Woodland Health

A column focusing on topics that might limit the health, vigor and productivity of our private or public woodlands

COORDINATED BY MARK WHITMORE

WANDERING THE GLOBE WITH A ZIG ZAGGING STRIDE

BY MARK WHITMORE

There is now yet another new invasive forest pest at our doorstep, elm zig zag sawfly, *Aproceros leucopoda*, or EZZ for short. That is a nice acronym, but having yet another pest arriving in our forests is not. One good lesson to take away from this is that someone first reported it on the iNaturalist phone app in Canada. It was not an expert, but rather an amateur who was concerned about what they saw. This is similar to what happened with the first detection of hemlock woolly adelgid on Lake George, which has led to an effective response to slow the spread of this devastating insect. We need public involvement at this time with invasive pest detection and I hope those reading this article will take note and learn how to use the iMapInvasives app available here in NY.

The first report of EZZ in North America was made on July 30, 2020 in a rural area about 20 miles north of the US border near Montreal. Surveys conducted at the time indicated it was still within about 20 miles of Montreal with an outlier about 40 miles downstream (Martel et al. 2021). The conclusion was that it had been established in the area for a couple years, or more. This year additional survey painted a different story. Movement downstream of Montreal, or to the east, was static, but to the west, EZZ was found at many locations in eastern Ontario, about 125 miles upstream, including sites on the St. Lawrence River near the Thousand Islands, across from Massena and

Zig-zag pattern and a small EZZ larva. Veronique Martel, Natural Resources Canada.

Loose, net-like cocoon for EZZ pupation. Veronique Martel, Natural Resources Canada.

Ogdensburg, NY. We have yet to get the results of survey efforts conducted by NYSDEC this summer, but experience in Europe makes it highly likely it is in NY now, or will be here soon.

EZZ is an elm specialist and a native of eastern China, Japan, Korea, and eastern Russia. Its spread from eastern Asia was first reported in Poland and Hungary in 2003. EZZ was likely introduced years prior to detection and spread rapidly with severe elm defoliation now found from Ukraine to Belgium and the Netherlands. In Germany, Blank et al. (2014) estimated the rate of natural dispersal to be up to 90 km/yr (56 mi/yr). Genetic analysis of specimens from the area of initial detection in North America by Canadian scientists indicates it is most similar to populations found in Austria and Romania, not eastern Asia as my container-shipping habituated mind would have thought. However, I'm reminded that EZZ feeds on leaves and pupates in soil, not on bark or wood like Emerald ash borer or Asian Longhorned beetle, so a different avenue of importation is likely. It often seems a futile venture to figure out how an insect travels such long distances but it can help direct efforts to intercept potential invasives in the future.

EZZ is a sawfly, in a group of insects known as broad-waisted wasps. They are called sawflies because adults have specialized ovipositors that allow them to saw into leaves to deposit their eggs. EZZ deposit up to 49 eggs singly into the tips of the saw like teeth on the edge of elm leaves. They hatch after just a few days and feed on the leaf tissue between the leaf veins in a characteristic zig-zag fashion. This early instar feeding pattern is quite different from other elm defoliators and easily recognizable. The larvae have six instars and complete development in just over two weeks. As they get larger, larvae consume more of the leaf, obscuring the characteristic zig-zag feeding pattern. Large sawfly larvae look like small caterpillars but have many more prolegs, the tube-like legs on the rear, or posterior, part of the body.

After they finish feeding, larvae construct either a light colored, loosely woven net-like cocoon affixed to the leaf or a darker, more compact and densely woven cocoon. Both cocoon

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types are produced with each generation. Pupation is completed and adults emerge after about a week in the light, net-like cocoon. The dark, tightly woven cocoons drop to the ground and are the overwintering stage. The fact that overwintering cocoons are produced with every generation during the summer allows this insect to take advantage of a potentially extra-long growing season, producing another generation, without taking a chance that they might not complete development and not produce overwintering pupae.

Two aspects of EZZ biology make it particularly damaging. First, reproduction is entirely asexual; and second, there are up to six generations a year. However, in northern Europe, there are usually only four generations and considering the similarity in climate, I would assume it would be the same in NY. These biological traits explain EZZ's capacity to spread rapidly and defoliate large areas of trees. This brings up one of the most concerning aspects of EZZ's introduction; it is within the area of Ontario and NY with the greatest concentration of elm in the lowlands surrounding the St. Lawrence River. It's not too great a stretch to think of it rapidly moving into the Ontario plain, across the Mohawk Valley, and into the Hudson Valley, areas where there are not only extensive native elm forests but also ornamental plantings of many elm species and cultivars.

EZZ's host range appears to be quite broad. Among eastern Asian elm species, defoliation of the widely planted Siberian elm should be of concern in North America. In Europe, native elms and many cultivars have experienced extensive defoliation, including cultivars resistant to Dutch elm disease. American, rock, and slippery elm, the most common species in NY, have all been found defoliated in both forested and urban settings in Canada. Based on European work and Canadian observations it appears that most, if not all, elm species will be impacted by EZZ.

Management of EZZ with insecticides has been researched in Europe but, as with any forest tree, can only reasonably be used in ornamental plantings or in small forest plots. Sawflies are definitely susceptible to natural enemies, but work in eastern Asia has found only one parasitoid, a Tachinid fly. Unfortunately, this fly turns out to be a generalist on a number of other moths and butterflies, which makes it unacceptable for biological control.

Elm just can't seem to catch a break! Dutch elm disease (DED) devastated populations of what was once one of our most common and majestic urban trees. A number of exotic species and now resistant varieties have been planted in urban settings and work from Europe indicates they will be susceptible to EZZ. Although Elm is not an important timber species, although I just learned that wheel wrights in the past valued elm for wheel spokes. Elm *is* an ecologically important species in wetland forests. Indeed, similar to hemlocks, it is considered a foundation species: species that dominate ecosystem structure and processes (Ellison et al. 2005). I had hope that American elm might be naturally developing resistance to DED in our extensive floodplain forests. Now, with EZZ, will this possibility be set back? With black ash being heavily impacted by emerald ash borer will our floodplain forest be left with only red maple?

There are so many reasons to be concerned about this newest invader. Please keep your eyes peeled for this insect next spring, and have your phone with the iMapInvasives app turned on!

Resources:

Blank, S.M., Köhler, T., Pfannenstill, T., Neuenfeldt, N., Zimmer, B., Jansen, E., et al. 2014. Zig-zagging across central Europe: recent range extension, dispersal speed and larval hosts of *Aproceros leucopoda* (Hymenoptera, Argidae) in Germany. Journal of Hymenoptera. Research, 41: 57–74.

Ellison, A.M.; Bank, M.S.; Clinton, B.D.; Colburn, E.A.; Elliott, K., et al. 2005. Loss of foundation species: consequences for the structure and dynamics of forested ecosystems. Frontiers in Ecology and the Environment. 3: 479-486.

Martel, V; Morin, O; Monckton S.K.; Eiseman C.S.; Béliveau, C; Cusson, M; and Blank, S.M., et al. 2021. The Canadian Entomologist.

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