

1.3 Adventive vs. Planned Introductions of *Trissolcus japonicus* Against BMSB: An Emerging Case Study in Real-time

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The invasive brown marmorated stink bug (BMSB), *Halyomorpha halys* Stål (Hemiptera: Pentatomidae), has been responsible for widespread damage to fruit, nut and vegetable crops since its establishment in North America and Europe in the past decade. Further spread to continents that are currently free of BMSB remains a serious risk (Kriticos *et al.*, 2017). Although this insect can also be a pest in its native range in northeastern Asia, its severity appears to be less there than in the newly invaded regions (Lee *et al.*, 2013), and natural enemies of BMSB in Asia are thought to be an important regulating factor. Abram *et al.*, (2017) reviewed surveys for indigenous natural enemies that attack BMSB in the invaded regions, which show that parasitism and predation rates are typically too low to suppress BMSB. Several studies have suggested that these indigenous parasitoids are often physiologically incapable of overcoming host BMSB defenses (Abram *et al.*, 2014, Haye *et al.*, 2015). Successful egg parasitism in particular is much lower than in the native Asian range, suggesting that a classical biocontrol approach to manage this pest may be appropriate. The egg parasitoid *Trissolcus japonicus* (Ashmead) (Hymenoptera: Scelionidae) (also in literature as *T. halyomorphae* Yang; Yang *et al.*, 2009; Talamas *et al.*, 2013, 2015b) is a key natural enemy of BMSB in its native Asian range (Yang *et al.*, 2009; Qui *et al.*, 2010; Zhang *et al.*, 2017). It has been under evaluation as a candidate biocontrol agent for introduction against BMSB into North America and elsewhere.

Trissolcus japonicus has been reared from several other pentatomid hosts in Asia besides BMSB (Zhang *et al.*, 2015; Matsuo *et al.*, 2016; Kim *et al.*, 2017; Zhang *et al.*, 2017). Laboratory host range testing conducted with no-choice tests in China showed that *T. japonicus* attacked and developed in most of the non-target Asian stink bug hosts tested (Zhang *et al.*, 2017). Similar tests in the U.S. have shown that it will also attack a number of native American hosts, although there is a wide range of developmental success. Choice tests reveal preferences for BMSB in many, but not all, paired comparisons (Hedstrom *et al.*, 2017, KAH unpublished data). Behavioral cues result in additional host selectivity during the process of searching for hosts (Hedstrom *et al.*, 2017).

Recently, several adventive populations of *T. japonicus* were discovered in North America, on the U.S. east coast in 2014 (Talamas *et al.*, 2015a; Herlihy *et al.*, 2016), on the west coast in 2015 (Hedstrom *et al.*, 2017; Milnes *et al.*, 2016), and in 2016, a second population in the northeastern U.S. (Fig. 1.3.1). All three populations are genetically distinct (M.C. Bon, unpublished data). It is not known how they arrived in North America

but they have established and are expanding their range. Their establishment will allow researchers the valuable opportunity to simultaneously: (1) assess the capacity of *T. japonicus* to impact BMSB populations in an invaded range, (2) determine the host and habitat preferences and fidelity of *T. japonicus* under natural conditions and contrast field results with laboratory evaluations, and (3) study how this introduced parasitoid will interact with resident parasitoids and influence trophic webs.

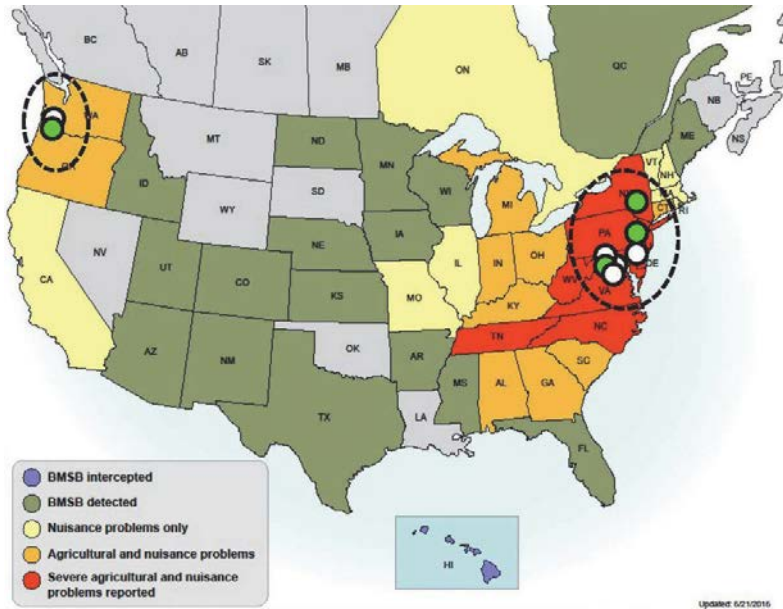


Fig. 1.3.1. Documented field occurrence of adventive *Trissolcus japonicus* in North America (as of December 2016).

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