PURDUE UNIVERSITY | Extension - Entomology

Invasive Species

Department of Entomology

ASIAN JUMPING WORM: A THREAT TO HEALTHY LANDSCAPES

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Introduction

Whether you work in landscaping, enjoy gardening, or make your living as a farmer, you rely on hundreds of soil-borne organisms to help provide nutrients, maintain soil structure, and help transport water. One of the most important of these organisms, the annelids, are collectively referred to as earthworms. Most of the earthworm species in the Midwest are nonnative because the native species were almost completely eliminated when glaciers covered portions of the continent. The earthworms we usually encounter are European, having accompanied settlers during the colonization of North America in potted plants or even getting dumped out of a ship's ballast tank, which were normally filled with rocks and soil, as they took on cargo. European earthworms have since spread across North America, filling an important ecological role that not only helps our environment, but also helps us grow the plants and foods we love.

However, we have a relatively new invasive earthworm to contend with known as the Asian jumping worm. The Asian jumping worm shares many characteristics with European worms but lacks the behaviors that provide a benefit to our environment. The Asian jumping worm is not a single species, but a complex of species; the three most recognized members are *Amynthas agrestis*, *Amynthas tokioensis*, and *Metaphire hilgendorfi*, though there may be other species as yet unknown. This may seem confusing on the surface, but each of these species share very similar behaviors and life cycles. While it isn't clear when the Asian jumping worm arrived in North America, some historical records indicate their presence as far back as the 19th century. In recent years, the worms have begun to spread across the United States; in Indiana, reports and public awareness have steadily increased, with the earliest confirmed presence in 2015 in Hamilton County.

Description

Asian jumping worms are earthworms that belong to the family Megascolecidae; most of the other earthworms in North America belong to the family Lumbricidae, which includes our most recognized earthworm, the nightcrawler. Jumping worms are an epigeic species, meaning they live and feed right at or just below the surface, feeding on leaf litter and other plant detritus. Like all earthworms, they are hermaphroditic, bearing both male and female sexual reproductive organs, but Asian jumping worms are parthenogenic and are able to reproduce asexually. The reproductive organs are contained in a set of segments known as a clitellum. On a European earthworm, the clitellum is a raised, saddle-shaped organ that wraps partially around the worm's body. On Asian jumping worms, however, this organ often looks like a set of discolored segments and is completely flush to the body (Fig. 1).

Fig. 1 Close-up of clitellum of Asian jumping worm, Amynthas agrestis. (*Photo Credit: Chris Wirth, Purdue University, Dept. of Entomology*)

Asian jumping worms can be any length between 1-8 inches, and possess a unique behavior that makes them thrash when handled or disturbed. Their thrashing motions are very active and energetic, often making observers draw a parallel between them and a snake. These motions can become so violent, the worms appear to leap off of a surface, earning the "jumping" part of their name. The worm's mobility is due to a set of

extensible hairs that it will extend out of its body to give them a grip on the substrate around them. Almost all segmented worms possess these hairs, or setae, but the number and arrangement vary by species. For example, nightcrawlers and other lumbricid worms have only eight setae per segment, and positioning depends on the species. On Asian jumping worms, there is a full ring of setae on each segment (Fig. 2), which is a significantly higher number than most other earthworm species. The skin of the Asian jumping worm will also have a shiny, much drier appearance, while European earthworms will typically be moist with a slimy texture; they also tend to be darker in color than European earthworms. Observers have also noted that one side of an Asian jumping worm may be darker compared to another, or that the worm is more darkly colored altogether as compared to their European cousins, possibly due to their more consistent exposure to sunlight.

Fig. 2. Rings of setae encircling entire segment. (*Photo Credit: Chris Wirth, Purdue University, Dept. of Entomology*)

Life Cycle

Under normal conditions, Asian jumping worms are an annual species, and the first hard frost will kill the adults, leaving only the eggs to survive the winter. The eggs are laid in egg cocoons shed by the adults as soon as they reach sexual maturity. The cocoons are nearly indistinguishable from the soil itself, and their appearance is similar to that of a mustard seed. Once spring arrives and ground temperatures rise above 50°F, the eggs will hatch and the new hatchlings will begin to feed. It will take around 60 days from hatching for adult worms to develop, resulting in 1-2 generations per summer growing season. However, in Indiana, there have been multiple, confirmed sightings of adult worms as early as May, and these sightings are often associated with compost piles. Compost piles can remain internally warm throughout the winter months, potentially offering a place for the worms to start their life cycle much earlier, but more research is needed to confirm this.

Damage

In order to understand the damage done by Asian jumping worm, it would help to first understand the benefit provided by European earthworms. As mentioned previously, European earthworms provide benefits to soil through aeration and nutrient cycling. For example, the common earthworm creates permanent, deeply excavated burrows, dragging leaf litter and other materials into the burrows to feed. These burrows also create channels that help transport water and provide aeration to plants. Earthworms that live closer to the surface can increase overall porosity of the soil, helping with water movement and reducing erosion. Lastly, the castings, or feces, of earthworms are rich in nutrients and breakdown easily in the soil. Unfortunately, Asian jumping worms offer none of these benefits.

Asian jumping worms are typically visible the soil surface, rarely burrowing under the soil more than an inch or two. The worms also tend to feed near each other, and it's very common to find a significant number of worms close together. The tendency to feed at the soil surface in large number means that Asian jumping worms are not providing any kind of aeration through deep burrowing, and they are too shallow to increase water absorption. They are also voracious feeders that completely denude the soil surface of leaf litter. However, past observations have noted that the worms appear to go through a 'boom and bust' cycle, with years of significant population growth, followed by years of severe population decline.

Castings of Asian jumping worms have a much different impact on soil than their European cousins. While these castings contain nutrients, they stay at the soil surface and break down quickly. The nutrients they could provide are washed away during heavy rains, effectively removing them from the local habitat. Castings of Asian jumping worm also act as a sign of their presence due to their unique appearance. European worm castings look like small clumps of organic matter and soil, while the castings of Asian jumping worms bear a resemblance to coffee grounds (Fig. 3). The loose consistency of the castings also contributes to erosion. The altered soil left behind by the worms is easily exploited by invasive species that can thrive in low-nutrient conditions, such as garlic mustard and Japanese stiltgrass.

The feeding habits and life cycle of Asian jumping worms can have severe consequences for woodlands and residential areas. When found in wooded areas, especially in the eastern United States, they consume leaf litter and effectively remove the ability of a forest to develop an understory, as well as reduce the environment's capacity to resist erosion. There is also a trend in Indiana of discovering Asian jumping worms in gardens, compost, and landscaping, steadily ruining the soil quality cultivated by growers. Asian jumping worm's capacity to spread into agricultural operations is not yet well-understood, but there is no evidence of the worm entering traditional corn-soybean fields. More research is needed to expand our knowledge of the worm's impact on traditional farming as well as vegetable and fruit production.

Fig. 3. Possible results of Asian jumping worm activity. (*Photo Credit: Peggy Brennan*)

Management

Asian jumping worms spread through the transport of soil and compost which is contaminated with their egg cocoons. Egg cocoons are very difficult to separate from the soil. Cocoons resemble mustard seeds, and even professionals would be challenged to identify them in a sample. In Indiana, Asian jumping worms have been found as early as February. This potentially indicates that the worms will exploit soils and composts that are kept warm year-round to complete their life cycles, surprising gardeners and landscapers with early infestations. To prevent this, only use soil or compost from trusted sources, and always monitor your growing areas and compost piles. If you use bulk soil or compost, make sure you are getting it from a supplier that uses heat treatments that warms compost to at least 130°F for three days to sterilize it. Since potted plants could pose a risk if planted in contaminated soil, a gardener might consider using bare-root stock instead of transplants to reduce that risk. If transplants are the best or only option, consider rinsing the roots and replanting in fresh, sterile medium.

Detection of the worms is fairly simple and can be done in a few different ways. Perhaps the most obvious method is finding the worms on the ground; since the worms tend to clump together in large numbers and do not go below the surface, making visual confirmation is common. You can also use a shovel to scoop under the surface of the leaf litter and pick up the worms. Another method of detection is the mustard test: mix 1/3 of a cup of group hot mustard to a gallon of water and pour half of the mixture over a square foot of soil. The mustard will force soil invertebrates to the surface while causing no harm to plants or impact soil quality. It is important to note that it will force all worms to the surface, not just Asian jumping worms, so proper identification is crucial. You can also monitor the texture of the soil for the 'coffee grounds' appearance, but that will only appear once the worms have fed extensively. Once worms are found, you can work with your local extension service to have them identified.

If you are concerned that you are working with contaminated soil, solarization is effective at eliminating both the worms and their eggs. Using a clear plastic tarp, completely envelop soil and leave it in the sun so the mass reaches at least 104°F for at least three days. This method prevents worms from escaping and should kill egg cocoons and adult worms. If the infestation is minor, worms can also be handpicked and placed in plastic bags, then set in the sun for several minutes. Once dead, the worms can safely be disposed without fear of spreading the infestation. It is important to note that there are no EPA-approved pesticides for use on Asian jumping worm. This means the use of any pesticides, homebrew or not, is not only illegal, it also poses a potential risk to the growing environment and the individual who uses it. The best options are physical removal, solarization, monitoring, and reporting.

Research is still needed to answer important questions about the Asian jumping worm, such as their ability to infiltrate agricultural fields. However, there is no evidence that this worm will become a widespread pest that will rewrite our landscape. For now, our best recommendations are to monitor for the worm, maintain best management practices for soil care, composting, and the exchange of plants, and avoid the purchase or trade of live Asian jumping worms. These worms are entirely dependent on human activity in order to spread. The more we can do to control their movement, the easier it will be in the future to prevent their presence.

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Resources

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