Established Populations of the Asian Chestnut Gall Wasp Discovered in Michigan

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The Asian chestnut gall wasp [ACGW; *Dryocosmus kuriphilus* Yasumatsu (Hymenoptera: Cynipidae)] was first reported as established in Michigan in July 2015 (Lizotte 2015) based on samples collected at two sites in southwestern Michigan in June 2015 (Springer et al. 2015). The ACGW is native to China, and was first reported outside its native range in Japan in the early 1940s (Murakami 1981), in the USA in Georgia in 1974 (Payne et al. 1975), and in Europe in Italy in 2002 (Brussino et al. 2002). It was also reported for the first time in Canada in Ontario near Niagara on the Lake in 2012 (Huber and Read 2012).

Where it has been introduced, the ACGW is recognized as the most serious insect pest of chestnuts worldwide (EPPO 2005), given that it can greatly reduce nut yield and may even kill trees (Battisti et al. 2014, Dixon et al. 1986). The ACGW has a 1-year life cycle and all individuals are female. Adults are active in early summer and lay eggs in the newly formed buds on chestnut trees. After hatching the larvae become inactive until budbreak the following spring. Galls form around the developing larvae and can be found on twigs, leaf petioles or leaves. Old galls become woody and can persist for several years, and their location along a branch can be used to age an infestation.

The ACGW has been expanding its range within North America since it was first found in Georgia in 1974. Since 2000, it was detected in Virginia (2001), Ohio (2002), Kentucky (2003), Maryland and Pennsylvania (2006), Connecticut (2011), Massachusetts and Ontario (2012), and now Michigan (2015). The ACGW can spread naturally of course, through flight, but most of the long-distance spread resulted from inadvertent movement of infested nursery stock and scionwood that is used for grafting. This is understandable given that buds infested with ACGW eggs or overwintering larvae show no outward signs of infestation, and even nursery stock with developing galls can be overlooked.

Michigan is the leading US state in the number of chestnut farms and total chestnut acreage under production (Bricault 2013). Given this prominence and the proximity of ACGW in nearby Ohio, Michigan chestnut growers were anxious about the potential arrival of ACGW (Haack et al. 2011). In fact, in 2010 the Michigan Department of Agriculture enacted a quarantine that prohibited the entry into Michigan of all living plants and scionwood of all *Castanea* species from all US states known to be infested with ACGW (MDA 2010).

The initial discoveries of ACGW in southwestern Michigan occurred at two sites, including one private orchard and the other at an experimental farm managed by Michigan State University (Lizotte 2015). However, by August, ACGW had been found at 10 sites in multiple counties, all within southwestern Michigan (Springer et al. 2015). Initially, eradication was considered given that there were only two known infested sites in Michigan (Lizotte 2015), however, that possibility will need reassessment as the number of infested sites increases.

One of the most effective biological control options for the ACGW is the Asian parasitoid *Torymus sinensis* Kamijo (Hymenoptera: Torymidae). This univoltine parasitoid is native to China and was first introduced to Japan, and later to the USA, and most recently to Europe (Cooper and Rieske 2011, Moriya et al. 2003, Quacchia et al. 2008). This parasitoid has usually moved with the ACGW in the USA, and apparently is present in Michigan based on DNA evidence (Springer et al. 2015).

In the years ahead it will be interesting to record the impact that ACGW has on Michigan's chestnut industry. Perhaps *Torymus sinensis* will spread quickly along with ACGW and thereby lessen the overall impact of ACGW. Or perhaps populations of *T. sinensis* can be augmented in Michigan through mass-rearing and release programs. Alternatively, growers may switch to chestnut cultivars that are less susceptible to the ACGW, such as 'Bouche de Bétizac,' which is a European x Japanese cross that appears immune to ACGW (Lizotte 2015). As for now, Michigan chestnut growers should scout their orchards for ACGW by looking for the telltale galls, and follow all quarantine regulations (MDA 2010) when ordering out-of-state chestnut trees or scionwood, as well as being very cautious, or perhaps even avoiding, within-state movement of chestnut plant material.

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