it also feeds on a variety of aphids. It is not yet known whether citrus aphids represent a suitable food for this ladybeetle, but it develops successfully on the melon aphid, *Aphis gossypii*. The Asian citrus psyllid also represents a suitable prey for this ladybeetle and its numbers appear to have increased somewhat in response to this new pest. Because of its relatively small size and

low feeding rate, it is unlikely to be very important in biological control.



Figure 7. Little red ladybeetle larva and adult.

Mealybug destroyer -- *Cryptolaemus montrouzeri* Mulsant

The mealybug destroyer is an introduced species, brought from Australia to Florida via California in 1930 (Fig. 8). The larvae produce white, waxy filaments that make them resemble larger versions of their prey. Mealybugs of all species are preferred prey, but since these are rarely abundant in producing citrus, neither is this ladybeetle, as it is quite a specialized predator. The mealybug destroyer has responded well to recent outbreaks of the invading papaya mealybug on both citrus and Hibiscus spp. and is known to prey on the pink Hibiscus mealybug which is likely to arrive in Florida in the near future.



Figure 8. Mealybug destroyer larva and adult.

Convergent ladybeetle -- *Hippodamia convergens* Guerin

Although presently quite rare, older literature indicates that this widely distributed native species was at one time abundant in Florida citrus groves (Fig. 9). The convergent ladybeetle is so-named for

the two convergent white lines readily visible behind the head. It prefers aphids as prey, but its full range of diet is not known. The convergent ladybeetle reproduces successfully on a diet of green and brown citrus aphids, but larvae do not develop well on these prey species. The melon aphid, *Aphis gossypii*, is a more suitable prey for both adults and larvae.



Figure 9. Convergent ladybeetle adult.

***Azya orbigera* Mulsant**

No common name is currently recognized for this scale-feeding ladybeetle, but it is thought to have been introduced accidentally from Colombia (Fig. 10). It appears restricted to southern regions of Florida where it is often collected in citrus groves. The wing covers are covered with fine hairs giving the beetle a frosted appearance; the two dark spots are created by an absence of hairs. The larvae are covered with soft, waxy secretions that are thought to deter predation by ants. Very little is known of its life history or ecology.



Figure 10. *Azya orbigera* Mulsant larva and adult.