

Getting Started with Insect Identification

by Danae Wolfe

I HAVEN'T ALWAYS appreciated the importance of insect identification. When I began photographing insects over 10 years ago, I routinely shared my photos on social media with nary a species name in sight. I spent more time editing (and oversaturating) my photos than I did learning about and identifying the animals I photographed.

Thankfully, as my entomological enthusiasm has grown over the years, so too has my interest in insect identification. Today, I understand that properly identifying insects can equip gardeners with the knowledge to make informed landscape decisions. Landscape management, after all, should not begin with an automatic assumption that all bugs are bad. In fact, most insects (and spiders) are incredibly beneficial for the garden.

So how do we know which insects are good, which might need a bit of management to control, and which should be reported to the local Extension office or Department of Agriculture? The first step is identification.

Properly identifying the insects we meet in our gardens can help ensure we aren't unnecessarily using harmful chemicals, help prevent the spread of invasive species before they cause significant ecological or economic damage, and alert us to when we might need to take extra protective measures to preserve a threatened species. In this article, I'll share some of the basics of insect taxonomy and resources to help get you started with growing your identification skills.

WHAT MAKES AN INSECT AN INSECT?

With over one million described species of insects in the world, learning to identify our six-legged friends can seem daunting. So, let's begin broadly. Insects are classified in the kingdom Animalia, phylum Arthropoda, and class Insecta. All organisms in the

class Insecta—known as insects—are classified as having three main body segments: the head, the thorax, and the abdomen. All insects have three pairs of legs. Most insects also have one pair of antennae and one pair of compound eyes, though there are exceptions in some species. Most adult insects are winged, but some species are wingless.

Insecta can be further classified into orders and within each order, divided

scientific names can help gardeners and scientists alike communicate unambiguously about a species.

INSECT LIFE CYCLES

We can also group insects by shared life cycle characteristics. In insects, there are two prominent types of life cycles—hemimetabolous and holometabolous.

Hemimetabolous insects, like grass-



All insects have three pairs of legs and three-part segmented bodies: the head, thorax, and abdomen. Most, like this lace bug, have two antennae and two compound eyes.

into family, genus, and finally species. Species is the finest unit of classification we use to categorize an organism.

This classification of organisms is called taxonomy. Scientists use taxonomy to classify groups of organisms based on shared characteristics. In addition to showing where species fall within the world's evolutionary family tree, taxonomy also helps ensure every identified species has a scientific name and description. As with plants, common names of insects vary greatly across regions so

hoppers, treehoppers, dragonflies, and damselflies, are those that undergo incomplete metamorphosis. These insects have three life stages—egg, nymph, and adult. Throughout the nymph stage, hemimetabolous insects resemble adults but lack developed wings and functional reproductive organs. Nymphs develop through several growth stages called instars, in which the insect grows and sheds its exoskeleton through a process called molting. Molting happens several times before the insect emerges as an adult.



True bugs, like these keeled treehoppers (*Entylia carinata*), are hemimetabolous and undergo incomplete metamorphosis. Here, we see a nymph (far right), a newly emerged adult (center) whose wings are still unfurling after molt, and a mature adult (left).

Holometabolous insects, like butterflies, beetles, flies, and bees, undergo complete metamorphosis. These insects have four life stages—egg, larva, pupa, and adult. Larval forms of holometabolous insects vary greatly from their adult forms, spending their time eating and preparing for pupation. During the non-feeding pupal stage, the insect transforms into an adult.



Lady beetles (family Coccinellidae) are holometabolous and undergo complete metamorphosis. Lady beetle larvae, like this one, are beneficial predatory insects that feed on other small insects in the garden.

Some of the orders of hemimetabolous insects you're likely to find in your garden include:

- Hemiptera:** True bugs, cicadas, aphids (82,000 species identified)
- Orthoptera:** Grasshoppers, crickets, katydids (20,500 species)
- Odonata:** Dragonflies and damselflies (5,500 species)
- Mantodea:** Mantids (1,800 species)
- Dermoptera:** Earwigs (1,800)

Some of the orders of holometabolous insects you're likely to find in your garden include:

- Coleoptera:** Beetles (400,000 species)
- Lepidoptera:** Butterflies and moths (150,000 species)
- Hymenoptera:** Bees, wasps, parasitoids, ants (130,000 species)
- Diptera:** Flies, midges, mosquitoes (120,000 species)
- Neuroptera:** lacewings, owlflies, mantidflies, (5,000)

Keep in mind that taxonomy is an ever-evolving science. As more insects are discovered and described, our understanding of how species are related and where they belong in the evolutionary tree is refined. As such, educational resources that are even just a few years old might offer differing information.



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- Julia

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If you're feeling unsure about your insect identification skills, there are lots of great resources to help you grow your knowledge and confidence. Because I'm a photographer, my favorite books are those loaded with color photos and easy-to-digest descriptions. I'm partial to the *National Wildlife Federation Field Guide to Insects and Spiders of North America* (2007) by Arthur V. Evans, and *Garden Insects of North America: The Ultimate Guide to Backyard Bugs*, 2nd edition (2018) by Whitney Cranshaw and David Shedlar.

More localized field guides are great for narrowing the focus down to species that are likely to appear in your region (though our changing climate is pushing species outside historical ranges). I own a number of Ohio-specific insect and spider field guides that are small enough to toss in my purse or camera bag for quick reference. I encourage you to check with your state's Department of Natural Resources to see what field guides they might offer.



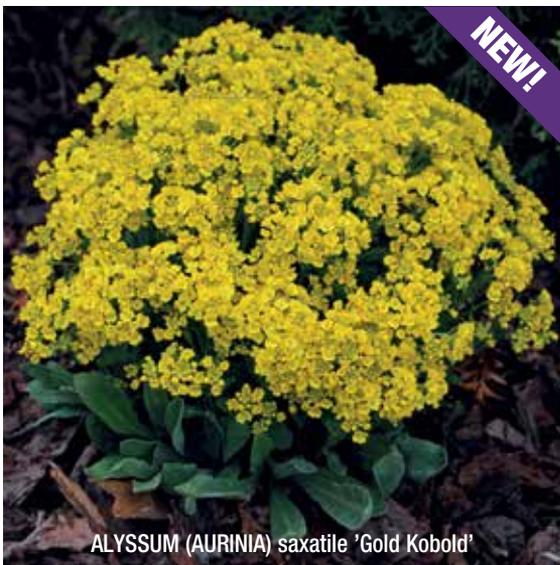
The author uses a variety of resources to help her identify the insects she photographs.

I also recommend getting acquainted with online entomology and naturalist communities like **iNaturalist** and **BugGuide**. These platforms allow you to share observations and photos of insects with online community members

who can help with identification. These tools, powered by citizen scientists, contribute to ever-growing data sets that can help scientists track changes in wildlife populations. These data sets are invaluable to helping us understand which insect species might need our help. Next time you visit your garden, consider snapping a few photos of the insects you meet and uploading your pictures to iNaturalist or BugGuide. It could be you who discovers the next new species!

In the next few articles, we'll take an even deeper dive into specific insect orders where I'll highlight identifying characteristics, species you're likely to find in your garden, and what you can do to help protect and preserve our littlest neighbors.

Danae Wolfe is a macro photographer and conservation educator based in Wooster, Ohio. She manages Chasing Bugs (www.chasingbugs.com), a platform that promotes the appreciation, stewardship, and conservation of insects and spiders.



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