

Ecological Survey of Unknown Ladybug Species (Coleoptera: Coccinellidae) in Mineola, TX

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Abstract: Ladybugs are commonly used as biological control agents against aphids, and typically not found to be invasive. However, the use of these insects might have had a negative effect by creating an invasive pest, *Harmonia axyridis*. It was hypothesized that the species observed in the area is *H. axyridis* because of the coloring and circumstances surrounding the collection. It was hypothesized that, at the time of the collection, around 200 ladybug carcasses could be found inside the building. Collection took place on Thursday, March 15, 2018 between the hours of 1:00 and 2:00 PM in Co Rd 3276, Mineola, TX (32.736248, -95.341007). Specimens were collected through careful handling with tweezers, and then placed into a single container. There was an actual value of 273 specimens inside the area. Using the accuracy formula, it was discovered that the estimated value was 73.260073% accurate. It was also hypothesized that all the collected organisms would be from the same species, however with the decay of the insects (greater than 3 weeks), it was difficult to determine, but the organisms presumably all belong to *H. axyridis*. All the ladybugs collected were found near doors, windowsills, or window panes. It was extremely rare to discover an insect in the middle of the surveyed region, dead or alive.

Keywords: *Harmonia axyridis*, biological control, Mineola, survey

Ladybirds are commonly regarded as harmless, even beneficial, in regard to their interactions with human society. They are easily identified by their forewings, which when at rest, create a dome shape that covers the abdomen and thorax of the insects, and move outwards from the outside at the elytra so the insects can take flight. There is patterning on the forewings, usually a bright color, such as red, orange, or yellow, with dark spots of varying sizes. Many species have been utilized as a biological control agent (BCA), the division of entomology that studies methods of pest control without the use of harmful pesticides, in order to combat various pest species, including aphids, scales,

mealybugs, and whiteflies (Flint et al., 2002). With the first two species being particularly destructive to agriculture, researchers have been introducing ladybirds to various areas to combat the destruction.

However, this introduction might possibly have had a reverse effect in some areas, meaning that the ladybird populations have potentially grown large enough to become an invasive species, or the insects have had innate invasive behaviors that were not investigated before utilizing them as biological control agents, particularly the East Asian Ladybeetle, *Harmonia axyridis*. The resulting consequences have been observed as biodiversity losses brought about

from the resource competition between native and introduced ladybirds; the congregation and invasion of thousands of ladybirds in a single building (usually occurring in fall and winter months for overwintering) inhabited by humans, creating a nuisance pest; and the spoiled taste crushed beetles can leave in wine, damaging vineyard owners' productions, and therefore sales (Chakir et al., 2016). Ladybirds have invaded homes as far as Nashville, TN for overwintering (UPI, 2013) The author observed an invasion first-hand in a residence in Mineola, TX by an unknown ladybird species.

The aim of this survey was to collect as many specimens from the inside of the aforementioned residence to establish whether or not an invasion was occurring or imminent. It was hypothesized that the species observed in the area is *H. axyridis* because of the coloring and circumstances surrounding the collection. It was hypothesized that, at the time of the collection, around 200 ladybug carcasses could be found inside the building.

Materials and Methods

Collection took place on Thursday, March 15, 2018 between the hours of 1:00 and 2:00 PM in Co Rd 3276, Mineola, TX (32.736248, -95.341007). The collection took place only inside the 4,800 ft² residence in the area. The temperature outside of the home was 21°C, as reported by the Apple iPhone Weather App (any smartphone weather app will suffice). The indoor thermostat regulated and reported the inside temperature to 20°C (68°F).

Specimens were collected through careful handling with Trim® brand tweezers (Trim Tweezers, USA). The specimens were all collected from heights ranging from

ground level to around 183 cm (approximately 6 ft). Insects that could have been found in higher areas were too high to reach. Every individual insect was placed into the same Ziploc® Extra Small Square Container (S.C. Johnson, Chicago, IL, USA).

The hypothesized estimation for insects found and the actual number of organisms found inside the house were compared for accuracy by using the accuracy formula: $1 - \text{ABS}[(A - E)/A]$, where "A" is the actual value and "E" is the estimated value.

Results

According to the hypothesis of an estimated 200 organisms within the specified area, there was an actual value of 273 specimens inside the area (Fig. 1). Using the accuracy formula, it was discovered that the estimated value was 73.260073% accurate. It was also hypothesized that all the collected organisms would be from the same species, however with the decay (Fig. 3) from the presumably long time of death for the insects (greater than 3 weeks), it was difficult to determine, but the organisms presumably all belong to *H. axyridis*, commonly known as the Multicolored Asian Lady Beetle (Bartlett 2004) (Fig. 2). There was only one alive specimen out of the entire collection when it was collected, but the specimen died and became undeterminable from the rest post-collection.



Fig. 1. The total collection from the survey. 273 specimens, all presumed to be from the same species.



Fig. 2. One collected specimen for size comparison. The tweezers are used for size reference. The gap between the two tweezer ends measured 0.714375 cm.

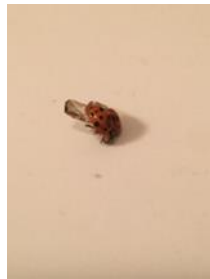


Fig. 3. Example of decaying organism.

Discussion

All the ladybugs collected were found near doors, windowsills, or window panes. It was extremely rare to discover an insect in the middle of the surveyed region, dead or alive. It was observed by the author by looking up, there were multiple specimens crawling all over the ceiling and high window panes as well, but those were not possible to reach by any means. The author also noted, having been in the residence during colder months (September-February), there was a significantly larger number of ladybugs invading the home than in the time of the collection.

The survey was conducted under the pretenses of understanding that most of the samples found within the area would be deceased, and could not possibly lead to a correct estimation of the number of this

species in the entire speculated area. Therefore, further surveys outside the same area would need to be conducted in order to fully grasp the quantity of *H. axyridis* within the region. Since it has been observed by the author that greater, living numbers of the ladybugs appear to enter the home in colder months, a more appropriate survey should occur in those times to accommodate, both inside and outside the home. Information from data such as this could then begin the process of discovering the specific factors that are promoting *H. axyridis* specimens to invade the home. This would lead to the eventual research to dissuade the insects from entering the home as a nuisance pest, without killing them fully. Damaging the area with pesticides to eliminate *H. axyridis* could potentially lead to a breakout, and potentially an infestation, of other insects.

Observing an event such as this one is scientifically fascinating. Humans introduced various alien species to multiple areas in an effort to save agricultural products, but it is the urban environments that suffer the most. These species were introduced beginning around the mid-1980s, and in an ironic twist of fate, *H. axyridis* has become not only a noted nuisance pest through overwintering, but also as a potential ineffective biological control agent since it often consumes other aphid predators, such as lacewings, Cecidomyiid larvae, parasitoids, and insect-pathogenic fungi (Evans et al., 2011). The best, and most ironic, course of action is to find a way to deter the predators from entering and disrupting the desired functions of the urban areas in questions, thereby creating a new biological control agent for the old biological control agent.

References

Chakir, R., M. David, E. Gozlan, and A. Sangare. 2016. Valuing the Impacts of An Invasive Biological Control Agent: A Choice Experiment on the Asian Ladybird in France. *Journal of Agricultural Economics*. 67: 619–638.

Evans, E. W., A. O. Soares, and H. Yasuda. 2011. Invasions by ladybugs, ladybirds, and other predatory beetles. *BioControl*. 56: 597–611.

Flint, M. L., S. H. Driestadt, and J. K. Clark. 2002. *Natural enemies handbook: the illustrated guide to biological pest control*. University of California Press.

Halim, M., A. Aman-Zuki, M. A. Mohammed, and S. Yaakop. 2017. DNA barcoding and relationships of eight ladybugs species (Coleoptera: Coccinellidae) that infesting several crops from Peninsular Malaysia. *Journal of Asia-Pacific Entomology*. 20: 814–820.

(UPI) UPI. 2013. UPI. (https://www.upi.com/Odd_News/2013/10/30/Ladybugs-swarming-in-US-South-in-big-numbers/UPI-55961383186660/).