

BSES Limited



***EUMETOPINA FLAVIPES* INCURSION MANAGEMENT PLAN**

VERSION 1

by

NS SALLAM

MN09001

**IF YOU SUSPECT A NEW PEST OR DISEASE
IMMEDIATELY NOTIFY:**

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**DO NOT REMOVE ANY MATERIAL
OR SPECIMENS FROM A SUSPECT AREA,
AS THIS MAY SPREAD THE PEST OR DISEASE**

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1.0 BACKGROUND

Australia is one of the top three exporters of sugar on the world market, with the total production of sugar in Australia in excess of 4 million tonnes with a value of \$1-2 billion. Over 85% of the sugar is exported. The sugar industry is a major employer and component of the economy of regional coastal areas in northern New South Wales and Queensland.

Australia has remained free of many serious animal and plant pests and diseases due to its isolation and its strict quarantine laws. This pest-free status has allowed Australia to provide agricultural products with lower pesticide usage and to produce these products more efficiently and at a lower cost than some of our competitors. Maintenance of this pest-free status is being threatened by the increasing ease of world travel and the growing demand for importation of agricultural products.

Throughout the world there are many insect pests associated with sugarcane (Box 1953), but there is no one group of pests that could be described as cosmopolitan in world sugarcane (Conlong 1994). Each region appears to have its own group of pest insects that cause the most damage. In Australia there are at least 65 insects associated with sugarcane and the importance of these insects as pests ranges from negligible to high. FitzGibbon *et al.* (1998a) identified 213 species of insects and mites as pests of sugarcane in areas to the immediate north of Australia. 39 of these were considered to pose threats to the Australian sugar industry. Of these, 12 species were stemborers. Commercial plantings of sugarcane in this country do not have stemborers as significant pests.

During the 1990s, the Standing Committee on Agriculture and Resource Management (now Primary Industries Standing Committee – PISC) developed a general, non-specific, incursion management strategy (SIMS) (Fig. 1) to manage responses to exotic pest incursions. This strategy, which largely remains current, outlines the broad areas of an incursion management plan and the appropriate authorities involved. The key feature of the strategy is the operation of a national Consultative Committee on Exotic Plant Pests (CCEPP) that is convened under the auspices of Plant Health Committee after an incursion occurs. CCEPP is chaired by the Chief Plant Protection Officer (CPPO) in Agriculture, Fisheries and Forestry – Australia and its membership includes the State/Territory Chief Plant Biosecurity Officers. The CCEPP oversees the strategic management of the initial pest response and facilitates decisions on the feasibility of eradication and future direction of the response. It also makes recommendations on strategic response-management issues through Plant Health Committee and Primary Industries Health Committee to PISC, which comprises the chief executive officers of departments of agriculture/primary industries in the Commonwealth and States/Territories. The ultimate decision-making authority regarding pest responses is Primary Industries Ministerial Council, comprising the ministers of agriculture/primary industries in the Commonwealth and States/Territories.

The generic incursion management plan (GIMP) for the plant industries is a refinement of SIMS. This plan outlines the four steps to incursion management: prevention, preparedness, response and recovery (Fig. 2). These plans were used to develop a generic pest incursion management plan for sugarcane (Allsopp *et al.* 1999).

In 2000, Plant Health Australia (PHA) was formed as a private company to coordinate policy development at the national level and facilitate improved biosecurity measurements for Australian plant industries. PHA is the holder of PLANTPLAN, which is the generic emergency response plan for emergency plant pest incursions and is a guide to management of emergency plant pest incursions. The plan provides detailed description of the procedures to follow on local, state and federal levels following a pest incursion.

In the view of the sugar industry, these generalised plans will be more useful if developed further to cover each of the important groups of pest species in detail. BSES Limited has developed detailed Incursion Management Plans for exotic key pests of sugarcane, mainly sugarcane stemborers (Sallam and Allsopp 2008a-e). The present Plan deals with the incursions of the island sugarcane planthopper, *Eumetopina flavipes*, into commercial cropping areas and into sugarcane in non-commercial cropping situations south of Cape York Peninsula. This plan outlines appropriate responses, details responsibilities, and provides an expanded review of the biology, ecology and management of this species. This Plan is linked to the Ramu Stunt Incursion Management Plan, which deals with the viral disease transmitted by this pest species.

Figure 1 Sequence of steps, officers and organisations in the SCARM incursion management strategy (SIMS)

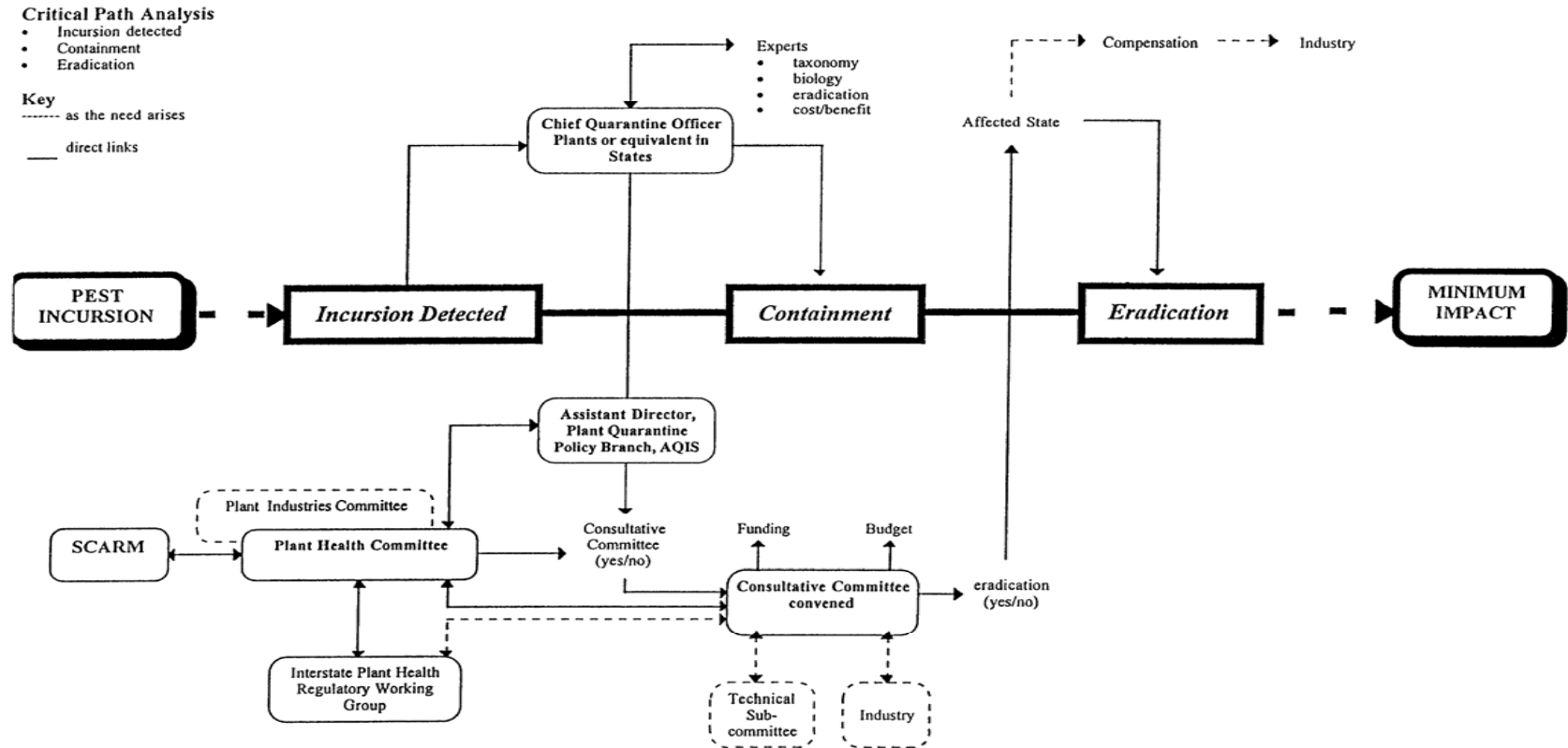
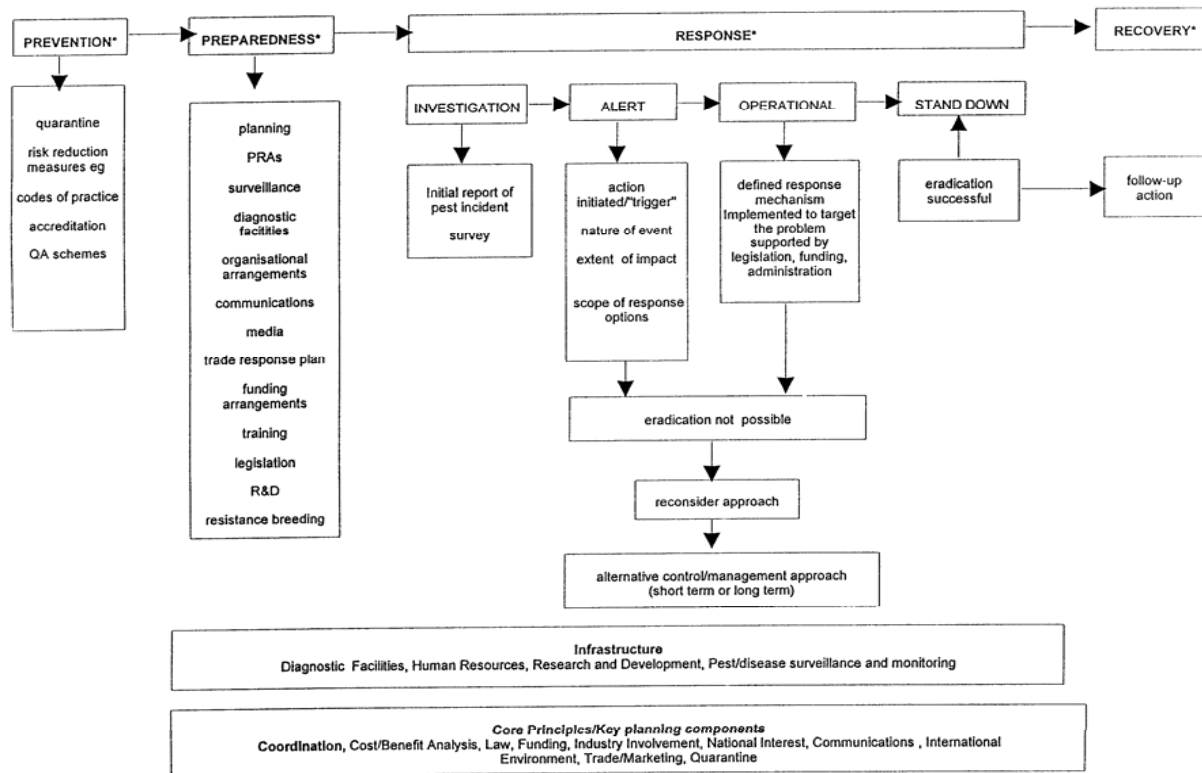


Figure 2 Generic incursion management plan (GIMP)



* Stages of the "all hazards" approach adopted by Emergency Management Australia

2.0 PEST INCURSION MANAGEMENT PLAN

2.1 Summary of Management Plan

SUGGESTED TIMELINE	ISSUE	RESPONSIBLE PERSONS	ACTION	
Day 1	INVESTIGATION Notification of suspect pest detection	BSES, State Department or AQIS Officer, Grower, Member of the Public	<p>Immediately contact BSES or other Entomologist. Hold specimens under secure conditions.</p> <table border="1"> <tr> <td style="text-align: center;">DO NOT REMOVE PLANTS FROM FIELD</td> </tr> </table> <p>Keith Chandler (Bundaberg) 07 41593956 Nader Sallam (Cairns) 07 4056 4506 Peter Samson (Mackay) 07 4954 5100 Peter Allsopp (Indooroopilly) 07 3331 3316 Murray Fletcher (NSW) 02 6391 3943 or CEO BSES 07 3331 3333</p> <p>Notify BSES & State/Territory Chief Quarantine Officer, Plants, prepare initial report. State/Territory Chief Quarantine Officer or CEO BSES to notify State/Territory Minister and Chief Plant Protection Officer, AFFA. CPPO to notify Federal Minister, other States and Territories and key industry representatives on a confidential basis.</p>	DO NOT REMOVE PLANTS FROM FIELD
DO NOT REMOVE PLANTS FROM FIELD				
Day 1-2	Identification of pest	BSES/other Entomologist	Travel to site, inspect suspect plants and specimens	
	Not a new pest	BSES/other Entomologist	Suspend operations	
	Uncertain identification	BSES/other Entomologist	<p>Collect specimens, return to laboratory and inspect microscopically, also dispatch live specimens (see packaging details in Appendix 1) by express courier to:</p> <p style="text-align: center;">BSES Indooroopilly 50 Meiers Road Indooroopilly 4068 Contact: Dr Peter Allsopp ☎:: 07 3331 3316 or 0408182614</p>	
	ALERT Positive identification of new pest	BSES/other Entomologist	Place infested premises under quarantine - State departments.	

SUGGESTED TIMELINE	ISSUE	RESPONSIBLE PERSONS	ACTION
Day 2-3	OPERATIONAL Implementation of response action	CEO BSES, State/Territory Chief Quarantine Officer, Plants	Establish: <ul style="list-style-type: none"> • State/Territory National Management Group (NMG), • Consultative Committee on Exotic Plant Pests (CCEPP), • National Pest Control Head Quarters (NPCHQ), • State Pest Control Centre (SPCC), • Local Pest Control Centre (LPCC).
		Operations Managers in Pest Control Centres and BSES/other Entomologists	Quarantine alert teams formed and instructed in pest identification, survey/trace-back methods and disinfestation techniques. Survey and trace-back commenced. Collection and destruction of infested plants on infested premises if appropriate.
Day 2-3	Convene Consultative Committee	CPPO in collaboration with State/Territory Chief Quarantine Officer, Plants	Committee is convened and briefed on incursion and recommends further action. Press Release is prepared and circulated to Government and Industry and BSES Media Officer establishes contacts with media outlets. Chairman of Committee negotiates with Federal and State Ministers on release of Press Release to media and statement by Minister or their nominee. Seek approval from NRA for use of pesticides needed in eradication or containment.
Day 3-5	Review of initial survey data	Operations Managers/LPCC	Collect and summarise survey data and report prepared for Consultative Committee. Expand surveys and trace-back (ongoing). Destruction of infested plants (ongoing).
		Consultative Committee	Review survey data and recommend Restricted Area (RA) and Control Area (CA) for restriction of movement of plants, plant parts, soil and machinery. Negotiations on quarantine protocols between Consultative Committee and relevant state plant-health agencies. Establish RA and CA by proclamation of necessary legislation. Assess likely success of eradication given available survey data. Prepare and circulate updated Press Release.
Day 6-9	Survey and trace-back	Operations Managers/LPCC	Collect, compile and interpret survey data. Initiate cost-benefit analysis for eradication or containment. Prepare report for Consultative Committee.
	Second meeting of Consultative Committee	Consultative Committee, State/Territory National Management Group	Consultative Committee to meet in district of outbreak (if commercial cane area) and meet with BSES Entomologist and Operations Managers. Review survey data, report on identification from CID-UQ and CSIRO Entomology (ANIC) and cost-benefit analysis and recommend: <ol style="list-style-type: none"> eradication more information - continue alert eradication not possible, move to active containment.

SUGGESTED TIMELINE	ISSUE	RESPONSIBLE PERSONS	ACTION
Day 6-9	(a) Eradication	CPPO and affected State/Territory National Management Group, Consultative Committee	Prepare recommendation for eradication including cost/benefit analysis and a budget. Submit recommendation and budget to SCARM through the Plant Health Committee. Discuss compensation with industry and governments. Prepare State legislation if required to restrict movement of plants and machinery and enforce plough-outs.
	Decision to eradicate made	Operations Managers/LPCC	Organise destruction of all infested and buffer crops. Re-survey fields surrounding infested crops. Continue wider surveys and trace-back. Organise counselling of affected farmers. Convene Information Meetings for Industry in affected district.
		State/Territory National Management Group, Consultative Committee	Prepare Press Release on decisions of Consultative Committee and SCARM. Inform industry organisations and interstate governments on decisions
Day 10-20	Review	Program and Operations Managers/LPCC	Reports prepared daily on ongoing survey results. Report on progress of eradication.
		Consultative Committee	Review survey and eradication reports. Re-assess decision to eradicate.
1-36 months		Operations Managers/LPCC	Report monthly on ongoing surveys and eradication.
		State/Territory National Management Group Consultative Committee	Meet bi-monthly or as required to review eradication program.
3-5 years	Review	State/Territory National Management Group Operations Managers	Final report prepared.
		Consultative Committee	Review final report and success of eradication. Committee to cease function.
Post-eradication	Surveillance	AQIS	Maintain surveillance and off-shore control programs.
Day 6-9	(b) More information	Operations Manager/LPCC	Surveys and trace-back (ongoing). Report prepared on daily basis.

SUGGESTED TIMELINE	ISSUE	RESPONSIBLE PERSONS	ACTION
Day 6-20	(c) Eradication not possible	Consultative Committee, State/Territory National Management Group	Consultative Committee ceases to function and Containment Committee formed. Preparation of containment plan. State/Territory National Management Group continues to oversee program until containment plan is fully operational. Prepare State legislation if required to restrict movement of plants and machinery and enforce plough-outs. Report to industry organisations. Discuss industry-wide levy to fund containment with State and Industry bodies.
		Operations Managers/LPCC	Organise strategic surveys in district outside infested district. Establish road-blocks on major roads out of district to inspect for plants and contaminated machinery. Organise survey teams to monitor pest levels and issue plough-out orders as required to reduce build up. Convene information meetings in affected area.
1-12 months		BSES/other Entomologist	Establish insecticide-screening program. Establish list of potential non-insecticidal controls. Establish propagation areas of resistant varieties initially in affected area but also in other districts. Distribute resistant varieties to affected growers.
		BSES/other Entomologist	Develop plan for production of pest-free planting material and establish resistance screening for advanced clones in breeding programs if appropriate. Organise visit by overseas Entomologist with expertise in control of particular planthoppers.

2.2 Detection of an incursion

2.2.1 Investigation and Alert phases

Anyone finding a plant that they believe may be infested with a new planthopper should **immediately** contact the nearest office of the BSES or relevant State/Territory Department. This office should immediately contact an experienced sugarcane entomologist (BSES) or their nearest State Department of Primary Industries office - contact numbers given on inside of front cover.

Under no circumstances should the suspect infested plants be removed from the infested premises. If there will be some delay before the entomologist can visit the site to inspect the suspect plant, the suspect plants should be covered with paper bags or fertiliser bags tied tightly around the stems.

Any suspect infested plant should be inspected by an entomologist (BSES or State Department) who will confirm that the plant is infested with a new planthopper. The entomologist will take samples and/or specimens for dispatch for DNA analysis at BSES Indooroopilly and/or to suitable taxonomists for further confirmation, but actions should be initiated immediately the entomologist has confirmed the identification of the planthopper to the best of their ability.

The entomologist must also notify the CEO of BSES or the relevant State/Territory Chief Quarantine Officer (Plants) in the State/Territory Department of Primary Industries (Biosecurity Queensland), and should also prepare a brief report on the details of the introduction. This notification should be made **urgently**.

The State/Territory Chief Quarantine Officer (Plants) or CEO BSES (in Queensland) will notify the State Minister (through the head of the department) and the Chief Plant Protection Officer in Canberra. The Chief Plant Protection Officer will notify the Federal Minister. A National Management Group should be convened at this stage in the affected State/Territory to coordinate the initial response.

As soon as possible after the entomologist has positively identified the planthopper as *Eumetopina flavipes*, the infested premises should be placed under quarantine and no plant material, soil or agricultural machinery should be allowed to leave the premises. After consultation with the Director of BSES and the relevant State/Territory Chief Quarantine Officer (Plants) and CPPO, declaration of a restricted area around the infested premises should be made as soon as possible.

2.2.2 Operational phase

At this stage, the State/Territory National Management Group is formally established and a Local Operations Centre established in the infested area. The Operations Manager should be a person with good local industry knowledge, such as the senior extension officer (from BSES in Queensland). Other members of this local group should represent BSES, local Cane Productivity Service and industry organisations. The Regional Manager, Plant Health from the relevant State/Territory department (from Biosecurity Queensland in Queensland) should also be a member. This group will report to the National Management Group and will ensure that local responses are carried out.

2.2.3 Notification of a quarantine incursion

The following list of authorities should be informed of the details of the incursion by the CEO of BSES or the relevant Director of the State Department of Primary Industries **before** any press releases.

- A. Chief Plant Protection Officer (CPPO)
Department of Agriculture, Fisheries and Forests - Australia
GPO Box 858
CANBERRA ACT 2601
Facsimile: (02) 6272 5835 Telephone: (02) 6272 3933
(02) 6271 6471 for general reporting
- B. The Minister
Department of Agriculture, Fisheries and Forests - Australia
GPO Box 858
CANBERRA ACT 2601
Facsimile: (02) 6273 4120 Telephone: (02) 6277 7520
- C. General Manager, Plant Biosecurity
Queensland Department of Primary Industries and Fisheries
80 Ann Street
BRISBANE QLD 4001
Facsimile: (07) 3239 6994 Telephone: (07) 3239 3361
- D. Chief Quarantine Officer (Plants)
New South Wales Primary Industries
161 Kite St
ORANGE NSW 2800
Facsimile: (02) 6391 3605 Telephone: (02) 6391 3150

- E. Chairman
CANEGROWERS
GPO Box 1032
BRISBANE QLD 4001
Facsimile: (07) 3864 6429 Telephone: (07) 3864 6444
- F. Chairman
Australian Cane Farmers Association Ltd
GPO Box 608
BRISBANE QLD 4001
Facsimile: (07) 3303 2024 Telephone: (07) 3303 2020
- G. Chairman
New South Wales Cane Growers Association
PO Box 27
WARDELL NSW 2477
Facsimile: (02) 6683 4503 Telephone: (02) 6683 4205
- H. Chairman
Queensland Sugar Corporation
GPO Box 891
BRISBANE QLD 4001
Facsimile: (07) 3221 2906 Telephone: (07) 3231 0199
- I. Chairman
Sugar Research and Development Corporation
PO Box 12050
BRISBANE ELIZABETH STREET QLD 4002
Facsimile: (07) 3210 0506 Telephone: (07) 3210 0495
- J. Chief Executive Officer
BSES
PO Box 86
INDOOROOPILLY QLD 4068
Facsimile: (07) 3871 0383 Telephone: (07) 3331 3333
- K. Mill Directors and/or Mill Managers, Cane Productivity Service Chairmen, Mill Suppliers Committee, BSES Regional Extension Officer in the district in which the incursion occurs.
- L. Chairman
Australian Sugar Milling Council Pty Ltd
GPO Box 945
BRISBANE QLD 4001
Facsimile: (07) 3221 1310 Telephone: (07) 3221 5633

A communication strategy should be developed and implemented at the first meeting of the Consultative Committee.

The involvement of offices of the ministers of the federal and relevant state departments of Primary Industries must be assumed in any quarantine incursion. The Federal and State/Territory Minister's press secretaries should be contacted and be appraised of the details of the incursion and discussions held on the release of the initial and future significant press releases. All press releases should be sent to the Federal and State/Territory Ministers' press secretaries **before** they are released to the media. This will allow the ministers to reply to any media enquires. This action may not be appropriate in all situations and should be negotiated with the CPPO.

An example of a possible press release is given in Appendix 3. A fact sheet giving details of the pest should be forwarded to all organisations with the initial press release.

On the initial press release, the CEO of BSES or the relevant state department or CPPO will nominate a media spokesperson(s) whose name will be shown on the press release. **Other staff should contact this person before releasing or making any comments on the incursion to the media.**

2.2.4 Formation of Sugarcane Pest Consultative and Containment Committees

A Sugarcane Pest Consultative Committee (will be referred to here as SCCC to avoid confusion with State Pest Control Centre - SPCC) should be formed to assess the initial survey results, make recommendations on eradication to SCARM through the Plant Health Committee (PHC) and to direct eradication if feasible. The Committee will be chaired by the Chief Plant Protection Officer. The PHC will determine the format of the committee and would be expected draw on expertise from sources such as:

- BSES Manager, QCanes or State Department Manager of appropriate department (Program Manager)
- BSES senior extension officer for the region where incursion has occurred (Operations Manager)
- CEO of BSES
- State Chief Quarantine Officers (Plants)
- BSES or State Department Entomologist
- AQIS Representative
- Media Liaison Officer
- Industry Representatives
- Representatives of other industries if a multi-host species

This committee should meet as soon as possible after the incursion has been confirmed and then after the initial survey which should be completed within 1 week. In view of the strategic nature of the Consultative Committee and the decisions it makes, the location of these meetings is not important. However, once the initial emergency phase is over, there would almost certainly be a Consultative Committee meeting in the outbreak area so that

members gain the necessary geographical and other contextual understanding necessary to facilitate strategic decision-making.

In each affected State/Territory, a National Management Group (NMG) should be formed to oversee the implementation of the Emergency Response campaign (ER). ER operations will be carried out by a Local Pest Control Center (LPCC), which will be established in the area of incursion as soon as the pest is identified as exotic. The centre will operate under a State Pest Control Centre (SPCC) on the state level and a National Pest Control Head Quarters on the national level (NPCHQ). Those two groups coordinate communication between LPCC and CCEPP and provide strategic input into managing the ER. Composition of these centres and the Head Quarters should be negotiated between the relevant State/Territory department, industry, and, if in Queensland, BSES.

If eradication is considered not to be feasible, the national Consultative Committee may be disbanded and a State/Territory Containment Committee formed; the AQIS representative would not normally be a member of this Committee. At the same time, Regional Managers, Plant Health, may cease membership of the Local Operations Centres and composition of the National Management Group may change.

2.3 Management of an incursion

If the SPCC considers eradication is not possible (**and before that decision is made**), actions should be taken to contain the incursion to the region where the incursion has occurred.

2.3.1 Surveillance

An urgent requirement will be to determine the extent of the incursion. This action should be initiated immediately. Samples of insects (preferably placed in 95+% ethanol or sent live in sealed containers to allow DNA analysis) should be collected to confirm identification.

There is a need to establish a list of host plants to allow establishment of quarantine protocols and aid in defining areas for surveys. This should be done by BSES Entomologists and/or state department officers - much of those data are in Appendix 5.

2.3.1.1 Commercial-crop areas

It will be essential to initiate surveys urgently if an incursion is found in a commercial sugarcane crop area. This will be required to define the area of spread, to limit any further spread and to allow appropriate responses to be initiated.

A Local Pest Control Centre (LPCC) will be formed, and this may include staff of the State Department, BSES, Cane Productivity Service or the equivalent, sugar mill and AQIS (only trace-back activities).

The owner and manager of the property should be interviewed to determine the source of planting material brought on to the property in the last 2 years and whether planting material or alternative hosts from the property have been moved to other properties. Movement of soil and machinery should also be determined and the other farms in the same harvesting group identified. Inspection teams should inspect all properties identified by the interview.

The approach to the inspection in commercial sugarcane crops will depend on the growth stage of the crop and the pest involved. In crops less than 2 m high, it should be possible to walk the crops. If the crop is lodged, inspections will be difficult. Inspections in lodged crops could be conducted from the headland and then row for row as the cane is harvested. Inspection of alternative host crops will depend on the type of crop involved.

During the inspection of these fields any infested plants located should be collected in paper bags or fertiliser bags for destruction. This same procedure should be followed for the farms with links to the infested farm as identified by interviews with the owners/managers and local mill and Cane Productivity Service staff.

After this initial survey, a meeting should be held of the Sugarcane Pest Consultative Committee to assess the findings of the survey. This committee will determine whether eradication is feasible or whether containment of spread to non-infested areas should be the objective of future actions. If eradication is considered to be feasible, the Consultative Committee will make a recommendation to the Plant Health Committee. While the Plant Health Committee and SCARM consider the recommendation, at least containment should proceed.

If incidence is low in the initial survey the inspection teams should then proceed to inspect 10% of sugarcane fields on a stratified random pattern throughout the rest of the mill area. If a known highly susceptible variety is grown in the mill area, a high percentage of fields of this variety should be included in the survey.

All other canegrowing districts, particularly those adjoining the infested area, should conduct random surveys of sugarcane and alternative host fields to determine the status of the pest in these districts. The number of fields to be surveyed depends on the type of pest involved.

All canefarmers should be sent a leaflet describing the pest and be asked to report any suspect plants to their nearest BSES or State Department Office.

2.3.1.2 Non-commercial-crop and non-sugarcane crop areas

If the incursion is in a non-commercial-crop area other than the far northern areas of Australia, such as Brisbane or Townsville, the local State Department office should be informed immediately and in consultation with BSES and CPPO a management plan developed. A survey team should be formed including staff of BSES and/or State Departments and, where appropriate, AQIS staff (normally only for trace-back activities). These teams should interview the owner of the infested premises to obtain information

about movement of cane plants and alternative hosts, soil and machinery onto and off the infested premises in the previous 2 years.

A survey should be conducted tracing the source of the plants involved and any plants moved off the infested premises. When the tracing has been completed, the survey team should inspect all properties in a wider area. Initially this should be set at a 1 km radius in a city or 10 km radius in the country. The survey should then be extended to cover a wider area depending on the situation.

If the incursion occurs in a sparsely isolated area of Northern Australia, the NAQS Co-ordinator should be advised and requested for assistance:

AQIS - NAQS

PO Box 96

Airport Administration Centre

Cairns International Airport

Cairns, Queensland 4870

Tel (07) 4030 7800

Fax (07) 4035 9578

The team leader should interview the owner of the premises to try and trace back the source of the infestation. If cane plants, soil or machinery have been brought from or taken to another site in the last 2 years the team should immediately inspect these sites or arrange for another team to inspect the site(s).

If there are no obvious links to other sites, the survey team should conduct a survey of all sugarcane and alternative hosts, radiating out from the original source. This survey would be the next priority after following any possible links. Sugarcane is mainly grown in backyard or garden situations and, therefore, surveys should concentrate on current or abandoned dwellings. Commercial or non-commercial plantings of alternative hosts should also be examined.

Concurrent with the survey, all infested plants should be collected and destroyed to reduce the risk of further spread of the pest.

The survey team, operating through LPCC and initially consisting of sugar industry personnel, should initiate surveys in all commercial sugarcane areas concentrating on the closest areas to the incursion. Other personnel should join survey teams following appropriate training. Team members should be prepared to change clothes after inspecting infested premises. Sugarcane and alternative hosts must be inspected.

The survey team should be instructed by the SPCC on correct methods of approaching members of the public during the survey and their legal rights and limits of entry to property.

2.3.2 Other containment actions

All movement of sugarcane and alternative host planting material, plant parts, soil and sugarcane machinery will be restricted. Planting material will require a period in an approved quarantine facility with suitable disinfestation treatments (See Section 3.2.7) before release to another region. All machinery must be thoroughly cleaned of all dirt and organic matter and steam cleaned before moving out of the infested area. A certificate stating the equipment has been inspected and is suitable for transport must be issued by a State official.

Definition of a quarantine area should happen early and will need Interstate Plant Health Regulation Working Group input. Road-blocks may be established on all main roads out of the infested region to ensure that no sugarcane, alternative hosts or contaminated machinery are carried out of the region.

The CCEPP should develop a policy for the plough-out of infested crops within the infestation area in an attempt to reduce pest pressure. A well-developed crop may have to be burnt and harvested before plough-out; harvested material may be sent to the mill. A suggested limit of infested plants should be established, based on the type and potential severity of the infestation. This will require a large inspection team to monitor the level of pests in crops. This team will be managed by a Sugarcane Pest Consultative Committee (will be referred to here as SCCC to avoid confusion with State Pest Control Centre - SPCC). SCCC will form a central part of the main CCEPP and will be in close contact with local groups such as Cane Productivity Services or their equivalents.

Potential useful insecticides should be identified from the literature (some listed in Appendix 5) and application made for emergency use permits to APVMA within 3 days of detection. These insecticides should be field tested to determine relative efficacies and establish MRLs as soon as possible.

The relevant State/Territory departments should limit further planting of known highly susceptible cultivars of sugarcane in the infested region. Suitable resistant cultivars should be multiplied as quickly as possible for distribution to growers with particular attention to known infested farms.

2.3.3 Eradication

Bags of all infested plants collected in the initial survey should be incinerated on site (with due regard to fire safety). If incineration is not feasible, bags should be placed into black 'garbage' bags that are then sealed and placed in the sun for 1 week to heat up and kill pests.

If the SPCC considers eradication a feasible option, all infested fields and buffer areas should be destroyed (See Section 3.2.4). Methods for eradication will depend on the extent of the incursion.

2.4 Information meetings

Meetings of all sugar industry personnel, both milling and grower sectors, should be convened in the infested mill area by the SPCC as soon as possible to explain the current status of the incursion and the proposed control program. This meeting will be essential to keep the industry fully informed and to enlist their assistance in the control programs. Similar meetings should be conducted in other regions as time permits.

2.5 Overseas expert

An overseas expert on control of *Eumetopina flavipes*, probably from Papua New Guinea, should be contacted as soon as possible after the pest is detected and asked for information on detection and control.

The expert should be invited to review the eradication or containment program. The best time for the visit of the expert will be decided by the SPCC, but it is likely to be between 3-12 months after the incursion when the extent of the incursion has been determined and urgent actions have been undertaken.

3.0 PRINCIPLES OF CONTROL AND ERADICATION

3.1 Introduction

If *Eumetopina flavipes* is detected in Australia outside the boundaries of Cape York Peninsula and Torres Strait, the response will depend on whether the infested plants are found in commercial crops or as isolated plants in non-crop areas, and on the range of alternative hosts.

Any decision on control or eradication will be influenced by whether or not Ramu Stunt has been introduced with *E. flavipes*, its vector. Infested plants and planthoppers from all areas of the incursion should be tested using methods developed by BSES Indooroopilly contact Dr Kathy Braithwaite (kbraithwaite@bses.org.au, 07 3331 3333) for information.

3.1.1 Infested plants in commercial crops

If the incursion is restricted to a small number of fields, it may be possible to eradicate the planthopper. The immediate response should assume eradication is possible until surveys determine the distribution of the pest.

If infested plants are found in commercial crops, it will be essential to determine as soon as possible the extent of infestation. If infestation is widespread and pests have been present for some time, eradication is unlikely to be successful and containment is likely to be the only viable option.

Containment will involve strict quarantine on movement of all sugarcane plant parts, alternative host-plants, soil and contaminated machinery. Reduction of sources of the pest by insecticides, plough-out and fallowing of infested fields, removal and destruction of infested plants, eradication of abandoned sugarcane, planting pest-free material and planting of resistant varieties could all be important in containing the spread of the pest.

3.1.2 Isolated plants in non-crop areas south of Cape York Peninsula

Sugarcane and its relative *Saccharum edule* are widely grown throughout the Torres Strait and in home gardens in northern Australia and as far south as Sydney. In some areas, the wild sugarcane relative *Saccharum spontaneum* has established as a weed, e.g. on the banks of the Mulgrave River near Cairns. Alternative hosts may also be grown over wide areas. If *E. flavipes* is found in isolated plants in a non-crop area outside Cape York Peninsula, it may be feasible to eradicate the outbreak, depending on the biology and host range of the pest. Eradication will involve:

- Immediate isolation and destruction or treatment with appropriate insecticides of all *Saccharum* species and alternative hosts within 10 km of the outbreak and follow-up destruction of any regrowth.
- Intensive surveys within 150 km of the incursion to determine any spread of the pest. These surveys would concentrate on current and abandoned dwellings where sugarcane and alternative hosts may have been planted.
- Public awareness campaign to alert all BSES, State Departments of Primary Industries in Queensland and New South Wales, Cane Productivity Services (and equivalents) staff, cane farmers and the general public to report any symptoms resembling those associated with the pest.

3.2 Methods to eradicate and prevent spread

Eradication of *E. flavipes* from isolated incursions in non-commercial crop areas will have a high probability of success if the infestation is detected early. Monitoring of the distribution of the pest in neighbouring countries may be important to warn of the approach of the pest. In non-commercial crop situations, such as wild *Saccharum* species and garden *Saccharum* species, it may be difficult to detect the pest. Regular surveys of qualified inspectors and good public awareness are the best approaches. Regular contact with sugar industries in neighbouring countries should be maintained to monitor the pest status of their crops. Surveillance should be high near the Cairns, Brisbane and Darwin airports.

3.2.1 Quarantine and movement controls

Quarantine and movement control must be imposed at several levels (dependant on what legislative controls are available):

Infested Premises (IP): A premises on which the pest is confirmed or presumed to exist. Total movement control is imposed.

Dangerous Contact Premises (DCP): A premises containing susceptible host plants, which are known to have been in direct or indirect contact with an IP or infested plants. Total movement control is imposed.

Suspect Premises (SP): A premises containing plants which may have been exposed to the pest and which will be subjected to quarantine and intense surveillance. Provided there is no evidence of infestation, the premises then reverts to normal status.

Restricted Area (RA): A restricted area will be drawn around all IPs and DCPs and include as many SPs as practical. The distance in any one direction is determined by factors such as terrain, the distribution, harvesting and management practices, the weather (particularly rainfall, temperature and prevailing winds) and the distribution of other host plants in home gardens.

The RA is not determined by drawing a circle of a certain diameter around the IP. The boundaries must be modified as new information comes to hand. A high level of movement control and surveillance will apply.

Control Area (CA): A CA will be imposed around the RA and include all remaining SPs. The purpose of the CA is to control movement of susceptible plant species for as long as is necessary to complete trace-back and epidemiological studies. Less stringent movement control and surveillance will apply. Once the limits of the pest have been confidently defined, the CA boundaries and movement restrictions should be relaxed or removed.

Movement controls should be maintained to contain the pest to within infested areas.

3.2.2 Trace-back

It is important in any incursion to try and identify the source of the outbreak. If the infestation has resulted from the illegal entry of an infested cutting or alternative host plant, the period in which the infested plant has been present and the subsequent movement of infested cuttings or plants from the original infested site will be important factors in determining the likely success of eradication, the extent of the restricted area, and the actions required.

If it appears likely that the incursion is through movement of contaminated machinery, then the movements of the machine should be traced.

Aerial incursions may require a much wider survey to determine whether spot incursions have occurred in other locations. Movements of plants and machinery from the infested premises should be thoroughly investigated.

3.2.3 Surveillance surveys

Eradication or restricting spread of *E. flavipes* will depend on the initial distribution and the range of alternative host plants, and surveys should be initiated as soon as possible after the first record of the pest. The scope of these surveys will obviously vary with these parameters, but those detailed below should be taken as the first approximation.

3.2.3.1 In commercial-crop areas

If *Eumetopina flavipes* is found in a commercial sugarcane crop, the entire field in which the pest was found should be walked row for row and the intensity of infestation determined. All fields within a 2-km radius of the initial infestation should be walked row for row, followed by inspections of 10% of fields at random throughout the remaining mill area or adjoining mill areas. All fields on farms belonging to the same farmer/company and the same harvester group as the infested farm should be inspected. Any farm on which machinery (including vehicles) or planting material from the infested farm has been shifted to in the previous 2 years should be inspected. If a highly susceptible variety is present in the region inspections should include a high percentage of fields of this variety. Extreme care should be taken to decontaminate all clothing and machinery before moving from a known infested site.

Surveys in alternative hosts should be similar to these, but may vary due to the nature of the crop.

Random inspections should be made throughout all other mill areas concentrating on any known susceptible sugarcane cultivars and alternative hosts.

Careful records of the number of infested plants per field, the distribution of infested plants within a field (infested plants in runs down a row suggest infested planting material, individual plants scattered throughout the field suggest aerial transmission) and the location of infested fields (mark on mill maps).

The intensity and number of positive findings in the initial 2-km-radius survey and the survey of farms with a link to the original farm should be reviewed before proceeding with the wider survey. If the pest is widespread on these farms, it is likely that the pest has been present for some time and eradication is less likely to be possible. Future action should concentrate on preventing movement from this region/mill area to surrounding regions/mill areas. If only a few infested plants or fields are found close to the original infestation, there may be some possibility of eradication and strict quarantine should be enforced around the infested farms. Detailed surveys should continue within the infested mill areas.

3.2.3.2 In non-commercial-crop areas

All *Saccharum* species and alternative host plants within a 1-km radius in a city or a 10-km radius in rural areas of the initial finding should be inspected and then inspections should be made radiating out from this initial area. The surveys would concentrate on current and abandoned dwellings where sugarcane and alternative hosts may have been planted.

A careful record should be kept of the location of cane plants and alternative hosts for follow-up inspections. Follow-up inspections should be carried out at 3, 6 and 12 months after the first finding. No plants should be removed from any location.

3.2.4 Destruction of infested plants

No insects, plants or soil should be removed from the infested premises, except for scientific purposes by an authorised person. Great care should be taken to limit the dispersal of any pest.

The actual methods of destroying infested plants will depend on the number of plants involved and the growth stage of the crop. If there are less than 50 infested plants, they should be dug out and should be destroyed fully by burning in an incinerator or in a pit. The cane in the infested fields should then be destroyed by rotary hoeing the field. The crop may be slashed or knocked down with a tractor first to assist in the hoeing. The field should be rotary hoed, disced or ploughed 3-4 and 6-8 weeks after the initial hoeing to destroy all volunteers. After these cultivations any further volunteers should be sprayed with glyphosate. If weather makes it impossible to plough the field it should be sprayed with glyphosate at 10 L/ha, left for at least 2-3 weeks and ploughed as soon as possible after this time. The field should be left fallow with no sugarcane volunteers or grass weeds for 12 months. All machinery must be decontaminated immediately after use.

If there are a large number of infested plants in the field, the field should be rotary hoed and/or sprayed with glyphosate.

If the survey shows that only a small number of fields are infested (1-5), an area of 300-500 m around the extremities of the infested fields should be rotary hoed and left fallow for at least 6 months to starve out pests. If no rain falls within the first 2 months, and irrigation is available, the field should be irrigated to field capacity on at least two occasions to promote plant growth and hatching of eggs.

The actual extent of the initial infestation will determine whether it is necessary to continue plough out of infested fields. If there are many infested fields, it may be necessary to set a level of infestation that would require plough out (eg 10% of stools) to help reduce the population for further spread outside the initial infested region.

3.2.5 Decontamination of clothing and machinery

3.2.5.1 Clothing

Where possible, disposable clothing (e.g. hats and overalls) should be worn. All other clothing worn in an infested field, including hats, should be washed in hot water (>60°C). The clothing should be sealed in a plastic bag for transport to the laundry. Shoes or boots should also be washed thoroughly.

Survey teams should change their clothes after inspecting an infested site, before moving to another field.

3.2.5.2 Vehicles and Machinery

All vehicles and machinery should be thoroughly washed and steam cleaned to remove all dirt and plant residues before leaving an infested property; this includes private vehicles that have entered the property. The vehicle or machine must be inspected by an authorised person before it is allowed to move. Survey teams and other visitors to infested sites should avoid driving vehicles close to the infested field.

3.2.6 Control with insecticides

Potentially useful insecticides should be identified from the literature and the dossiers in Appendix 5 as a matter of urgency. Those insecticides with established MRLs (Maximum Residue Levels) in Australian sugarcane should be used. Permission for use must be obtained from the Australian Pesticides and Veterinary Medicines Authority (APVMA), PO Box 6182, Kingston, ACT 2604; telephone 02 6210 4700, fax 02 6210 4813.

Screening to determine efficacy should commence as soon as possible (within 3 days of detection), especially if it is clear that there is no chance of short-term eradication.

3.2.7 Non-insecticidal control

The known infested fields and those close by should be planted with resistant varieties after the prescribed fallow period.

Varieties with high levels of resistance to *Eumetopina flavipes*/Ramu Stunt have been bred in Papua New Guinea. Some of these varieties are held in variety collections at BSES experiment stations. Some Australian varieties may also be resistant to the pest. In the case of an incursion into a commercial sugarcane area, a selection of any resistant varieties should be multiplied for use on infested farms and for possible introduction into the area if eradication is unsuccessful or is not possible.

Other controls, such as the introduction of parasitoids and predators, use of traps, and management options, may be useful in controlling introduced pests. Information should

be taken from the literature, the dossier in Appendix 5 and from consultation with overseas experts.

3.2.8 Approved-seed plots

Distribution of approved seed should be discontinued until the extent of the incursion is determined. It may be necessary to hot-water treat all cane being distributed from an approved seed plot. The approved seed plot should be inspected for the pest row-for-row before any cane is distributed.

3.2.9 Abandoned sugarcane and alternative hosts

All abandoned sugarcane within 10 km of the incursion should be destroyed, as this could act as a source of re-infestation of the pest. Spraying with glyphosate may be the most effective and efficient method of destruction, but follow-up sprays may be necessary.

In some areas the wild sugarcane relative, *Saccharum spontaneum*, has established as a weed (e.g. banks of the Mulgrave River near Cairns) and sugarcane and its relative *Saccharum edule* are grown in home gardens across northern Australia and as far south as Sydney. Attempts should be made to destroy these plants if they are found to be infested with the pest. This would need to be discussed with the Queensland Department of Primary Industries and Fisheries to determine the environmental impacts of any control program.

Sugarcane grown in backyards should be inspected in the area near any incursion and any infested plants should be destroyed.

3.3 Feasibility of control in Australia

If *Eumetopina flavipes* is found on isolated plants outside a commercial canegrowing area, it may be feasible to eradicate the pest from Australia. If an initial incursion occurred in a commercial crop, it is unlikely that eradication will be possible, but the response to the incursion should assume that eradication is possible until the extent of the incursion is known. Careful internal quarantine can delay the spread of a pest within a country with distinct breaks between canegrowing areas. This delay in spread would allow the screening of insecticides, resistant varieties and other controls before the arrival of the pest. Ultimately, if eradication is not achieved, the pest may be controlled, but this will involve potentially serious yield losses and the loss of valuable commercial varieties.

A decision to eradicate or contain must be based on an appropriate cost-benefit study. Factors to be considered include: resistance levels in current commercial cultivars; area in which the incursion occurred; cost of insecticides; costs associated with parasitoid rearing.

4.0 ACKNOWLEDGEMENTS

We thank colleagues in BSES, AFFA, QDPI&F and PHA for their input to this plan. We acknowledge the work of overseas colleagues that forms the basis of the dossiers.

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- Sallam, N S and Allsopp, P G (2008d) *Scirpophaga* spp. incursion management plan. Version 2. BSES Publication Manual MN08004.
- Sallam, N S and Allsopp, P G (2008e) *Eoreuma loftini* incursion management plan. Version 2. BSES Publication Manual MN08006.

APPENDIX 1 - CONTACTS FOR IDENTIFICATION OF PLANTHOPPERS

Confirmation of the identity of planthoppers should be made through:

DNA analysis

BSES Indooroopilly

Morphological identification

Dr Murray Fletcher

NSW Department of Primary Industries

Orange Agricultural Institute

Orange NSW 2800

☎: 02 6391 3943

Email: murray.fletcher@dpi.nsw.gov.au

Specimens should be placed live in individual, sealed, non-breakable containers with a piece of sugarcane stem for food and a piece of paper towelling to absorb excess moisture, or placed in 95+% ethanol. Upon arrival, live specimens must be killed by freezing to ensure that they do not escape.

APPENDIX 2 - SURVEY FOR SUGARCANE PLANTHOPPERS

Method

1. Teams of 2-4 people will be trained in recognition of the pest, survey methods, disinfection, and protocols for surveys on private and public lands.
2. Equipment:-
 - disposable hats, overalls and gloves
 - washable boots
 - illustrated guide to established pests likely to be confused with the target planthopper and to the introduced species
 - mill or local authority maps, hand-held GPS device (one per team)
 - paper bags or fertiliser bags to collect infested material
 - slicing knives
 - 70% methylated spirits in hand held spray bottles to disinfect equipment
 - portable cleaning kit for boots
 - survey report sheets
 - identification tags and leaflets explaining reason for survey
 - mobile phone
 - small bottles of 100% ethanol (where DNA samples need to be analysed) or methylated spirits for collecting insect specimens
3. Owners of private properties will, where possible, be advised in advance of the survey, by letter drop, radio, and/or TV.
4. Team to dress in protective clothing before entering property and display identification tags.
5. Vehicles to be left on farm roads.
6. Team leader to identify group to property owner/manager if available, explain survey and provide them with a leaflet on the pest.
7. All cane plants are inspected or the pre-determined number of blocks and rows walked in commercial crops.
8. When an infested plant is located, it should be carefully covered in a paper or fertiliser bag, the stalk cut and the bag sealed. If large numbers infested plants are present (eg >100), the team should leave the field without removing plants; these fields should then be destroyed by burning and/or ploughing.
9. Infested plants should be incinerated. Treated material should be buried on the infested property. Disposable clothing should be placed in bags of water-soluble plastic and washed in a hot cycle or autoclaved. Vehicles and boots should be treated with contact insecticide or steam-cleaned.
10. Complete survey form.

- 11.** Advise property owner/manager of survey results.
- 12.** If the pest is located on the property, report results immediately to the operation control centre.
- 13.** At the end of each day, the survey sheets will be entered onto the database and a summary report prepared and forwarded to the operations manager.

Sugarcane Planthopper Survey

Commercial Crops

Farm Name: Farm No:

Mill Area: Locality:

Block No: Variety:

Crop Class: Plant Source:

Movement of plants and machinery off property:
.....

Date of Inspection: Inspection method:

No. of infested plants located:

Distribution in block:

GPS Co-ordinates of block and infested plants:

<p>Sketch of field and location of infested plants</p> <p style="text-align: right;">↑ N</p>
--

Sample number for insect specimens

Comments:.....
.....
.....

Team Leader: Signature: Date:.....

Sugarcane Planthopper Survey

Dwellings/Abandoned Cane

Dwelling Location: (Street No./Local Authority No./GPS Co-ordinates):

.....

Owner/Occupier:

.....

Sugarcane no. stools: **No. of infested plants:**

Type of sugarcane -

Noble:

Edule:

Commercial:

Spontaneum:

Trace-back - source of plants: **Movement plants to other properties:**

Sample number for insect specimens

Comments:

.....

.....

Team Leader: **Signature:** **Date:**.....

APPENDIX 3 - DRAFT PRESS RELEASE

This may be made in the name of the federal or state minister responsible for plant health; the example given is for the Queensland Minister for Primary Industries and Fisheries.

NEWS RELEASE	From the office of
 MP
	Minister for Primary Industries and Fisheries

Date

Program to Eradicate NAME OF PEST

The Queensland Primary Industries and Fisheries Minister,, said today that the Island Sugarcane Planthopper, *Eumetopina flavipes*, had been detected on a sugarcane farm in the **NAME OF AREA** with the property immediately being quarantined.

Mr said BSES Limited senior entomologist had inspected the infested plants and confirmed that the pest was present. Further confirmation will be available when results from samples that were sent to are available.

The *Eumetopina flavipes* planthopper is a potentially serious pest of sugarcane that can reduce yield if it carries Ramu Stunt disease.

“This is the first suspected case of *Eumetopina* planthopper outside Cape York Peninsula and a control plan developed by BSES with assistance from State and Federal Governments has been activated,” Mr. said.

“Under the plan, an Industry-Government task force has begun tracing all movements of cane and machinery from the suspect property and has commenced a survey of neighbouring farms. This includes a total ban on movement of cane and machinery from the suspect property.

BSES, the Federal Government and the QDPI&F are working closely with the sugar industry to ensure the outbreak is eradicated or contained as quickly as possible,” Mr. said.

The source of this outbreak is unknown at this stage.

Media contact: Mr (Ministerial Adviser)
 Phone:
 Fax:

Technical information contact: **Designated person- phone number**
 CEO, BSES 07 3331 3333

Attached: Fact Sheet on *Eumetopina flavipes*
 Location map of outbreak

APPENDIX 4 - ABBREVIATIONS USED IN THIS REPORT

AFFA	Department of Agriculture, Fisheries and Forestry - Australia
ANIC	CSIRO Entomology, Australian National Insect Collection
APVMA	Australian Pesticides and Veterinary Medicines Authority
AQIS	Australian Quarantine and Inspection Service
BSES	BSES Limited
CA	Control Area
CCEPP	Consultative Committee on Exotic Plant Pests
CEO	Chief Executive Officer
CPPO	Chief Plant Protection Officer
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DCP	Dangerous Contact Premises
GIMP	Generic Incursion Management Plan
IP	Infested Premises
LPCC	Local Pest Control Centre
MRL	Maximum Residue Limit
NAQS	Northern Australia Quarantine Strategy
NMG	National Management Group
NPCHQ	National Pest Control Head Quarters
PHC	Plant Health Committee
PISC	Primary Industries Standing Committee
QDPI&F	Queensland Department of Primary Industries and Fisheries
RA	Restricted Area
SCARM	Standing Committee on Agricultural Resource Management
SIMS	SCARM Incursion Management Strategy
SP	Suspect Premises
SCCC	Sugar Cane Consultative Committee
SPCC	State Pest Control Centre
STF	SCARM Task Force on Incursion Management

APPENDIX 5 - DOSSIER ON *Eumetopina flavipes* AS A PEST OF SUGARCANE

Eumetopina flavipes Muir (Hemiptera: Delphacidae)

Common name

Island sugarcane planthopper

Distribution

Papua New Guinea (PNG), Torres Strait Islands (TSI) and northern peninsula area of Cape York, Queensland, Australia (Bourke 1968; Gough & Peterson 1984; Chandler & Croft 1986; Kuniata *et al.* 1994; Wilson 2004; Anderson *et al.* 2007; Grimshaw & Donaldson 2007). Also recorded from Indonesia, Borneo, Sarawak, Solomon Isles, Philippines, New Caledonia (M. Wilson, personal communication).

Genus *Eumetopina*

The genus *Eumetopina* is believed to have evolved in Papua New Guinea where several species occur together with *E. flavipes*. The genus is confined to South East Asia. So far, seven species have been described, and whilst the majority of species appear to be in PNG, there may be up to 25 undescribed species worldwide (M. Wilson, Personal communication). The described species are: *E. bakeri* Muir 1919: Borneo; *E. bicornis* Fennah, 1965: PNG; *E. caliginosa* Muir, 1913: Indonesia; *E. flava* Muir, 1919: Philippines; *E. flavipes* Muir, 1913: PNG; *E. kruegeri* Breddin 1896 (type species): Indonesia - Java; *E. maculata* Muir, 1919: Philippines (Wilson 2004).

Wilson (2004) gives the following description of the genus:

“*Eumetopina* is a small genus of small (3-5 mm) rather elongate, slightly flattened delphacid planthoppers. Characters of the male genitalia define the genus; the anal segment with one process and the thin elongate parameres being among the characters. The adults often have black forewings and thorax but there is considerable variation in the extent of this dark pigmentation. Some species may be recognised easily by marking on the face. Some other species are pale yellow or golden yellow in colour and with only small dark markings. A combination of external features and male genitalia characters are used for species separation.”

IMPORTANT

***Eumetopina flavipes* is the vector of Ramu Stunt disease of sugarcane. For information on this disease refer to the Ramu Stunt Incursion Management Plan.**

Host plants

Saccharum officinarum, *S. robustum*, *S. edule* and *Saccharum* hybrids (Wilson 2004; Sallam & Anderson 2006, Anderson *et al.* in press). *E. flavipes* has also been recorded on *S. spontaneum* by Kuniata *et al.* (1994), however, recent surveys indicated that this association is relatively rare and may be coincidental (Sallam & Anderson 2006; Anderson *et al.* in press; Sallam, personal observation).

Symptoms

The insect on its own (virus free populations) may cause plant stress, yellowing of whorl and spindle deformation under heavy pressure, specially in susceptible varieties. Eggs are laid under the leaf epidermis and this causes local discoloration (fig. 1). However, if the insect transmits the causal agent of Ramu Stunt, then symptoms of severe stunting, trashy appearance, leaf stripes and mottling and stool death will be manifested in the sugarcane plant.

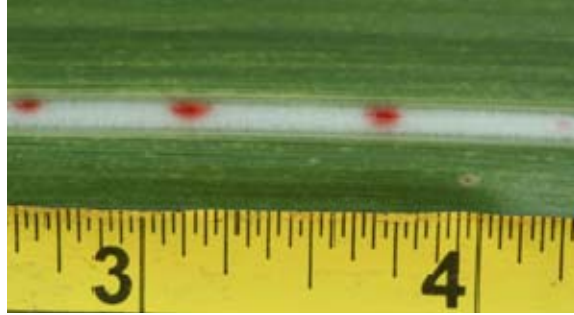


Fig 1 *E. flavipes* eggs in the leaf midrib and surrounding discolouration

Economic impact

Virus free populations are unlikely to have a significant impact on the crop unless under heavy infestation which may lead to plant stress. However, if the insect transmits the causal agent of Ramu Stunt then the economic impact will depend on the resistance level of the host plant. In 1986, Ramu Stunt almost destroyed the sugarcane industry in PNG, where a 60% reduction in productivity was recorded in the highly susceptible cultivar Rangar which occupied 90% of the plantation. Varieties Q90 and Yasawa were also affected but Cadmus and Q107 were resistant (Waller *et al.* 1987; Eastwood 1990; Kuniata *et al.* 1994; Cronjé *et al.* 1999).

Morphology

Eggs

Eggs are microscopic, curved and elongate in shape (Fig. 2).

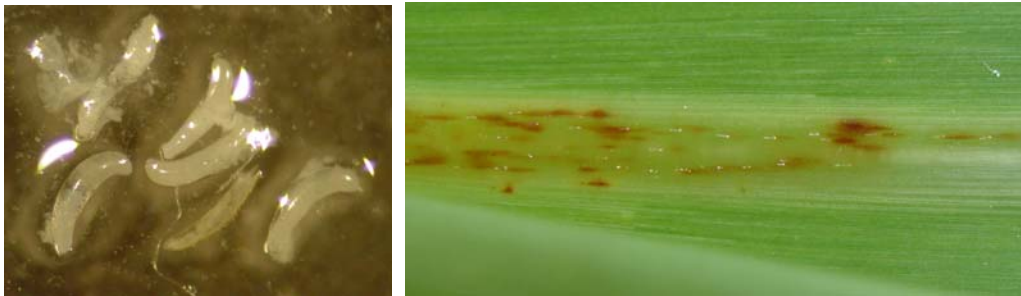


Fig 2 On left, *E. flavipes* mature eggs dissected from female ovary; on right, newly laid eggs in a sugarcane leaf. Note white wax cover excreted by females to prevent desiccation. Photos taken by Kylie Anderson (JCU)

Nymphs



Fig 3 On left newly emerged *E. flavipes* nymph; on right, nymphs in sugarcane 'spindle' roll – TSI (Kylie Anderson JCU)

Adults**Fig. 4a****Fig. 4b****Fig. 4c**

Figs 4 *E. flavipes* adult stage – a) Dorsal view, b) Lateral view - Bill Crowe (AQIS - Brisbane)
 c) Adults and nymphs in the leaf whorl - PNG. Photo also shows nymphal exuvia (exoskeleton shed after molting) (Nader Sallam – BSES Limited)

There appears to be a difference in colour within and between the Australian and New Guinea populations, although this is untested (Croft, unpublished; N. Sallam, personal observation; K. Anderson, personal communication). The colour variation may not be directly related to geographical distribution. Genetic variation among populations throughout PNG and the TS/NPA is currently being investigated.

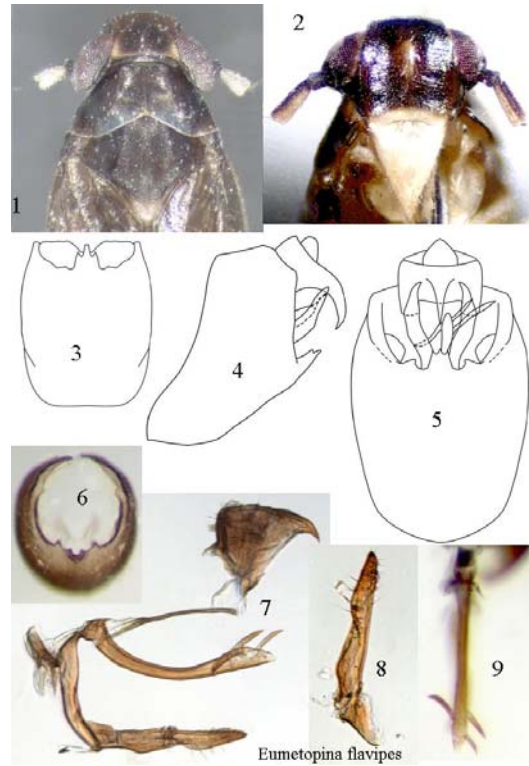


Fig 5 *E. flavipes* morphological characters – Photos supplied by Glenn Bellis -AQIS.

1. Dorsal view of head
2. Ventral view of head
3. Ventral view of male pygophore
4. Lateral view of male pygophore
5. Postero-ventral view of male pygophore
6. Diaphragm of male pygophore
7. Lateral view of internal male genitalia
8. Paramere
9. Dorsal view of aedeagus

Detection methods

Adults and nymphs reside in the ‘spindle’ roll, or growing tip of the sugarcane plant. They are found by unrolling the leaf whorl. Large numbers of individuals (i.e. >100) are not uncommon in PNG.



Fig 6 *E. flavipes* adults and nymphs can be detected by unrolling the leaf whorl – PNG (Nader Sallam – BSES Limited)

Biology and Ecology

No specific studies on the biology and ecology of *E. flavipes* are available. However, the insect seems to be a 'ubiquitous commensal' of *Saccharum officinarum*, where it occupies virtually all noble and commercial cane plants in Papua New Guinea (N. Sallam, personal observation; Anderson *et al.* in press). A variety of ant species seem to be associated with *E. flavipes* and these include: *Anoplolepis gracilipes*; *Pheidole* sp., *Paratrechina* sp., *Monomorium* sp., *Iridomyrmex* sp. and *Camponotus* sp. (K. Anderson, unpublished).

Varietal preference has been observed, and most of the currently available sugarcane cultivars planted in Ramu Sugar are resistant to Ramu Stunt disease (L. Kuniata, personal communication). It is not clear if there is a relationship between insect numbers on a plant and manifestation of the disease.

Management

Chemical control

There is no available information on management of *E. flavipes* and no chemical control is practiced at Ramu Sugar (PNG) against this pest (Kuniata *et al.* 2001). However, pyrethroids such as lambda-cyhalothrin (Karate at 0.5L/ha) and permethrin at 1L/ha and neonicotinoid-based insecticides such as Mospilan at 0.75L/ha which are used against sugarcane moth borers at Ramu Sugar suppress *Eumetopina* populations (L. Kuniata, personal communication).

Monitoring

Carefully unroll the whorls. Insects can be collected using an aspirator.

Means of Movement

Movement of infested plant material is a key dispersal mechanisms for *E. flavipes* (Allsopp 1991; Anderson *et al.* 2007). Anderson *et al.* (2007) showed that whilst *E. flavipes* males, females and nymphs disperse from cut stalks as they dry up over time, all life stages can survive up to six days on the cut sugarcane stalks and are thus available for colonisation.

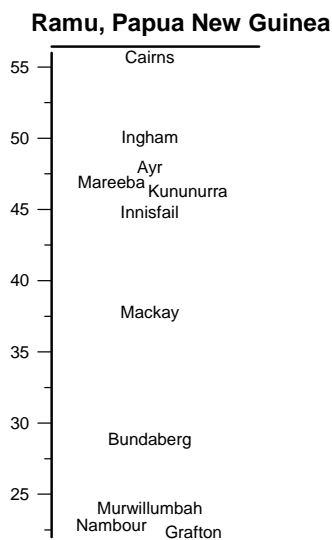
Phytosanitary Risk

Entry potential: Already on northern peninsula area of Cape York Peninsula, mainland Australia. Spreading further south is a possibility if quarantine measurements are not followed strictly.

Colonisation potential: High.

Spread potential: High, especially in North Queensland.

Establishment potential: High, especially in North Queensland (see Match Indexes for climate at Ramu and principal Australian areas below).



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