

**Submission to the Inspector-General of  
Biosecurity's review 'Assessment of the  
effectiveness of biosecurity measures to manage  
the risks of brown marmorated stink bug (BMSB)  
entering Australia'**

**Department of Agriculture and Fisheries**

This publication has been compiled Biosecurity Queensland, Department of Agriculture and Fisheries.

© State of Queensland, 2019

The Queensland Government supports and encourages the dissemination and exchange of its information. The copyright in this publication is licensed under a Creative Commons Attribution 4.0 International (CC BY 4.0) licence.

Under this licence you are free, without having to seek our permission, to use this publication in accordance with the licence terms.



You must keep intact the copyright notice and attribute the State of Queensland as the source of the publication.

Note: Some content in this publication may have different licence terms as indicated.

For more information on this licence, visit <https://creativecommons.org/licenses/by/4.0/>.

The information contained herein is subject to change without notice. The Queensland Government shall not be liable for technical or other errors or omissions contained herein. The reader/user accepts all risks and responsibility for losses, damages, costs and other consequences resulting directly or indirectly from using this information.

## Table of contents

<b>Executive summary .....</b>	<b>2</b>
<b>The BMSB pest threat.....</b>	<b>4</b>
<b>BMSB as a hitchhiker pest threat.....</b>	<b>4</b>
<b>Risk profiling and risk assessment activities .....</b>	<b>5</b>
<b>Pressure on the border.....</b>	<b>6</b>
<b>Effectiveness of offshore BMSB management measures .....</b>	<b>7</b>
<b>Effectiveness of onshore BMSB management measures .....</b>	<b>8</b>
<b>Preparedness and response.....</b>	<b>9</b>
<b>Surveillance and diagnostics .....</b>	<b>10</b>
<b>Research, development and extension .....</b>	<b>10</b>
<b>Education and awareness .....</b>	<b>11</b>
<b>Stakeholder engagement .....</b>	<b>11</b>
<b>Conclusion.....</b>	<b>11</b>
<b>References .....</b>	<b>13</b>

## Scope of the review

The Queensland Department of Agriculture and Fisheries (DAF) understands that the scope of the Inspector-General of Biosecurity’s review of the Department of Agriculture and Water Resources (DAWR) BMSB risk management may include an evaluation of the department’s activities in:

- developing and verifying the effectiveness of offshore BMSB management measures
- BMSB profiling, assessment, inspection and treatment of conveyances and cargo arriving in Australia
- management of approved arrangements involved in onshore BMSB management activities, including reviewing the effectiveness of measures taken by industry to ensure compliance with biosecurity requirements
- approval/accreditation of offshore and onshore treatment providers
- engagement and consultation with industry and other stakeholders
- identifying improvements required to manage biosecurity risks, including:
  - legal powers available to manage BMSB risks effectively, and
  - assessment of need for replacement and/or upgrade of current ICT systems used onshore

## Executive summary

Brown marmorated stink bug (BMSB) (*Halyomorpha halys* (Stål)) has emerged as an invasive pest of global concern due to its success as a hitchhiker pest and ability to establish in new areas outside of its natural geographical range.

The continual pest pressure at the border (evidenced by the rate of BMSB interceptions at the border and the number of BMSB incidents post-border) and the known invasive nature of BMSB overseas, indicate a high likelihood of entry and establishment of the pest in Australia in the near future. If established in Australia, BMSB would affect many plant industries, the environment and our social amenity.

DAF acknowledges the significant effort that the DAWR has put into prevention and preparedness activities directed specifically towards BMSB, including:

- monitoring and assessing the BMSB pest situation internationally to ascertain the risk of BMSB to Australia, including liaising with international experts (e.g. from New Zealand (NZ)) to inform Australia's prevention, preparedness and response activities for BMSB
- implementing emergency measures for targeted break bulk and containerised cargo including vehicles, boats and machinery, incorporating revised treatment conditions
- preparing the 'Draft pest risk analysis for brown marmorated stink bug (*Halyomorpha halys*)' with the final report due for release later in 2019
- drafting a national surveillance protocol for input and endorsement from the Subcommittee on National Plant Health Surveillance (SNPHS) and undertaking surveillance at ports, quarantine approved premises and distribution centres
- developing a field guide for identification of BMSB and related exotic species of stink bugs and other general awareness material for BMSB
- developing a response strategy/contingency plan for BMSB in collaboration with Plant Health Australia (PHA)
- scoping pest management options for BMSB, including chemical controls, and applying for permits for the use of lures and pesticides
- working with importers to manage the risk of BMSB in goods shipped into Australia, including developing safeguarding arrangements ('Safeguarding arrangements for BMSB – industry guide')
- developing the 'Strategy to respond to the detection of brown marmorated stink bug (BMSB, *Halyomorpha halys*) in imported goods and conveyances'

However, a range of factors such as increasing international trade and globalisation and establishment of large populations of BMSB in North America and Europe, outside of its native range in Asia, is continually increasing the likelihood of entry of this pest into Australia. Strong preventative measures offshore and early detection and eradication of BMSB at the border is critical to reduce the risk of pest establishment and spread in Australia.

DAF recommends that DAWR continues to undertake or undertakes a range of actions to mitigate the risk of BMSB, including:

- risk profiling and risk assessment for BMSB to maintain a good knowledge and understanding of the threat that BMSB poses and identify any gaps in prevention, preparedness and response activities in Australia
- monitoring and evaluating the broad range of risk pathways by which BMSB can enter and establish in Australia including assessment of the risk of particular goods and conveyances, particular countries and ports, the effectiveness of treatments and treatment providers, and seasonality etc.
- monitoring the BMSB risk of other countries to ensure that measures for containerised and break-bulk sea cargo are implemented according to the risk
- implementing measures in such a way that the time between treatment and shipping is reduced as much as possible, and that treated goods and conveyances are segregated from untreated goods at all times to prevent contamination with BMSB
- investigating novel methods for inspection of sea vessels, containers and cargo, including validation and verification of their efficacy and efficiency for detecting BMSB
- monitoring data on BMSB interceptions at the Australian border as an indication of the seasonality of the pest pressure at the border and adapting seasonal measures according to the risk
- implementing an intensive targeted surveillance program specifically for BMSB at major ports, approved arrangement sites and high-risk post-border sites to ensure early detection of BMSB
- evaluating BMSB surveillance methodology including the efficacy of different trapping systems, the effectiveness of lures and traps for all life stages of BMSB, placement of traps, and the level of confidence of detecting BMSB, to ensure that surveillance is optimal for early detection of the pest at the border and delimiting surveillance post-border
- evaluating the likelihood of establishment and spread of BMSB in different regions of Australia based on accurate climate modelling
- in collaboration with state and territory governments and the relevant plant industries, maintaining active international linkages to follow current international research, development and extension (RD&E) activities and priorities for BMSB, and pursuing strategies to secure funding for BMSB RD&E in Australia
- considering the development of a government and industry model for BMSB, similar to the 'BMSB Council' model in New Zealand
- developing and delivering a nationally coordinated education and awareness campaign for BMSB

Further details in relation to these recommendations are provided below.

The ability and propensity of BMSB to stowaway as a hitchhiker pest associated with a variety of imported goods and conveyances indicates a high likelihood of pest entry into Australia. This constant pest pressure at the border requires strong and effective preventative measures to keep the risk of BMSB offshore. The potential serious impacts of BMSB, if the pest becomes established in Australia, require that the efforts to manage the risk of BMSB offshore are sustained by DAWR, despite the management challenges and resource implications. The implementation of robust risk mitigation measures for BMSB (offshore, at the border and post-border), are likely to also minimise the risk of other serious hitchhiker pests entering and establishing in Australia.

## The BMSB pest threat

Brown marmorated stink bug (BMSB) (*Halyomorpha halys* (Stål)) is widely recognised as a high-risk plant pest threat given that it is a 'hitchhiker' pest that is not commodity-specific and can be introduced on a multitude of pathways. Over the past several years the approach and interception rates of BMSB at the Australian border have increased considerably. The biology of the pest, including its broad host range, high reproductive rate and mobility, and the tendency of adults to aggregate in various objects, materials and structures, also indicates a high likelihood of pest entry and establishment in Australia. If BMSB were to establish in Australia, it would affect many plant industries, the environment and our social amenity. In addition to the impacts caused by damage to fruit, fruit trees, vegetables, vegetable crops, field crops, ornamental plants, and native vegetation, BMSB is a notorious nuisance pest invading vehicles, homes, buildings and other structures where it aggregates and overwinters.

## BMSB as a hitchhiker pest threat

Brown marmorated stink bug is widely recognised as a high-risk plant pest threat due to its status as a hitchhiker pest that can be introduced into Australia in association with many different risk items. The pest is associated with a variety of goods and conveyances including vehicles and parts; machinery (both agricultural and non-agricultural) and parts; personal effects; plastic, cardboard, paper, metal, containers and packaging.

DAF recognises that implementing effective preventative measures for BMSB and other hitchhiker pests is particularly complex and challenging, however given the potential impacts of this pest if it was to establish in Australia, it is essential that the efforts to manage the risk of BMSB offshore are sustained.

It is acknowledged that the risk mitigation measures that are in place to manage the risk of BMSB on the many different risk items and pathways that the pest is associated with, will also likely reduce the risk of entry and establishment of other hitchhiker pests (e.g. Asian gypsy moth (*Lymantria dispar*), giant African snail (*Achatina fulica*) and burnt pine longicorn beetle (*Arhopalus fesus*)), diseases, weeds and contaminants. Evaluating and managing biosecurity risks more generically at the pathway level, and addressing the risks associated with all the species potentially on the pathway, is often a preferable risk management strategy to focussing on particular pests (Meurisse et al., 2018).

DAF is aware that the Inspector-General of Biosecurity recently completed a review of the threat of hitchhiker pests and contaminants, with the report 'Hitchhiker pest and contaminant biosecurity risk management in Australia' published in July 2018. The purpose of the review was to examine the effectiveness of DAWR's management of biosecurity risks associated with hitchhiker pests and contaminants that enter Australia on sea and air conveyances, cargo containers and break-bulk cargo. The review included assessment of (i) the major hitchhiker pest and contaminant threats to Australia, and (ii) DAWR processes to manage current risks and identify and respond to emerging risks associated with sea vessels, containers, general or break-bulk cargo and cargo ship holds, aircraft and air cargo containers. The review recognised BMSB as a major agricultural, environmental and social pest threat.

DAF refers to the Inspector-General of Biosecurity's review of hitchhiker pests and contaminants in Australia (Inspector-General of Biosecurity, 2018) as a basis to describe the challenges associated with managing the risk of hitchhiker pests; and the policies, procedures, programs and systems that DAWR implements to manage the risk and prevent these pests from entering and establishing in Australia.

The review states that 'DAWR works with national and state and territory agencies and industry to implement risk mitigation measures and a range of multilateral, bilateral and national programs pre-border, at the border and post-border. It aims to keep risks offshore as far as practicable but also applies stringent border monitoring and some post-border surveillance. These controls reduce the risk of many hitchhikers and contaminants entering the country, but absolute prevention is unattainable' (Inspector-General of Biosecurity, 2018).

DAF supports the findings and recommendations of the Inspector-General of Biosecurity's review of hitchhiker pests and contaminants in Australia (Inspector-General of Biosecurity, 2018) as highly relevant to the current review assessing the effectiveness of biosecurity measures to manage the risks of BMSB entering Australia.

## **Risk profiling and risk assessment activities**

DAF is aware that the DAWR has been undertaking a number of risk profiling and risk assessment activities specifically targeted at BMSB over the past five years. These risk profiling activities include monitoring and assessing the pest situation with BMSB internationally and liaising with international experts (e.g. with the Ministry for Primary Industries (MPI) and the Better Border Biosecurity (B3) program in New Zealand), to ascertain the risk of BMSB to Australia. The risk assessment activities include preparing the 'Draft pest risk analysis for brown marmorated stink bug (*Halyomorpha halys*)' with the final report due for release later in 2019.

DAF recommends that risk profiling and risk assessment for BMSB by DAWR continues, to (i) maintain a good knowledge and understanding of the threat that BMSB poses (e.g. based on the BMSB pest situation in other countries, distribution of the risk, risk pathways and effectiveness of risk mitigation measures), and (ii) identify any gaps in prevention, preparedness and response activities (e.g. in scientific knowledge, risk mitigation activities or policy). A current knowledge and understanding of the threat of BMSB is essential to inform Australia's prevention, preparedness and response activities for BMSB.

Submission to the Inspector-General of Biosecurity's review 'Assessment of the effectiveness of biosecurity measures to manage the risks of brown marmorated stink bug (BMSB) entering Australia', Department of Agriculture and Fisheries, 2019

## Pressure on the border

It is well understood that continually increasing international trade and globalisation have led to a corresponding increase in the risk of invasive pest threats via sea, air, and land pathways (Meurisse et al., 2018). Sea and air conveyances, cargo containers (whether carrying cargo or arriving empty) and break-bulk cargo provide a pathway for hitchhiking pests, diseases, weeds and contaminants to enter Australia. Given the large volumes of sea containers transported worldwide, even relatively low rates of pest contamination represent a significant risk (Meurisse et al., 2018).

Most interceptions of BMSB at the Australian border have been associated with sea cargo and containers, on vehicles and parts; machinery (both agricultural and non-agricultural) and parts; personal effects; plastic, cardboard, paper, metal, containers and packaging. A lesser proportion of the interceptions have been associated with air cargo, air baggage and mail pathways. Most interceptions are reported to arrive in shipments originating from the United States of America (USA), Italy, China, Japan, and Korea (Haye et al. 2015; Inspector-General of Biosecurity, 2018). Aggregations of BMSB are more likely to be associated with sea conveyances, containers and cargo as a pathway, and represent the highest risk for pest establishment given that they include multiple insects and both sexes. Interceptions of individual BMSB are also common and are more likely to be associated with personal items such as luggage. Individuals of BMSB are a lesser risk for pest establishment.

DAF recommends that the DAWR continues to monitor and evaluate the broad range of risk pathways by which BMSB can enter and establish in Australia. Evaluation of the risk pathways may include assessment of: the association of BMSB with particular goods and conveyances; the level of contamination of the goods and conveyances; the effect of seasonality on the level of contamination; the likelihood of detection in different goods and conveyances; the country of origin, port of origin, arrival port and destination of the goods and conveyances; the survival of BMSB during storage and transport; the effectiveness of treatments and treatment providers; and the likelihood of establishment and spread of BMSB in different regions of Australia.

Currently, interceptions of BMSB at the border appear to be seasonal, with the number of interceptions increasing during September to April in Australia. This time period corresponds with when BMSB are sheltering and aggregating to overwinter in the northern hemisphere and they are harboured in risk items at their source of origin. However, as BMSB continues to expand its geographical range internationally, it will be important to monitor interceptions of the pest in risk items sourced from countries in the southern hemisphere (e.g. Chile, New Zealand and South Africa) and to respond and adapt the seasonal measures accordingly. The risk of BMSB entering Australia is likely to change once the pest is established in countries in the southern hemisphere, which may require that the seasonal window is changed or withdrawn.

DAF recommends that the DAWR continues to monitor data on BMSB interceptions at the Australian border, and the BMSB pest status in other countries, as an indication of the seasonality of the pest pressure at the border and adapts seasonal measures according to the risk.



## Effectiveness of offshore BMSB management measures

Since 2014, when large numbers of BMSB were detected in sea cargo, including containerised and break-bulk cargo, from the USA; and 2016 when the detections of BMSB in cargo from Italy increased due to the expansion of the pest in Europe, DAWR has responded by implementing requirements for mandatory treatment of high-risk goods shipped as containerised or break-bulk cargo from the USA and Italy. The three approved treatments include sulfuryl fluoride fumigation or methyl bromide fumigation or heat treatment that must be used in accordance with particular treatment windows. During 2017 and 2018, DAWR adapted the import conditions in response to an increase in interceptions and post-border detections of BMSB, which indicated that offshore fumigation treatments were not effective. Currently, target high-risk goods shipped as break-bulk cargo from target risk countries must be treated offshore. Target high-risk goods shipped as containerised cargo from target risk countries must be treated, but can be treated offshore or onshore. Target high-risk goods that require offshore treatment and arrive untreated, or treated by an unapproved treatment provider, are to be directed for export or destruction, unless exceptional circumstances are granted. Random inspections of goods are being carried out on (i) target risk goods, (ii) after treatment to verify the effectiveness of the treatment, and (iii) for goods from all other emerging risk countries. The DAWR has also developed treatment assurance measures including (i) set minimum standards for BMSB treatments for treatment providers, (ii) an offshore BMSB treatment provider's scheme, (iii) lists of approved offshore and onshore treatment providers, and (iv) processes to prevent the use of fraudulent treatment certificates.

DAF recommends that the DAWR continues to monitor the BMSB risk of other countries to ensure that measures for containerised and break-bulk sea cargo are implemented according to the risk association with other countries. The measures should also continue to be implemented in such a way that the time between treatment and shipping is reduced as much as possible, and that treated goods and conveyances are segregated from untreated goods at all times to prevent contamination with BMSB.

Development or expansion of incentives and sanctions to encourage compliance with best practice could be considered to mitigate industry concerns on delays experienced due to fumigation and clearance. For example, an exporter that continually adheres to best practice could receive financial discounts or expedited processing.

DAF notes that the Inspector-General of Biosecurity has commenced 'A review of the Department of Agriculture and Water Resources' recognition of pre-border certification (including the role of overseas competent authorities) as a biosecurity risk mitigation measure' which is currently in progress. This review will consider the reliance of DAWR on overseas certifying bodies/authorities and recognition of offshore third-party quality assurance systems; how certification is used by DAWR in its risk assessment and decision making at the border; the issue of fraudulent certificates impacting the department's efforts to manage biosecurity; and how the level of certification aligns with international trade facilitation and Australian government's obligations.

DAF welcomes the review of pre-border certification as a risk mitigation measure. For highly invasive pests such as BMSB, preventing pest entry and establishment is a crucial strategy, and prevention relies heavily on effective offshore risk management.

## **Effectiveness of onshore BMSB management measures**

The Department of Agriculture and Water Resources manages the risk associated with sea vessels, sea containers and cargo through a diversity of systems including the Maritime Arrivals Reporting System (MARS), the Vessel Compliance Scheme (VCS), and the Sea Container Hygiene System (SCHS). The department undertakes physical inspections, treatments and certification based on the risk that the vessel, container and cargo poses.

The external contamination risk of sea containers is managed by vessel, container and cargo inspections with subsequent treatment as required. Vessels are selected for inspection based on the risk profile of the vessel, container and cargo, which is often determined by the country or port of origin. The internal contamination risk of sea containers is also managed by container and cargo inspections. The risk is often determined by importer declarations and potential destinations of the goods (Inspector-General of Biosecurity, 2018).

Targeted physical inspection of sea vessels, containers and cargo from high-risk countries is resource intensive, time consuming and challenging. There is the potential that these inspection processes could be more resource efficient and effective, if novel methods for detection of hitchhikers and contaminants, such as sensors, drones or robotics were employed to inspect containers. However, the efficacy and efficiency of any novel methods for inspection would need to be fully validated and verified prior to their implementation.

As identified in the Inspector-General's review of hitchhiker pest and contaminant biosecurity risk management in Australia (Inspector-General of Biosecurity, 2018), improved inspection and cleaning regimes for sea containers, e.g. by automated inspection methods and automated washing at ports before being moved from the wharf, could significantly reduce the risk of the sea containers as a pathway for hitchhikers and contaminants.

DAF recommends that the DAWR investigates novel methods for inspection of sea vessels, containers and cargo, including validation and verification of their efficacy and efficiency.

The break-bulk cargo risk is managed similarly to the external contamination of sea containers risk, however the heightened risk of break-bulk cargo, due to it being exposed, is assessed on a case-by-case basis. Break-bulk cargo from CAL (country action list) countries or high-risk pathways such as farm machinery or vehicles must be inspected before leaving the wharf. If the cargo is too complex or large to thoroughly inspect at the wharf, it may be moved to an approved arrangement (AA) site, after being enveloped in a tarpaulin to prevent any pests or contamination from escaping during transport.

The Department of Agriculture and Water Resources is responsible for ensuring that all approved arrangement sites comply with their approval conditions, and are provided with

ongoing education and awareness in relation to their responsibilities for managing biosecurity risk.

DAF notes that the Inspector-General of Biosecurity is also conducting 'An assessment of the effectiveness of the Department of Agriculture and Water Resources' system of approved arrangements under the *Biosecurity Act 2015*. This review will consider DAWR processes for recognition of approved arrangements within Australia as a biosecurity risk management mechanism; the ability of industry to manage biosecurity risks associated with imported, high-risk goods that are stored, inspected and/or treated at approved arrangement sites; and what, if any, improvements should be made to the current arrangements.

DAF welcomes the review of the effectiveness of the approved arrangements system.

The risk of BMSB and other hitchhiker pests at wharves and ports is firmly established, based on the sheer number of sea vessels, containers and cargo arriving at ports; often including high-risk goods from high-risk countries; the less than 100% inspection rate; the challenges associated with physical inspection and treatment; and stockpiling of containers at wharves. There is also a high-risk of hitchhiker pests escaping when containers or cargo are moved to approved arrangement sites. Effective risk management for BMSB (and other hitchhiker pest threats) requires intensive targeted surveillance at and around major ports, and at approved arrangement sites.

DAF recommends that an intensive targeted surveillance program specifically for BMSB is implemented at major ports, approved arrangement sites and any high risk post-border sites to ensure early detection of the pest and to minimise the likelihood of pest establishment in Australia. This surveillance strategy would require efficient detection and trapping methods for all life stages of BMSB, adequate numbers and placement of traps, inspection and servicing of traps in a timely manner, and surveillance in preferred habitats for BMSB around ports and approved arrangement sites. Early detection and eradication of BMSB at the border or post-border is critical to reduce the risk of pest establishment and spread in Australia.

## **Preparedness and response**

DAF acknowledges the significant efforts by DAWR to prepare for BMSB in Australia. This includes the development of a response strategy/contingency plan for BMSB in collaboration with Plant Health Australia (PHA). The BMSB contingency plan provides useful guidance for response actions for incursions of BMSB in Australia.

Other preparedness activities such as applying for permits and sourcing lures and insecticides for BMSB are also acknowledged and welcomed.

DAF acknowledges the development by DAWR of the 'Strategy to respond to the detection of brown marmorated stink bug (BMSB, *Halyomorpha halys*) in imported goods and conveyances'. This strategy is a useful document that outlines the response actions and responsibilities of DAWR and the state and territory governments to manage the likelihood of escape of BMSB from imported goods and conveyances.

Given the increasing rate of post-border detections of BMSB over the past couple of years in Australia, and the number of active BMSB incidents, it is timely to enhance preparedness and response arrangements to ensure appropriate response to border interceptions and post-border detections of BMSB. This should include the development of response plans, transition to management plans, and funding arrangements for ongoing management of BMSB in Australia.

The likelihood of establishment of BMSB in Australia is very high, based on its invasive nature and widespread success as an invasive pest internationally.

## **Surveillance and diagnostics**

DAF is aware that DAWR has been engaged in drafting a national surveillance protocol for input and endorsement from the Subcommittee on National Plant Health Surveillance and undertaking surveillance at ports, approved arrangements sites, and distribution centres throughout the BMSB season. The DAWR has also developed a field guide for identification of BMSB and related exotic species of stink bugs and a fact sheet including general information about the pest. These are useful tools for surveillance and diagnosis of BMSB, in particular to differentiate BMSB from native Australian species of stink bugs.

Further work could be done to evaluate BMSB surveillance methodology, placement of traps, the efficacy of different trapping systems, the effectiveness of lures and traps for all life stages of BMSB, and the level of confidence of detecting BMSB, to ensure that they are optimal for early detection of the pest.

## **Research, development and extension**

It is necessary to have a good knowledge and understanding of the biology, ecology and behaviour of BMSB and in particular how the pest is likely to behave under Australian conditions in agricultural production systems, urban areas and the environment. This will be critical to inform surveillance and detection activities for BMSB, response actions to control, contain or eradicate the pest, and pest management options if BMSB becomes established in Australia.

DAF is aware that DAWR has established and fostered good collaborative linkages with international agricultural agencies (e.g. MPI and B3 in New Zealand and the USDA (United States Department of Agriculture)) to gain an understanding of BMSB as a pest threat, and pest management strategies. It is important that DAWR, the state and territory governments and the relevant plant industries, maintain these active international linkages to follow current international research, development and extension (RD&E) activities and priorities in relation to BMSB. Strategies to secure funding for BMSB RD&E in Australia should also be pursued.

Areas of RD&E necessary to support preparedness and response activities for BMSB would include but are not limited to: lifecycle biology, dispersal behaviour, feeding biology, effective lures and trapping; development of a point source lure; effective treatment/disinfestation options; effective chemical controls; biological control options; and integrated pest

management (IPM) in production systems, urban areas, and the environment; area wide management; the potential host range of BMSB (including host preferences and native hosts); and climate modelling of the pest in Australia

## **Education and awareness**

The Department of Agriculture and Water Resources has made a consistent effort to provide education and awareness material to other governments, industry, and other stakeholders in relation to the pest threat that BMSB poses to Australia, and to encourage early detection and reporting. In recent years, the department has been working with importers and industry in relation to the import requirements for BMSB. It is important that this engagement with importers and industry is continued to ensure the risk of BMSB is effectively managed offshore, at first points of entry, distribution centres and along the supply chain.

Given that BMSB will have such wide-ranging distribution and impacts in Australia, it would be prudent to develop and deliver a nationally coordinated communications program focussed on BMSB. All government, industry and community stakeholders need to be engaged in prevention and preparedness, effective early detection and response, and understanding the impacts of BMSB, and the implications if the pest becomes established in Australia.

DAF recommends that DAWR develops and delivers a nationally coordinated education and awareness campaign for BMSB, at this stage to encourage early detection and reporting of the pest, then later for passive surveillance, pest monitoring and management, and to reduce the impacts of BMSB in Australia.

## **Stakeholder engagement**

To date there has been good collaboration amongst DAWR, state and territory governments, and industry for BMSB, and these relationships and linkages will need to be maintained and enhanced in the future.

The Department of Agriculture and Water Resources should consider developing a government and industry model for BMSB, similar to the 'BMSB Council' model in New Zealand. The BMSB Council was established to oversee the BMSB Government Industry Agreement (GIA) for Biosecurity Readiness and Response. The council includes six industry bodies and MPI in New Zealand, who have agreed to work together to ensure that the activities outlined in the BMSB Operational Agreement to prepare and respond to BMSB are achieved in partnership.

## **Conclusion**

BMSB has emerged as an invasive pest of global concern due to its success as a hitchhiker pest and ability to establish in new areas outside of its natural geographical range. The establishment of large populations of BMSB in North America and Europe, outside of its native range in Asia, is accelerating the international spread of this pest (Haye and Weber 2017).

The ability and propensity of BMSB to stowaway as a hitchhiker pest associated with a variety of imported goods and conveyances indicates a high likelihood of pest entry into Australia. This constant pest pressure on the border requires strong and effective preventative measures to keep the risk of BMSB offshore. The potential serious impacts of BMSB, if the pest becomes established in Australia, require that the efforts to manage the risk of BMSB offshore are sustained by DAWR, despite the management challenges and resource implications. The implementation of robust risk mitigation measures for BMSB (offshore, at the border and post-border), are likely to also minimise the risk of other serious hitchhiker pests entering and establishing in Australia.

The continual pest pressure at the border (evidenced by the rate of BMSB interceptions at the border, the number of BMSB incidents post-border, and the known invasive nature of BMSB overseas), indicates a high likelihood of entry and establishment of the pest in Australia in the near future. Once established in Australia, BMSB will affect many plant industries, the environment and communities. A strong government, industry, and community partnership will be essential to combat BMSB, and to minimise the impacts of the pest on the economy, environment and social amenity in Australia.

DAF thanks the Inspector-General of Biosecurity for the opportunity to comment on the review of the effectiveness of biosecurity measures to manage the risks of BMSB entering Australia.

## References

- BRASIER, C.M. 2008. The biosecurity threat to the UK and global environment from international trade in plants. *Journal of Plant Pathology* 57: 792–808.
- COATES, L. & MANNERS, A. 2016. Threat specific contingency plan for brown marmorated stink bug. Brisbane: DAF.
- BROCKERHOFF, E.G., BULMAN, L.S. 2014 Biosecurity risks to New Zealand's plantation forests and the rationale for pathway risk management. *New Zealand Journal of Forestry* 59: 3–8.
- BROCKERHOFF, E.G., BULMAN, L., LIEBHOLD, A.M., MONGE, J.P. (2016) Role of sea containers in unintentional movement of invasive contaminating pests (so-called "hitchhikers"), and opportunities for mitigation measures, Food and Agricultural Organization of the United Nations, Rome, Italy.
- DEPARTMENT OF AGRICULTURE AND WATER RESOURCES Safeguarding arrangements for brown marmorated stink bug, Industry guide. Canberra: Australian Government.
- DEPARTMENT OF AGRICULTURE AND WATER RESOURCES 2015. Guide to the identification of brown marmorated stink bug, *Halyomorpha halys*, and other similar bugs. Canberra: Australian Government.
- DEPARTMENT OF AGRICULTURE AND WATER RESOURCES 2017. Draft pest risk analysis for brown marmorated stink bug (*Halyomorpha halys*). Canberra: Australian Government.
- DEPARTMENT OF AGRICULTURE AND WATER RESOURCES 2018. Strategy to respond to the detection of brown marmorated stink bug (*Halyomorpha halys*) in imported goods and conveyances. Canberra: Australian Government.
- HAYE, T., GARIEPY, T., HOELMER, K., ROSSI, J-P., STREITO, J-C., TASSUS, X., & DESNEUX, N. 2015. Range expansion of the invasive brown marmorated stinkbug, *Halyomorpha halys*: an increasing threat to field, fruit and vegetable crops worldwide. *Journal of Pest Science*, 88: 665–673.
- HAYE, T., & WEBER, D.C. 2017. Special issue on the brown marmorated stink bug, *Halyomorpha halys*: an emerging pest of global concern. *Journal of Pest Science*, 90: 987–988.
- INSPECTOR-GENERAL OF BIOSECURITY 2018. Hitchhiker pest and contaminant biosecurity risk management in Australia. Canberra: Australian Government.
- KRITICOS, D., KEAN, J., PHILLIPS, C., SENAY, S., ACOSTA, H. & HAYE, T. 2017. The potential global distribution of the brown marmorated stink bug, *Halymorpha halys*, a critical threat to plant biosecurity. *Journal of Pest Science* 90: 1033–1043.
- LEE, D.-H. & LESKEY, T. 2015. Flight behavior of foraging and overwintering brown marmorated stink bug, *Halyomorpha halys* (Hemiptera: Pentatomidae). *Bulletin of Entomological Research* 105: 566–573.

- MEURISSE, N., RASSATI, D., HURLEY, B., BROCKERHOFF, E. & HAACK, R. 2018. Common pathways by which non-native forest insects move internationally and domestically. *Journal of Pest Science* 1:13–27.
- ORMSBY, M. 2018. Technical Review – Proposed treatments for BMSB (*Halymorpha halys* (Stål); Pentatomidae). *Technical Document*. Wellington: New Zealand Ministry of Primary Industries.
- PLANT HEALTH AUSTRALIA. Brown marmorated stink bug workshop: an imminent threat to Australia and New Zealand. *In*: PLANT HEALTH AUSTRALIA, ed. Brown marmorated stink bug workshop, 2017a Brisbane. Plant Health Australia.
- PLANT HEALTH AUSTRALIA 2017b. Contingency plan for brown marmorated stink bug (*Halymorpha halys*). Canberra: Plant Health Australia.
- ZHU, G., BU, W., GAO, Y. & LIU, G. 2012. Potential geographic distribution of brown marmorated stink bug invasion (*Halymorpha halys*). *PLoS ONE* 7, e31246.