

PREDATION OF THE SPOTTED LANTERNFLY, *LYCORMA DELICATULA* (WHITE) (HEMIPTERA: FULGORIDAE) BY TWO NATIVE HEMIPTERA¹

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The spotted lanternfly, *Lycorma delicatula* (White), is a recently introduced exotic pest to North America, and is currently restricted to four counties in eastern Pennsylvania (Barringer et al., 2015, Dara et al., 2015). First detected in 2014, this pestiferous species is a significant risk to forestry and agriculture in the United States, as Korea has experienced with its own introduction (Lee et al., 2011). The spotted lanternfly has a broad host plant range of 65+ species, with over 25 of these occurring in Pennsylvania, making the full impact of this introduction potentially very damaging (Dara et al., 2015).

Pennsylvania has a suite of naturally occurring specialist parasitoids for plant-hoppers (Fulgoroidea) such as Dryinidae (Hymenoptera) and Epipyropidae (Lepidoptera), however parasitism by either of these families has not been observed since the spotted lanternfly's discovery in September 2014 (Barringer et al., 2015). Generalist predation by other taxa has also not been documented, possibly in part to natural defenses the spotted lanternfly possesses. Chemical defenses through the use of cytotoxins, acquired by feeding primarily on the tree of heaven (*Ailanthus altissima*), are thought to deter against generalist predators and birds (Xue and Yuan 1996, Kang et al., 2011). Here we report the first records of native predatory insects feeding on spotted lanternfly.

The first observation of predation was observed by the author (Erica Smyers) on September 4, 2015, in Berks County, Pennsylvania. A wheel bug, *Arilus cristatus* (Linnaeus), was discovered feeding upon the ventral side of an adult male spotted lanternfly at the base of a willow tree (*Salix* sp.) (Figure 1). The wheel bug was in close proximity to a brown paper sticky band wrapped around the willow's trunk.

The distribution of *A. cristatus* (Reduviidae) (Linnaeus) is extensive, ranging from Rhode Island and Ontario west to California and south to Florida and Mexico (Henry and Froeschner 1988, Mead 2014). The wheel bug is regarded as an important generalist predator of forest and shade tree pests including Coleoptera, Lepidoptera, and Hemiptera (Mead 2014). Life history work in York County, Pennsylvania, showed that its seasonal occurrence overlaps closely with

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that of the spotted lanternfly. Predation on other Auchenorrhyncha (e.g. *Atymna querci* (Fitch) and *Ceresa diceros* (Say)) and on other invasive insects (*Popillia japonica* Newman) has been previously documented (Moul 1945).

The second observation, also in Berks County, was made by a Pennsylvania Department of Agriculture field crew (James Herron and Betsy Myers) on November 3, 2015. A female stink bug, *Apoecilus cynicus* (Say) (Identified by author LEB) was observed puncturing the underside of a female spotted lanternfly (Figure 2). During collection the stinkbug released the lanternfly but resumed feeding after being left undisturbed. The stink bug and associated spotted lanternfly specimens are deposited in the Pennsylvania Department of Agriculture collection (PADA).

Apoecilus cynicus (Say), a predatory stink bug (Pentatomidae: Asopinae), has a broad distribution in North America reaching west to Arizona, north to south central Canada, and across the eastern seaboard (Henry and Froeschner 1988). *A. cynicus*, a generalist predator, has a documented history of feeding on introduced pestiferous species (McPherson 1982). These predators have been collected as both nymphs and adults from maple trees (*Acer* spp.) (Hussey 1922, McPherson 1982, McPherson and Mohlenbrock 1976) which adult spotted lanternfly use as a food source and an egg laying site (Dara et al., 2015). *A. cynicus* has also been reported to be more common on the edges of woods, which overlaps with the habitat of the tree of heaven (*A. altissima*), the preferred host of the spotted lanternfly (Dara et al., 2015).

Their extensive range, seasonality, and habitation of forest edges will increase the likelihood these two predator species will come in contact with the spotted lanternfly. Both *Arilus cristatus* and *Apoecilus cynicus* have historically preyed on other invasive pest insects, indicating they may be useful biocontrol agents.

Additionally, these predators may have behavioral or physiological mechanisms for overcoming spotted lanternfly chemical defenses that may illuminate toxin avoidance or detoxification strategies. There is still much to learn about the ecology and life history of the spotted lanternfly in North America. It is likely that other native predators exist and their discovery may be useful in developing biocontrol options.

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Fig. 1 (left). An *Arilus cristatus* (Linnaeus) feeding on a male spotted lanternfly, *Lycorma delicatula* (White). Penetration by the beak is in the sternum. The specimens were located on a willow tree (*Salix* sp.), near a PDA tree banding sticky band.

Fig. 2 (right). A female *Apoecilus cynicus* (Say) feeding on a female spotted lanternfly, *Lycorma delicatula* (White). Penetration by the beak is in the sternum, anterior to the mesocoxae. Beside the specimens are sap trails from spotted lanternfly feeding.