



Department
for Environment
Food & Rural Affairs

Plant Pest Factsheet

Brown Marmorated Stink Bug

Halyomorpha halys



Figure 1. Adult brown marmorated stink bug found in London © Fera

Background

The brown marmorated stink bug (BMSB) *Halyomorpha halys* (Stål) (Hemiptera: Pentatomidae), native to East Asia, is an invasive species that is expanding its range in North America (first detected 1996) and in Europe (first detected 2004). It is highly polyphagous, and since 2017 it has become a major economic pest in northern Italy attacking a range of crops including apple, pear, kiwi, peach, apricot, cherry, hazelnut, soya and corn crops, in some cases causing significant losses (estimated losses in 2019 were €250 million). It is also a pest of peppers grown in glasshouses in Hungary and Switzerland and is a nuisance when thousands of adults enter residential and commercial buildings in the autumn to overwinter, leaving a characteristic unpleasant odour.

Because it is so polyphagous the crops in the UK that could potentially be impacted by BMSB are varied and cover a few different production sectors: top-fruit (apples, pears, apricots, plums, cherries) viticulture, soft and cane fruit (blueberries, blackberries, raspberries, strawberries), nuts (hazelnut, cob nut, walnut), hops, protected salad crops and vegetables (tomatoes, peppers, aubergines, cucumbers), field vegetables and salads (sweetcorn, green beans, lettuce, spinach, carrots, cauliflower, broccoli, asparagus, pumpkins, and courgettes), cereals and seed crops (wheat, sunflower, soy) as well as a wide range of ornamental and nursery plants.

BMSB is not being treated as a quarantine pest in the UK because it is not considered possible to regulate all the potential pathways that the pest could arrive on, as it is a well-known hitchhiker on non-regulated commodities, such as packaging material associated with manufactured products and passenger luggage. BMSB has been intercepted in Britain on several occasions in association with imports of a variety of commodities from China, mainland Europe and North America. There have also been findings in the wider environment, mostly in southern England and one finding in Leicester, but so far there has been no evidence of it breeding in the wider environment. However, an isolated population has been found breeding under protection in southern England. It is highly likely that BMSB will be encountered more frequently in Britain as it is becoming more common and widespread on the continent.



Figure 2. Brown marmorated stink bug eggs © D. Lance, USDA, APHIS, PPQ



Figure 3. Brown marmorated stink bug hatched eggs and first-instar nymphs © D. Lance, USDA, APHIS, PPQ



Figure 4. Brown marmorated stink bug third instar nymphs © D. Lance, USDA, APHIS, PPQ



Figure 5. Group of brown marmorated stink bug fourth and fifth instar nymphs © G. Bernon, USDA, APHIS



Figure 6. Brown marmorated stink bug adult on a peach © G. Bernon, USDA, APHIS



Figure 7. Brown marmorated stink bug adult on an apple © Fera

Geographical Distribution

BMSB is native to East Asia and has been recorded from China, Japan, South Korea, Russian Far East, Taiwan and Northern Vietnam. It has been introduced to North America and spread widely in the USA and southern Canada, and in Puerto Rico in the Caribbean. In Europe it has been recorded from Austria, France, Germany, Greece, Hungary, Italy, Lichtenstein, Romania, Russia, Serbia, Slovakia, Spain, Switzerland and intercepted in the UK.

Host Plants

BMSB is a highly polyphagous pest attacking more than 100 plant species, primarily fruit trees and woody ornamentals, but also field crops.

Fruit crops include: *Citrus* spp., *Diospyros* spp., *Malus domestica* (apple), *Morus* spp., *Prunus armeniaca* (apricot), *P. avium* (sweet cherry), *P. domestica* (plum), *P. persica* (peach), *Pyrus communis* (pear), *Solanum lycopersicum* (tomato), *Rubus idaeus* (raspberry) and *Vitis vinifera* (grapevine). Field crops include: *Asparagus* spp., *Glycine max* (soybean), *Phaseolus vulgaris* (common bean) and *Zea mays* (maize). Forest and ornamental trees/shrubs include: *Abelia grandiflora* (glossy abelia), *Acer* spp. (maples), *Aralia elata* (Japanese angelica tree), *Buddleia davidii* (summer lilac), *Cryptomeria japonica* (Japanese cedar), *Cupressus*, *Decaisnea fargesii* (blue bean shrub), *Hibiscus*, *Lonicera*, *Paulownia tomentosa* (foxglove tree), *Rosa rugosa*, *Salix*, *Stewartia pseudocamellia* and *Tropaeolum majus* (nasturtium). In Asia, BMSB has also been found on weeds (e.g. *Actrium* spp.).

Description

The eggs are oval (1.6 x 1.3 mm) and light green (Fig 2). They are attached side by side in groups of 20 to 30 on the underside of leaves. There are five nymphal instars. They range in length from 2.4 mm at the first instar to 12.0 mm at the last instar. Deep-red eyes characterize the immature stages. The abdomen is a yellowish-red in the first instar (Fig 3) and gradually turns to off-white with reddish spots in the latter instars (Figs 4-5). The pronotum (section of the body behind the head) of the nymphs is armoured with spines (Fig 4), and the legs of the third to fifth-nymphal instars show a distinct white band. Adults range from 12.0 to 17.0 mm long and are generally brownish in colour with extensive cream and black mottling and dense punctuation (Figs 1 and 6-9). Distinguishing characteristics found on adult BMSB include lighter bands on the antennae and darker bands on the membranous, overlapping part at the rear of the wings (Fig 8). They also have patches of coppery or bluish metallic-coloured punctures on the head and pronotum. The scent glands are located on the dorsal surface of the abdomen and the underside of the thorax. It is these glands that are responsible for producing the pungent odour that characterizes "stink bugs."

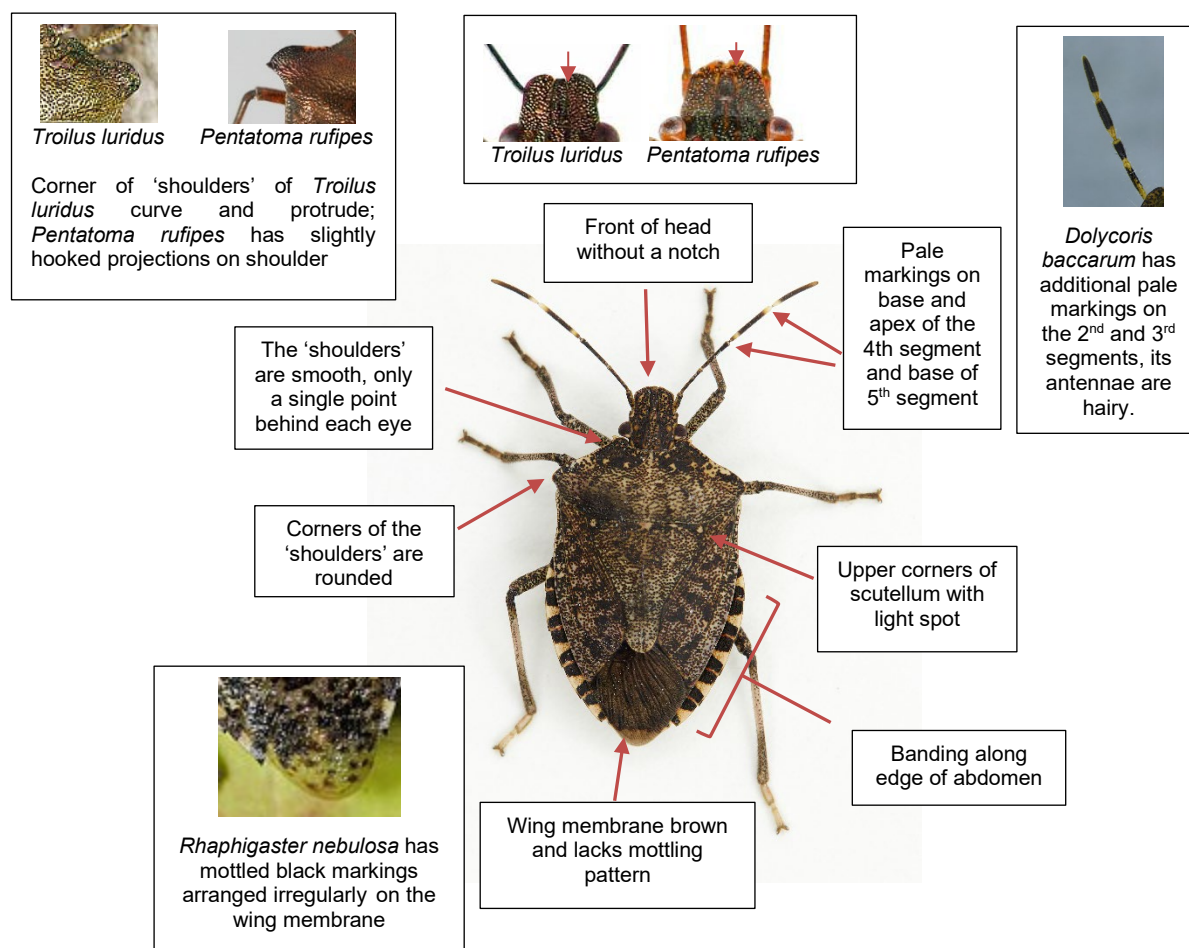


Figure 8. Diagnostic characters of adult brown marmorated stink bug and a comparison with other stink bugs that it may be confused with in Britain © Fera

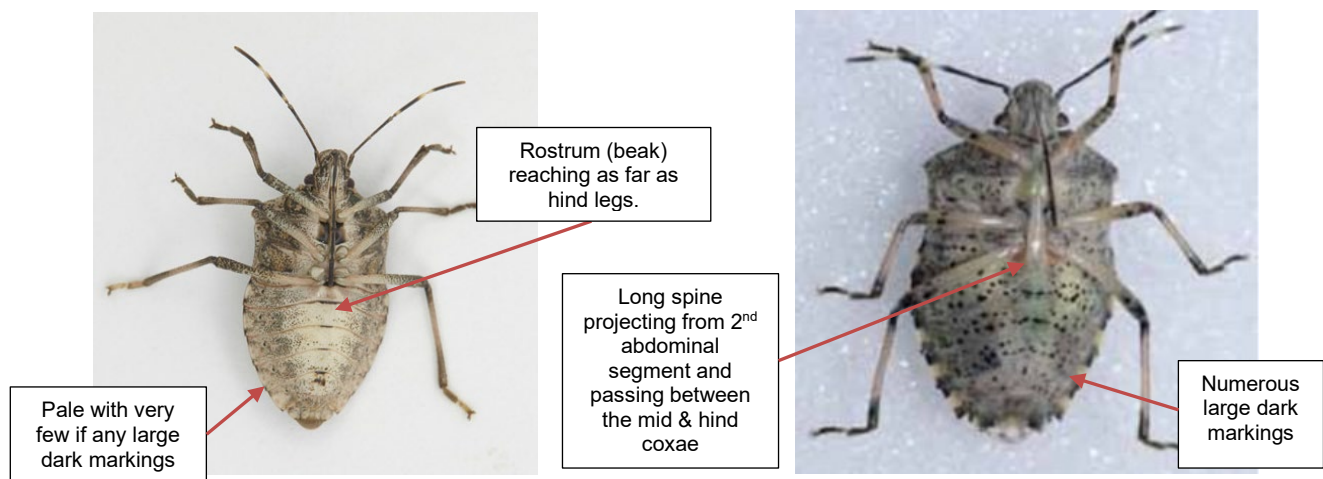


Figure 9. (Left) Adult brown marmorated stink bug, ventral view © Fera;
(Right) Adult *Rhopigaster nebulosa*, mottled shield bug, ventral view © Tristan Bantock

Bugs in Britain that could be confused with brown marmorated stink bug

BMSB is superficially similar in colour and overall appearance to a few other shield bugs present in Britain, therefore careful examination of discriminatory morphological characters is required for an accurate identification (Fig 8). Mottled shield bug (*Rhopigaster nebulosa*) (Figs 8, 9 and 11) is a common continental European species which is often mistaken for BMSB due to its similar appearance, habitat preference and aggregation behaviour. It was introduced to the UK in 2010 and has established in London. It is a large shield bug, usually 14-16 mm, similar in size to BMSB but has distinctly mottled wing membranes. It also has a distinctive long spine on the underside, arising from the 2nd abdominal segment, which projects forwards between the bases of the mid and hind legs (Fig 9).

Sloe bug or hairy bug (*Dolycoris baccarum*) (Fig 10) is widespread and locally common across the whole of southern Britain and is less common further north. It generally feeds on Rosaceae. Adults are purple-brown and greenish in colour (uniformly dull brown in the winter), about 11-12 mm long and are covered in long whitish hairs (best seen with a x10 hand lens). Adult BMSB can be distinguished from Sloe bug by their antennal banding and lack of long hairs, they are also *usually* longer.

The forest bug (*Pentatoma rufipes*) (Fig 12) is widespread and common across Britain in wooded areas, orchards and gardens, and occasionally enters homes. It is a large brown/bronze shield bug with orange legs and slightly hooked projections at the front of the body (absent in BMSB). Bronze shield bug (*Troilus luridus*) (Fig 13) is another woodland species, associated with both deciduous and coniferous trees, and occurs widely across Britain. It is generally smaller than BMSB, being about 10-12 mm long, mostly brown/bronze in colour with orange and black banding around the edges of the abdomen. It can also be separated from BMSB by the plain brown scutellum, shape of the head and single orange band on the 4th antennal segment.

Although not a shield bug, the Western conifer seed bug (*Leptoglossus occidentalis*) (Fig 14) can sometimes be mistaken for BMSB. Adults of this very large squash bug, also known as a “leaf-footed bug”, are about 15-20 mm long and have a reddish-brown body, transverse white zigzag line across the centre of the wings (although this is sometimes faint or even absent), and characteristic expansions on the hind leg. The bug feeds on pines and is native to the USA but is now established in the UK after it was first detected in 2007. It is attracted to light and frequently enters buildings in search of hibernation sites in the autumn.



Figure 10. *Dolycoris baccarum*, sloe bug © C. Malumphy



Figure 11. *Rhaphigaster nebulosa*, mottled shield bug © Tristan Bantock, British Bugs.org.uk



Figure 12. *Pentatoma rufipes*, forest bug © Crown copyright



Figure 13. *Troilus luridus*, bronze shield bug © Tristan Bantock, British Bugs.org.uk



Figure 14. *Leptoglossus occidentalis*, Western conifer seed bug © Crown copyright

Biology

In its native range five to six generations per year have been reported. In northern US states there is normally one generation per year although in hot summers there can be more. BMSB overwinters in the adult stage. In summer, females lay eggs (usually 50-150 eggs but sometimes up to 400, clustered by groups of 20-30) on the underside of leaves. BMSB has a relatively high minimum threshold for development of over 14°C.

Dispersal and Detection

BMSB is a strong flyer and can move from host to host during the growing season. The pest can be disseminated by trade of host plants but also by the movement of goods or vehicles over long distances. The pathways of introduction of BMSB into the USA and Switzerland are unknown but it is suspected that the pest was introduced either as a contaminating pest on packing material or via plant imports.

Economic Impact

Like other true bugs, BMSB feeds by sucking plant sap. Adults generally feed on fruit, whereas the nymphs feed on leaves, stems and fruit. The most important crop damage results from insect feeding on pome and stone fruits, and on seeds inside legume pods (e.g. beans and soybean). Leaf feeding is characterized by small lesions (3 mm diameter) which may then become necrotic and coalesce. Fruit that has been fed on by BMSB may have small necrotic spots or blotches, grooves and brownish discolorations. In cases of heavy infestations, fruit are severely disfigured and rendered unmarketable. In Asia, BMSB causes significant damage to soybean and various horticultural crops. In northern Japan, apple crops have increasingly been damaged by BMSB. Forest trees are known hosts of BMSB, but no damage has been reported in Asian forests. In Japan BMSB is considered as a pest in nurseries producing seeds of cedar and cypress because it can feed on cones. In the USA, damage caused by BMSB was initially reported in suburban or urban environments on woody ornamentals and peach and pear trees. However, in 2006 commercial fruit growers reported damage in apple and pear orchards. BMSB is considered a vector of *Paulownia witches' broom* phytoplasma in Asia. In northern Italy BMSB has become a pest of a range of crops including apple, pear, kiwi, peach, apricot, cherry, hazelnut, soya and corn crops, causing significant losses. In addition to plant damage, BMSB can be a nuisance to humans because at the end of autumn, adults can aggregate in residential and commercial buildings (on walls, window and door frames) seeking overwintering sites. When disturbed or crushed they discharge a characteristic pungent odour (unpleasant and long lasting!).

The potential economic impact that BMSB may have on the agricultural and horticultural industries, particularly on pome and stone fruit trees, in the UK is unclear. Although conditions are suitable for establishment in some areas of Britain, BMSB is not likely to cause significant impacts to UK outdoor crops since low summer temperatures will limit this species to one generation per year. However, hot summers will become more common in future due to climate change, potentially allowing BMSB to cause more damage to vulnerable crops. Reports from the USA and Europe suggest that more than one generation per year is required before serious economic damage is observed. Climate data suggests that BMSB would not be capable of more than one generation per year outdoors in northern Europe, although protected cropping situations could support more than one generation per year. The pest has recently been reported to damage glasshouse crops in central Europe (e.g., pepper in Hungary and Switzerland) and even low levels of feeding may cause internal brown marks in fruit which may significantly lower the market value. However, anecdotal evidence from agronomists in mainland Europe suggests that BMSB is easier to control in protected environments. Therefore, the risk needs to be continually monitored and re-assessed and this factsheet will be updated when significant new information is available.

Advisory Information

The biggest impact of BMSB in the USA has been as a nuisance pest when it congregates in domestic buildings. Filling the cracks around doors and windows with a silicone-based or similar sealant can help to prevent such invasions. Once BMSB has entered homes, removing the bugs with vacuum cleaners is recommended in the USA.

Pest management strategies for BMSB are being researched and there are a number of promising leads involving egg parasitoids such as the samurai wasp (*Trissolcus japonicus*) and aggregation pheromones, but there are as yet, no effective biological control agents available specifically for this pest in the UK. Pyrethroid insecticides (such as deltamethrin and lambda-cyhalothrin) have been shown to be effective treatments. Pyrethroids have the drawback that they are likely to have an impact on non-target arthropods including predatory species. Products containing deltamethrin are currently approved for use by professional growers for use on apple and pear crops. Products containing lambda-cyhalothrin are currently approved on label for pear crops and have off-label approvals for apple crops. There are currently also insecticides registered for home and garden use containing lambda-cyhalothrin or deltamethrin. Pesticide approvals are constantly changing therefore the approval status of products should be checked before use. Approvals can be checked using the Chemical Regulation Directorate's internet search page (<https://secure.pesticides.gov.uk/pestreg/ProdSearch.asp>). All users of plant protection products should read and follow the instructions on the product label (and off-label approval notices when appropriate).

Control of BMSB can be difficult depending on the crop situation, therefore monitoring is important as it allows early detection and interventions while pest populations are still at low or moderate levels. Ground-deployed black pyramid traps baited with a BMSB aggregation pheromone are suggested to be the most sensitive method of monitoring for all mobile life stages. Clear sticky cards hung horizontally in or near BMSB host trees, are considered sufficient for surveillance of BMSB, but have been found to catch significantly fewer BMSB than ground-deployed traps. The highest densities of BMSB have been observed along crop edges as the pest invades from wild hosts, therefore traps should be placed around the edge of the crop for early detection of BMSB.

Although BMSB is not being treated as a quarantine pest, findings of the pest in the UK are increasing and suspected sightings, particularly if there is evidence of breeding (eggs or nymphs) or crop damage, can be reported to NIAB via the email address below. Photographic evidence of findings are particularly helpful, especially if an object to indicate the size of the insect (such as a coin) can be included in the photo.

NIAB is currently surveying and monitoring for brown marmorated stink bug records in the UK, sightings should be sent to: bmsb@niab.com

For additional information on UK Plant Health please see:

<https://secure.fera.defra.gov.uk/phiw/riskRegister/>

<https://planthealthportal.defra.gov.uk/>

<https://www.gov.uk/plant-health-controls>

<http://www.gov.scot/Topics/farmingrural/Agriculture/plant/PlantHealth/PlantDiseases>

<https://www.daera-ni.gov.uk>

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