

Brown Marmorated Stink Bug, *Halyomorpha halys* Stål (Insecta: Hemiptera: Pentatomidae)¹

Jamba Gyeltshen, Gary Bernon, and Amanda Hodges²

Introduction

The brown marmorated stink bug (BMSB), *Halyomorpha halys* Stål, is a pest that was first officially reported from the western hemisphere in Allentown, Pennsylvania in 2001 (Hoebeke and Carter 2003). This stink bug may become a major agricultural pest in North America, similar to the [southern green stink bug](#), *Nezara viridula* (L.). Both species are polyphagous pests of various crops, but in the U.S. it has been primarily reported as a household nuisance and ornamental pest. However, in eastern Asia where the BMSB is native or indigenous, it is a pest on fruit trees and soybeans.

Synonymy

There is considerable confusion in the genus and a revision is needed. All references to *Halyomorpha* species in Japan, Korea, and east-China are *Halyomorpha halys* (Rider 2005).

Distribution

Although the first specimen was positively identified in 2001 (Hoebeke and Carter 2003), there were numerous reports of a nuisance stink bug in Allentown, Pennsylvania, at least several years prior to that date. Interviews with homeowners indicated that there were likely breeding populations in Allentown as early as 1996, and BMSB has been reported in 34 Pennsylvania counties as of 2008

(Hoebeke and Carter 2003, Jacobs 1996). As of 2005, established populations was reported in Oregon. BMSB has also been reported as intercepted or detected in several other U.S. states. If you have questions regarding BMSB distribution in your state, please contact your local Cooperative Extension Service, State Department of Agriculture, or National Plant Diagnostic Network (NPDN) laboratory. BMSB was reported as intercepted in Hillsborough County, Florida during February 2009 (Halbert 2009).

Identification

Typical of other stink bugs, the BMSB has a shield-shaped body and emits a pungent odor when disturbed. With a mottled brown, 12 to 17 mm long (approximately 1/2 inch) body, it has characteristic alternating dark and light bands across the last two antennal segments that appear as a single white band in both nymphs and adults. This is the most distinguishing characteristic in the field, although it can easily be confused with other hemipterans, including native brown stink bugs from the genera *Acrosternum*, *Brochymena* and *Euschistus* (Hobeke and Carter 2003).

Example species that could be confused with the brown marmorated stinkbug include the [brown stink bug](#), *Euschistus servus*; the [green stink bug](#), *Acrosternum hilare*; [leaf-footed bugs](#); boxelder bugs; [Euthyrhynchus floridanus](#); and other similar hemipterans.

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2. Jamba Gyeltshen and Amanda Hodges, Department of Entomology and Nematology, University of Florida; and Gary Bernon, USDA-APHIS.

Eggs: The white or pale green barrel-shaped eggs are laid in clusters on the undersides of leaves. Egg masses have about 25 eggs that are only about 1 mm in diameter but become apparent when nymphs have recently emerged, as they will stay at the egg mass for several days. In Pennsylvania, eggs first appeared in late June, but females continued to lay egg masses until September. Although only one generation was observed, there are likely to be multiple generations as the distribution spreads south (Bernon et al. 2004).



Figure 1. An egg mass of the brown marmorated stink bug, *Halyomorpha halys* Ståhl, and newly emerged 1st instar nymphs are shown.
Credits: Karen Bernhard, Lehigh County Extension, Pennsylvania State University

Nymphs: As with all immature stink bugs, the nymphs lack fully developed wings and have been described as tick-like in appearance, ranging in size from 2.4 mm (1st instar) to 12 mm (5th instar). Nymphs need to molt, or shed their outer skin (exoskeleton), as they progress through five different stages or nymphal instars. First instars are colored orange or red and remain clustered around the egg mass, sometimes until they molt to the 2nd instar stage. The 2nd instar begins to develop an almost black appearance, and subsequent instars (3rd, 4th, and 5th) begin to acquire more of the adult BMSB coloration.

Adults: Adults are 12 to 17 mm long (approximately 1/2 inch), and have a mottled appearance. Alternating dark and light bands occur on the last two antennal segments.



Figure 2. First and 2nd instar nymphs are shown dispersing from an egg mass of the brown marmorated stink bug, *Halyomorpha halys* Ståhl, in Allentown, Pennsylvania.
Credits: Gary Bernon, USDA-APHIS



Figure 3. A 2nd instar nymph of the brown marmorated stink bug, *Halyomorpha halys* Ståhl. The white marking on the antennae is possibly the best field identification characteristic.
Credits: Deepak Matadha, Rutgers University



Figure 4. Fifth instar nymph of the brown marmorated stink bug, *Halyomorpha halys* Ståhl, on raspberry in Allentown, Pennsylvania. Credits: Gary Bernon, USDA-APHIS

Additionally, the head and pronotum are covered with patches of coppery or bluish metallic-colored punctures and the margins of the pronotum are smooth as compared to the toothed, jagged pronotal margin of *Brochymena* (Hoebeke 2002). The exposed lateral margins of the abdomen are marked with alternate bands of brown and white. Faint white bands are also evident on the legs.



Figure 5. Two adults and one 5th instar nymph of the brown marmorated stink bug, *Halyomorpha halys* Ståhl, in Allentown, Pennsylvania on crab apple. Credits: Gary Bernon, USDA-APHIS

Life Cycle

In Pennsylvania, the BMSB has only one generation a year, corresponding to the northern part of its native range. However, in southern China up to five generations occur each year, and the same pattern can be expected as the BMSB spreads south (Hoebeke and Carter 2003, Hoffmann 1931). The adults mate in the spring approximately two weeks after emerging from diapause or the resting phase. After a short period, the females begin laying egg masses. Egg masses are laid at approximately weekly intervals, and each female lays as many as 400 eggs in her lifetime. In Pennsylvania, females were observed laying eggs from June to September. Since females continue to lay new egg masses throughout the season, different nymphal stages were often observed on the same host plant.

First instar nymphs emerge four to five days after eggs are laid. Nymphs are solitary feeders, but they occasionally aggregate between overlapping leaves or leaf folds (Bernon et al. 2004). BMSB has five nymphal instars, and each stage lasts approximately one week, depending upon temperature. Laboratory studies indicate that adults are sexually mature two weeks after their final molt (Hoebeke and Carter 2003). Adults are very active and drop from plants or fly when disturbed. Again, the best field characteristic for adults is the white band on the antennae.



Figure 6. Six 5th instar nymphs of brown marmorated stink bug, *Halyomorpha halys* Ståhl, with one 5th instar nymph of green stink bug, *Acrosternum hilare* (Say) in Allentown, Pennsylvania on black cherry. Credits: Gary Bernon, USDA-APHIS

Economic Importance

BMSB is polyphagous, and is a pest of several important crops in its native range. In Japan it attacks shade and fruit trees, vegetables, and leguminous crops (Hoebeke 2002). In southern China, it feeds on flowers, stems and pods of various legumes, and also on:

- flowers of hibiscus, *Hibiscus rosa-sinensis* L.,
- stems of celosia, *Celosia argentea* L.,
- fruits of black night-shade, *Solanum nigrum* L., and
- malabar/Indian/ceylon spinach, *Basella rubra* L.

Other host plants of economic importance include:

apple, *Malus domestica* L.,
cherry, *Prunus avium* L.,

- *Citrus* spp.,
- fig, *Ficus*,
- Japanese apricot, *Prunus mume* Siebold and Zuccarini,
- Japanese persimmon, *Diospyros kak* L.,
- mulberry, *Morus* sp.,
- peach, *Prunus persica* Batsch,
- pear, *Pyrus pyrifolia* Nakai,
- the princess tree, *Paulownia tomentosa* Thunb., and
- soybean, *Glycine max* Merrill,

(Hoebeke 2002, Hoebeke and Carter 2003).

Unfortunately, it is difficult to assess the damage caused by one species of stink bug, since several species cause similar damage. A similar situation may occur in the southern U.S., as the BMSB spreads south and overlaps with the distribution of the [southern green stink bug](#) (Bernon 2004 et al.).

Originally, populations in Pennsylvania were limited to ornamental plants, garden crops, fruit and shade trees in suburban areas and urban landscapes (Bernon et al. 2004). Damage was observed on several ornamentals, including butterfly-bush (*Buddleia* spp), and the princess tree (*P. tomentosa*). Both adults and nymphs fed on the leaves of these two host plants, and leaf damage was very apparent by the end of the season (Bernon et al. 2004). These two ornamentals may attract the stink bug as it spreads to new areas, and homeowners are likely to be the first to see this new pest. Significant damage was also reported on urban peach and pear crops. Following the first official identification of BMSB, Bernon et al. (2004) found BMSB on over 60 host plants.

As the BMSB continues to expand its range, it is likely to invade agricultural areas and may pose a risk to various crops. Nielson and Hamilton (2009) conducted an extensive

study of BMSB populations at farms in New Jersey and Pennsylvania, and found approximately 25% damage per fruit tree. These studies critically indicate the potentially increasing pest pressure that may occur in tree fruits, particularly pears, apples, and peaches, as a result of the introduction of BMSB. Nielson and Hamilton (2009) predict that pest pressure from BMSB could be more severe in southern U.S. peach-producing states, as it is possible that two generations per year would occur in warmer climates.



Figure 7. Early and late instar nymphs of the brown marmorated stink bug, *Halyomorpha halys* Stål, feeding on Asian pear in Allentown, Pennsylvania.

Credits: Deepak Matadha, Rutgers University



Figure 8. Nymphs of the brown marmorated stink bug, *Halyomorpha halys* Stål, feeding on green beans in Allentown, Pennsylvania.

Credits: Deepak Matadha, Rutgers University



Figure 9. Adults of the brown marmorated stink bug, *Halyomorpha halys* Stål feeding on peach in Allentown, Pennsylvania. Characteristic damage is evident.
Credits: Gary Bernon, USDA-APHIS



Figure 10. Two adults and a nymph of the brown marmorated stink bug, *Halyomorpha halys* Stål, feeding on one of its main hosts, princess tree in Allentown, Pennsylvania. Characteristic feeding damage of the brown marmorated stink bug is also evident. Late instar nymphs of leaf-footed bugs (Hemiptera: Coreidae) are often mistakenly submitted as brown marmorated stink bug samples. The Coreidae pictured is probably the western conifer seed bug, *Leptoglossus occidentalis* Heidemann.
Credits: Gary Bernon, USDA-APHIS

Damage

Similar to other stink bugs, the nymphs and adults have a piercing-sucking type of mouthpart. In order to obtain the nutrients of the liquid part of the fruit, stink bugs use these mouthparts in a straw-like fashion by piercing the fruit. Small necrotic spots on fruit and leaf surfaces often

result from feeding damage, and it may be compounded by secondary infections and scarring as the fruit matures. In particular, affected apples often exhibit pitting and discoloration symptoms and peaches frequently display a characteristic distortion referred to as “catfacing” (Hamilton and Shearer 2003). Even if a fruit such as a peach is still edible, it may not be suitable for market. Similar damage to other crops, such as soybeans, is more likely to occur in the southern U.S. Because the BMSB is polyphagous, or feeding on a wide range of host plants, almost any crop with fruit may be at risk.

In addition to direct feeding damage, the BMSB is also known to potentially vector or spread a witch’s broom phytoplasma in princess tree, *Paulownia tomentosa*, in Asia (Jones and Lambdin 2009). Incidences of vector transmission of BMSB in the U.S. have not been reported.

Nuisance Pest Status

Late in the season, adults will enter homes and other buildings when seeking sheltered sites to overwinter, or diapause. During the several weeks of peak flight, many insects can enter homes through any small opening, mostly around windows. In Japan, the BMSB is a well-known nuisance pest for this reason, and the same situation is now common in Allentown, Pennsylvania in late September and early October. This nuisance behavior resulted in many complaints to the Lehigh County (Allentown) Cooperative Extension Service, and ultimately resulted in the identification of this new invasive pest. As the insect spreads to new areas, this aggregation behavior will probably again attract attention and ironically assist in monitoring its distribution. The nuisance aspect is a major concern in suburban areas and may distract from the potential future agricultural risks (Bernon 2004).

Management

The effectiveness of various insecticide classes to control of BMSB is evaluated in Nielsen et al. (2008). Remember to read and follow all pesticide labels prior to attempting application. In some cases, pesticide application must be conducted by a pest control applicator. A newly described species, *Trissolcus halymorphae* Yang (Hymenoptera: Scelionidae) is an egg parasitoid that has been identified as the primary biological control agent responsible for the management of BMSB in northern China (Yang et al. 2009). This parasitoid averages a 50% mortality rate for BMSB populations, and it was the only natural enemy identified with a mortality rate exceeding 10%. *Trissolcus halymorphae* is currently not known to occur in the U.S.

with existing populations of BMSB. Future management of BMSB populations in orchards or other commodity-based fields will probably consist of a combination of integration of reduced-risk pesticides and biological control.

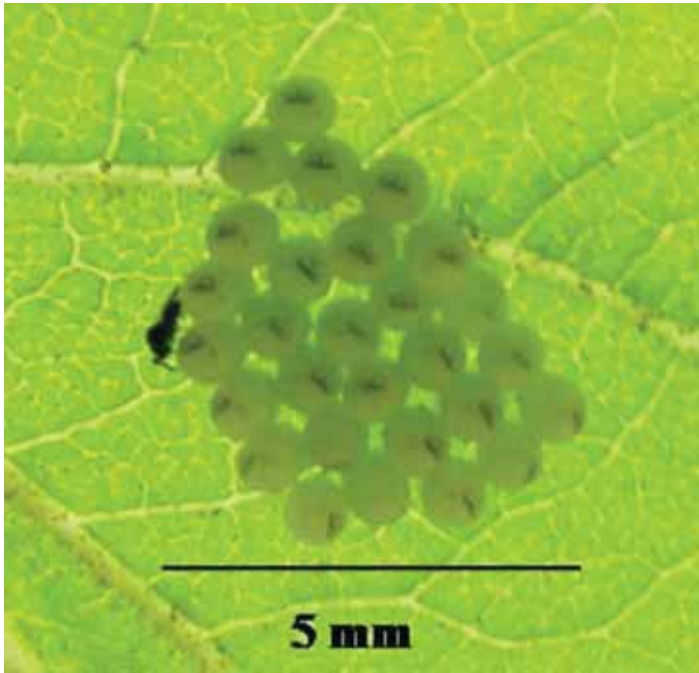


Figure 11. *Telenomus podisi* (Hymenoptera: Scelionidae), a generalist stink bug parasitoid that was recently recorded for the brown marmorated stink bug, *Halyomorpha halys* Stål. The host plant in this photo is a princess tree, *Paulownia tomentosa*, in Allentown, Pennsylvania.

Credits: Gary Bernon, USDA-APHIS

Indoor nuisance pest problems. Mechanical exclusion and chemical control have been suggested for preventing nuisance, overwintering pest problems in residential homes and commercial businesses (Jacobs 2009). BMSB can be mechanically excluded by sealing cracks and other building openings with quality silicone or silicone latex caulk. Damaged screens on doors or windows should be repaired or replaced. Some synthetic pyrethroid insecticides available to commercial pesticide applicators may be applied to the exterior of the home just prior to fall aggregations, but the effectiveness of these chemical sprays is only temporary. Sunlight will degrade synthetic pyrethroid insecticides within a few days to a week of the application.

Urban pest management. Occasionally stink bugs were observed to damage ornamentals in Allentown, including butterfly bush, Paulownia shade trees and crabapples. Although insecticides were used, plant damage was minimal and most control efforts were focused on suppression of nuisance population. Despite insecticidal treatments, some damage was still observed on backyard fruit trees.

This documented damage to agriculturally important crops suggests that there will be a need for IPM when populations reach agricultural areas (Bernon et al. 2004).

Reporting in Florida. If stink bugs are found flying into homes in the fall, they may be the BMSB and should be reported to the UF/IFAS Cooperative Extension Service or the Florida Department of Agriculture and Consumer Services Division of Plant Industry. Specimens should be collected for positive identification. Although the brown mottled color is distinctive, there are several native species of brownish stink bugs that will look very similar to the BMSB.

[Sample Submission Form for the UF/IFAS Insect Identification Laboratory](#)

[UF/IFAS Distance Diagnostic and Identification System](#) [October 2011]

[Find your local Florida County Cooperative Extension Service Office](#)

[Florida Department of Agriculture & Consumer Services, Division of Plant Industry, Sample Submission Instructions](#)

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