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 Cape York Peninsula, Queensland, Australia (Bourke 1968; Gough & Peterson 1984; Chandler & Croft 1986; Kuniata *et al*. 1994; Magarey *et al*. 2002; Wilson 2004; Anderson *et al.* 2007, 2009, 2010; Grimshaw & Donaldson 2007; Anderson & Condon 2013). Also recorded from Indonesia (Borneo), Malaysia (Sarawak), Solomon Islands, 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 Dossier.**

Host plants
Saccharum officinarum, S. robustum, S. edule and *Saccharum* hybrids (Magarey *et al.* 2002; Wilson 2004; Sallam & Anderson 2006, Anderson *et al.* 2008). *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.* 2008; Sallam, personal observation).

Symptoms
The insect on its own (virus-free populations) may cause plant stress, yellowing of the whorl and spindle deformation under heavy pressure, especially 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 (a virus), then symptoms of severe stunting, trashy appearance, leaf stripes and mottling and stool death will be manifested in the sugarcane plant.

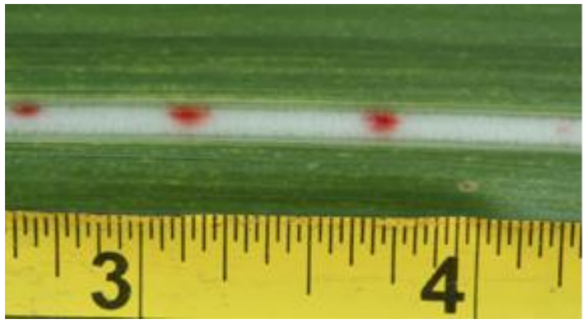


Fig. 1. *E. flavipes* eggs in the leaf midrib and surrounding discolouration.

Economic impact

Virus-free populations are unlikely to have a significant impact on the crop unless they are heavy infestations 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). Varieties are routinely rated for resistance levels at Ramu Sugar, including many Australian varieties (Braithwaite *et al.* 2012).

Morphology

Eggs

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

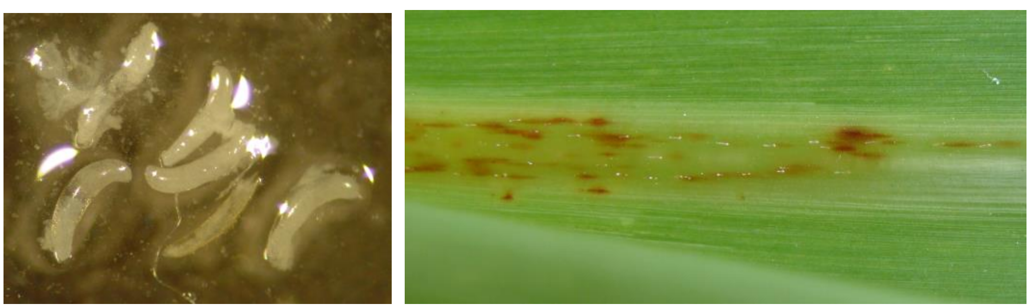


Fig. 2. On left, *E. flavipes* mature eggs dissected from female ovary; on right, newly laid eggs in a sugarcane leaf. Note white wax cover excreted by females to prevent desiccation. Photos taken by Kylie Anderson (JCU).

Nymphs

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

Adults

Fig. 4a

Fig. 4b

Fig. 4c

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

There appears to be a difference in colour within and between the Australian and New Guinea populations that may not be directly related to geographical distribution. Genetic variation occurs among populations throughout PNG and TS/CYP and indicates frequent, wind-assisted immigration from multiple sources in PNG contributes significantly to repeated colonisation of far-northern islands of the Torres Strait (Anderson *et al.* 2010; Anderson & Congdon 2013). Populations are more isolated further south.

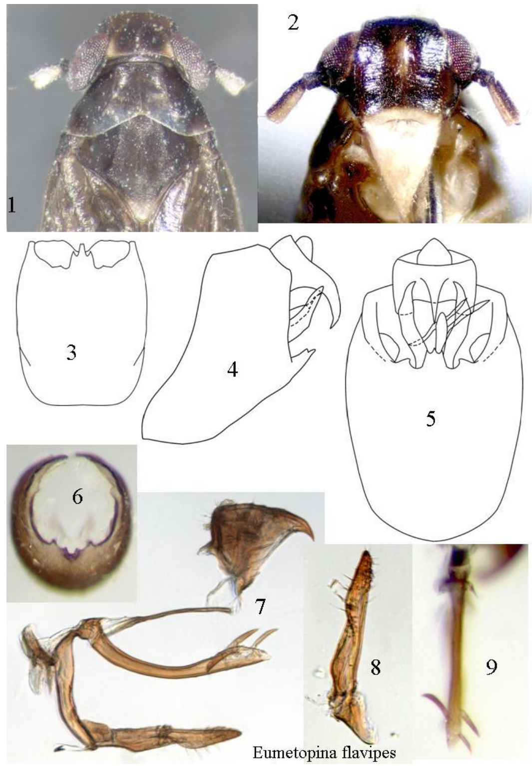


Fig. 5. *E. flavipes* morphological characters – Photos supplied by Glenn Bellis –Department of Agriculture. 1. Dorsal view of head; 2. Ventral view of head; 3. Ventral view of male pygophore; 4. Lateral view of male pygophore; 5. Postero-ventral view of male pygophore; 6. Diaphragm of male pygophore; 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 – SRA).

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 (Magarey *et al.* 2002; N. Sallam, personal observation; Anderson *et al.* 2009). 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; Braithwaite *et al*. 2012). 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 Mosiplan at 0.75L/ha which are used against sugarcane moth borers at Ramu Sugar suppress *Eumetopina* populations (L. Kuniata, personal communication).

Cultural control

Anderson *et al.* (2009) advocated annual, simultaneous tip-pruning as an effective pre-emptive management technique for *E. flavipes* in the Torres Strait. However, this may be more effective in the southern islands than further north where there is wind-assisted migration from PNG (Anderson *et al.* 2010; Anderson & Congdon 2013).

Monitoring

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

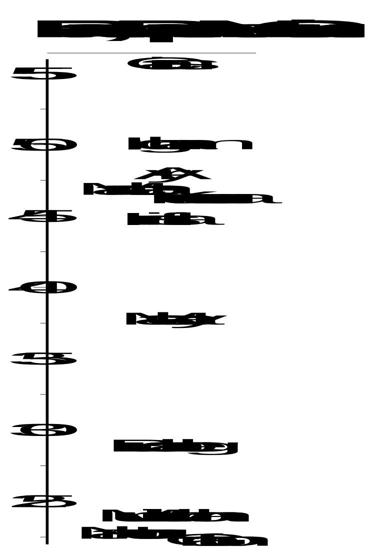
Means of Movement

Movement of infested plant material is a key dispersal mechanism 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.

Genetic variation that occurs among populations throughout PNG and TS/CYP indicates frequent, wind-assisted immigration from multiple sources in PNG that contributes significantly to repeated colonisation of far-northern islands of the Torres Strait (Anderson *et al.* 2010; Anderson & Congdon 2013). Populations are more isolated further south.

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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