Attachment A:

Efficacy of insectocutors on livestock vessels for early detection of SWF incursion

Executive summary:

Both Old World screwworm fly (*Chrysomyia bezziana*) and New World screwworm fly (*Cochliomyia homnivorax*) are exotic to Australia, and deemed a significant animal health risk to livestock, companion animals and wildlife, and with zoonotic potential. Current strategies for incursion mitigation or early detection include use of insectocutors on returning livestock vessels, but there is very little knowledge regarding their efficacy. The aim of this project is to establish their efficacy for attracting old world screwworm fly, using Lucitrap as a positive control.

Introduction

The distribution of new world screwworm fly is currently limited to South America (recently eradicated from Central America), whilst old world screw worm fly is widespread across parts of Africa, the Middle East, and most of central and southern Asia, including Australia's closest neighbours Papua New Guinea (PNG), Indonesia and Timor Leste (Lau S, 2015). For the purpose of this paper, SWF refers to both species as they both pose a similar risk to Australian biosecurity.

Adult screwworm flies lay eggs on wounds or moist orifices of warm-blooded animals, and the hatched maggots then feed on healthy flesh, needing only a mild excoriation to break through the skin and burrow deep, potentially resulting in large debilitating wounds.

An incursion of SWF into Australia would most likely establish in northern Australia, having significant effects on northern livestock - affecting production, animal welfare, and access to important international export markets. Quite apart from economic and welfare effects in the livestock industry, the impact on domestic animals and wildlife and would also be potentially devastating. People living in remote and socially disadvantaged areas with limited access to health care would also be affected, with cases of endemic species' myiasis already seen regularly.

An extensive early detection surveillance network is in place across Australia and particularly in the north where SWF is more likely to establish. The surveillance strategy is coordinated by the Screwworm Fly Surveillance and Preparedness Program (SWFSPP), a technical committee comprised of industry and government stakeholders coordinated by Animal Health Australia, with the aim to detect a SWF incursion early enough to ensure a high chance of successful eradication. The surveillance strategy consists of targeted live fly trapping, wound and myiasis monitoring across a range of species, and maggot submissions from human and animal wounds. This strategy also serves to contribute to SWF pest freedom assurance.

Risk assessments of SWF incursion potential to Australia identify several regulated and unregulated pathways including:

- Infested passengers returning from host countries
- Imported animals carrying flies
- Live flies hitchhiking on aircraft or vessels (particularly those returning from SWF endemic countries after exporting livestock)
- Windborne spread from near-neighbour countries

Passengers and animals travelling from PNG through the Torres Strait are a particular risk to carry SWF south.

To mitigate the risk of SWF incursion from the hitchhiking pathway, insectocutors have been used on livestock vessels since 1986. Old world SWF has been detected on at least eight reported occasions (Rajapaska, 1989), however none since 1988, and only one incident of trapped live flies whilst in an Australian Port (Lady Geraldine, Darwin 1988). Other forms of SWF mitigation on board vessels include use of pestigas, phytosanitary measures, and biosecurity inspections as described in the work instruction "*Undertake a livestock vessel inspection*" (Department of Agriculture, Water and the Environment , 2018)

Insectocutors are non-specific electrical discharge traps generally used to control flying insects. Specific SWF traps include Lucitraps with bezzilure, and older style sticky traps with Swormlure – these lures contain synthetic chemical attractants designed to mimic warm-blooded animal wounds. Lucitraps are widely used for Australian endemic blowfly control, but when used with SWF-specific Bezzilures have been shown to be more effective at attracting SWF than other lure-based traps (Urech, 2012). To the best of SWFSPP's knowledge Lucitraps have not been compared to insectocutors for efficacy as part of the incursion mitigation strategy on board vessels.

Despite their long-term use, there have also been no studies demonstrating the sensitivity of insectocutors as a mitigation strategy for SWF using livestock as bait animals. One laboratory-based study (Clarke, 1991) noted an average of 13% female and 21% male SWF released in a room were attracted to insectocutors. To better understand the efficacy of using insectocutors in early detection and risk mitigation strategies, the trial proposed here will be conducted in a field setting with live host animals, to provide a more realistic setting for host and pest behaviour. The trial ultimately seeks to confirm that insectocutors provide adequate confidence for early detection of SWF on a livestock vessel. Testing the sensitivity of a trap in an area with a known endemic population is not the same as on a ship where SWF is not expected but given this well managed feedlot has a thorough SWF management strategy, there is likely a relatively low-density SWF population that might be similar to an endemic port area where livestock discharge from vessels.

Objectives

1. To determine if insectocutors are effective at attracting and killing SWF in a low-density endemic SWF environment.
    - Null hypothesis: there is no evidence that insectocutors are effective at attracting and killing SWF
2. To determine the efficacy of insectocutors at attracting/trapping SWF compared to Lucitraps
    - Null hypothesis: there is no difference in efficacy between insectocutor and Lucitrap at trapping SWF

Methods

Study design

This is a comparative study to test the effectiveness of insectocutors in a SWF endemic setting with live host animal baits. Lucitraps will be used as positive controls.

- A trial will be conducted locally in Broome from July to September to ensure traps are functional and to establish that insectocutors do attract calliphorid flies
- Traps will be set in PNG during monsoon season, when SWF are more active – November to March
- Insectocutors and Lucitraps will be placed at opposite ends of the test paddocks so as not to interfere with each other.
- Traps will be cleared and reset weekly and their location rotated, to account for site/trap/host effects.

- To ensure consistent data collection, collectors will be provided with forms to capture host data and weather conditions.
- Flies will be frozen on collection, use drying agents within samples to gather moisture and reduce rotting
- Samples will be couriered to Australia each week for ID +/- PCR

<u>Setting</u>

The experimental setting has been chosen as it is a large beef production facility in a known SWF endemic area.

- Ramu Beef feedlot, Markham Valley, Papua New Guinea.
- Breeding/rearing/fattening/slaughter beef production facility. 3000 head in each of two feedlots at any one time. Produced 7700 calves in 2020, ie lots of susceptible host animals particularly after calf-marking.
- Branding/dehorning/castrating is done in January
- 50-100 cases SWF myiasis each year despite extensive controls (Dectomax @marking, Demise anytime through yards, backrub in remote paddocks)
- Paddock 25 (see attached map) – lots of signal grass and vegetation for SWF habitat
- Paddock is long enough that traps can be separated to reduce competition of attractants.
- Avoid eucalypts (*Lucilia* spp avoid them, not sure about SWF?)

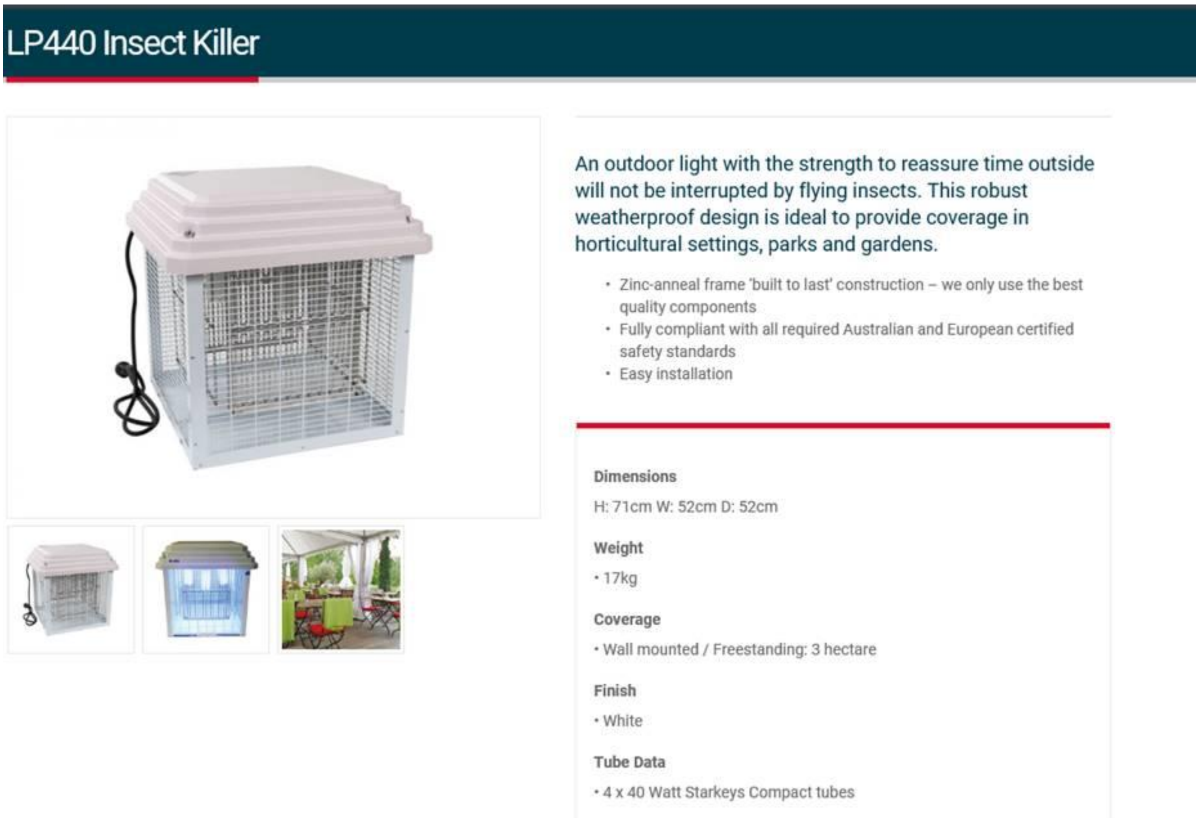
Paddock 25 – suitable vegetation for SWF habitat and large enough to set traps at each end

MATERIALS

<u>Insectocutor trap</u> – eg Starkeys PestWest LP440 insect killer as used on livestock

- Generator & fuel – Ramu can provide

MODEL	Cost (2019)	Pros	Cons
LP440	$964.14 (ex GST & Freight)	Identical to those on livestock vessels so ideal control	Expensive to purchase, Bulky and expensive to transport to PNG Large area covered (3ha) - may interfere with Lucitrap?
L40	$404.05	Cheaper to purchase, Easier and cheaper to transport to PNG	Not identical to those on vessels, smaller area covered. BUT is still robust commercial grade quality
Bunnings (similar style to L40)	Approx. $70	Very cheap, easier/cheaper to transport to PNG	Much less range and quality – not recommended.



Lucitrap

- Bezzilure-2 kit (synthetic wound-derived attractant)
- Gloves
- Spare lures
- Insecticide tabs/kill strips

BUGS FOR BUGS

LuciTrap® TRAP KIT

CONTENTS: 5 x Bowls
5 x LuciTrap Lids
1 x Bag containing
- 10 x Yellow Plugs
- 10 x Collars*
- 1 x Tweezers*
- 1 x Bridge/Boomerang*

ASSEMBLY DIAGRAM

NOTES:
- The parts marked * are needed for the LuciTrap Refill Kit.
- The LuciTrap A, LuciTrap B and LuciTrap C are sold separately as Lucitrap Refill Kit.
- Visit www.bugsforbugs.com.au for more information.
- On the LuciTrap Refill Kit label, under 'DIRECTIONS FOR USE', there is reference made attaching LuciTrap to a tree. Avoid eucalypts. Experience has shown that attractiveness to Luci flies may be reduced.


One example of barrier designed to minimize dislodgement by livestock.


One possibilty for trap positioning. *Preferably place on southern or eastern side of structures*

General equipment

- Sample containers
- Sample handling instructions
- Silica/other drying agent sachets?? Approx. 10-20c each
- Data collection forms – include date/collector/location/number host animals/rain & wind conditions etc
- Self addressed post packs

Risk Mitigation Strategy:

No	Activity	Hazard Identification	Risk Assessment				Likelihood after controls	Risk acceptable?
			Risk	Likelihood	Consequence	Risk control		
1	Trap setting	No power at trap site	Insectocutor won't work -no samples	Possible	Project failure	Generator placed at trap site, regular refuelling	Unlikely	Acceptable
		Errors in trap set up, lures not set properly etc	Insectocutor / lucitrap won't work – inaccurate data	Possible	Inaccurate data	Test experiment design at Broome Common cattle yards first, then write instructions for Ramu Beef setup	Unlikely	Acceptable
		Traps set too close together	Interference between traps – likely that lucitrap will detract flies away from insectocutor	Possible	Inaccurate data, project failure	Test experiment design at Broome Common cattle yards first and ensure insectocutor is trapping flies	Unlikely	Acceptable
		Traps set where SWF not active or out of season	No flies caught despite traps possibly being effective	Possible	Inaccurate data or project failure	Set traps in known SWF season – October/November til March/April	Unlikely	Acceptable
2	Trap collecting	Traps not collected frequently enough	Flies rot or eaten by ants	Likely	Sample unable to be identified	Collect frequency depends on how many flies caught and if rainy weather – NPA traps collected every 2-3 days to avoid rotten flies.	Unlikely	Acceptable
		Flies delayed or lost in transit	Flies rot or lost –	Likely	Sample useless	Use drying agents within samples to gather moisture and reduce rotting esp condensation after freezing	Possible	Acceptable
3	Data analysis	Confounding parameters						

ISSUES TO RESOLVE

ISSUE	DESCRIPTION	SOLUTION	VARIATION
Seasonality	SWF more prevalent in Wet season – may need to clear and switch traps every 2-3 days so is long time/effort for Ramu staff and DAWE staff managing trap and IDing samples	John has suggested that Ramu is keen to be involved and has a R&D section that will probably help with resourcing. DAWE capacity – TBC (& depends on sample yield)	May need to reassess frequency of trap catches if Ramu can't keep up, or if yield too high for DAWE capacity. Think start weekly and adjust as needed.
Presence of host animals	Need high numbers of susceptible animals	Plenty of susceptible hosts, and still 50-100 cases/year in feedlot despite range of prevention & treatment strategies. Ensure traps are set where wounded animals (marked calves) are providing SWF habitat nearby	May need to move sites if initial selected sites not yielding samples
Trap placement	Ensure traps are separated such that they don't compete for attracting flies	The LP400 covers up to 10ha so perhaps is too big for this purpose (despite wanting to use same model as on livestock vessels) Lucitrap is recommended at a rate of one per 100 animals, not on area.	May need to move sites if initial selected sites not yielding samples May need to use a smaller insectocutor
Trap placement	How many traps to use?	Start with one each (insectocutor & Lucitrap) and if no SWF trapped at all within first month or so then try duplicate traps in other sites?	Go all out and have three of each to start with, need to identify other sites tho – may be challenging…
Lure choice	Bezzilure 2 alone, or Bezzilure 2 & POC	TBC – discuss	
Frequency & duration of trapping	How often to clear & switch traps?	Start with NPA protocol for Lucitraps and at each trap clearance then switch trap sites	Adjust as necessary for trap yield
Couriering samples from Ramu to Australia	Who pays? Transport time?	Find out if Ramu has a regular courier account for priority packages, or use whatever offshore program has done for survey samples	
Resourcing for sample sorting & IDs	Send to where?	TBC – discuss	

References

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