Using differential responses to light as a push-pull control strategy for wood borers

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Background

- Wood borers are significant export quarantine pests that are attracted to bright lights at wood processing mills where they infest timber stacks.
- Risks currently mitigated by use of toxic fumigant, e.g., methyl bromide.
- Alternative non-toxic controls are required.

Push-Pull control strategies are non-toxic and rely on a combination of:

1. A deterrent to push unwanted pests away from a desired resource.
2. An attractant to pull unwanted pests away from a desired resource.

The push-pull concept maximises the efficacy of behavioural modifying stimuli by tandem deployment, i.e., each stimuli cannot exert control on their own but in combination they can provide effective control.

Identifying effective push - pull visual stimuli

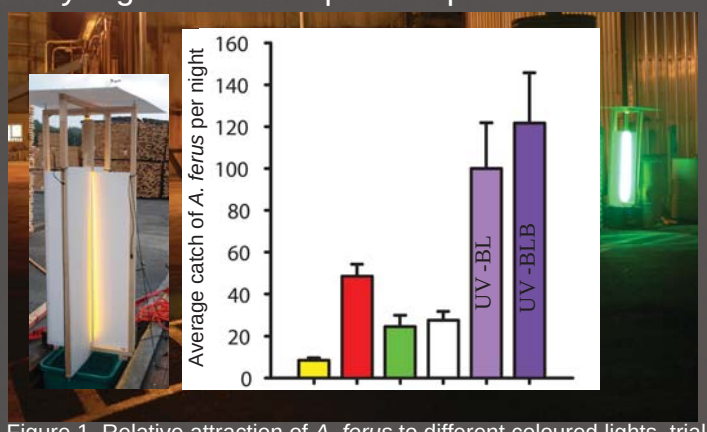

Figure 1. Relative attraction of *A. ferus* to different coloured lights, trialed with bucket traps (pictured left) at a wood processing mill (background).

- *A. ferus* highly attracted to UV light - best pull treatment
- Low attraction to yellow light - best push treatment

Key export wood borer pests in New Zealand

Arhopalus ferus
Introduced to New Zealand 1960s. Is beneficial in forests for nutrient cycling but a significant export pest.

Prionoplus reticularis
Native to New Zealand, also important decomposer of woody debris, again significant export pest species. NZ's largest beetle.

Experimental test of a push pull technique to control wood borers

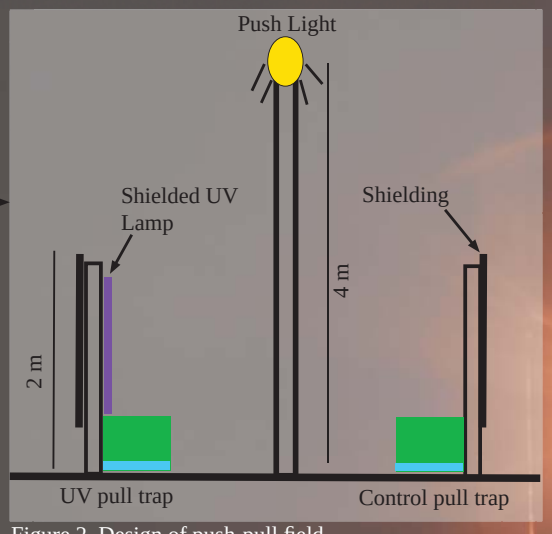

Figure 2. Design of push-pull field trial conducted in plantation forest, shown below.

Our push-pull design (see left) combines a push light on top of a 4 m post. A highly attractive UV pull trap and control situated beneath. The strategy can be deemed effective if the combination of stimuli satisfy the following criteria:

1) one 'push' light treatment attracts fewer beetles compared to other lights, or is no different from the no-light control

2) beetle catch in the control 'pull' trap beneath the least attractive 'push' light treatment is minimal relative to its adjacent UV 'pull' trap.

Low trap captures in control 'pull' traps adjacent to UV 'pull' traps indicate that the UV light traps are effective at trapping residual individuals attracted to the site.

Push - Pull experiment in Action

Methodology

- Four different push lights trialed, white (metal-halide lamp), yellow (low (SON) and high (SOX) pressure sodium lights) and a control.

- Beetles caught in UV and control 'pull' traps beneath push light treatments

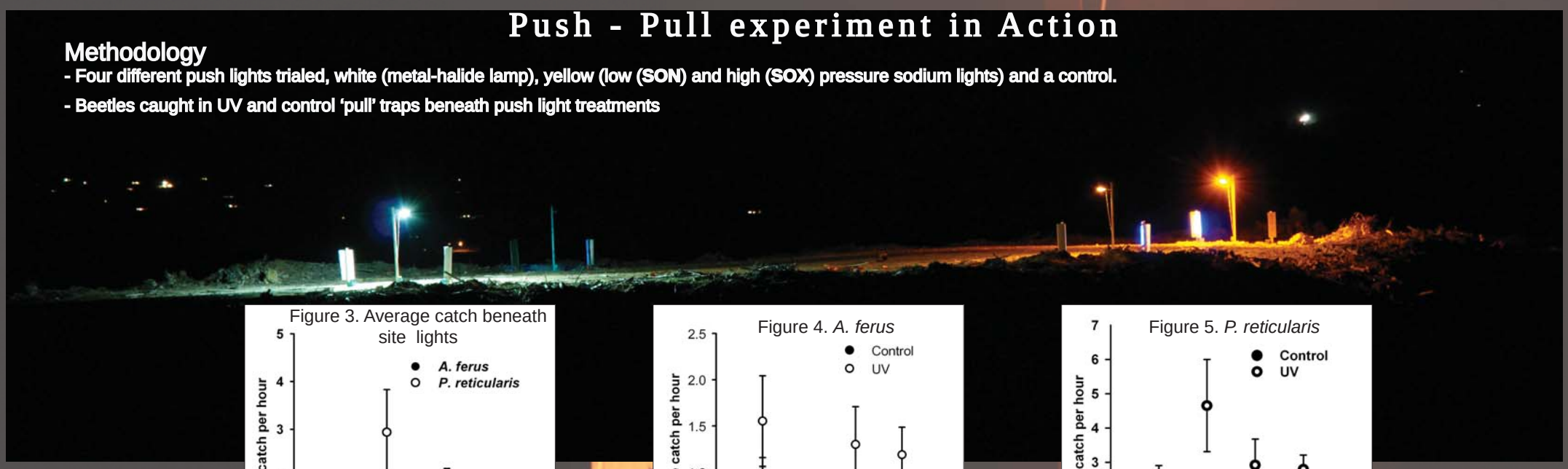

Figure 3. Average catch beneath site lights

Figure 4. *A. ferus*

Figure 5. *P. reticularis*

Results

Figure 3 - Average catch of woodborers beneath yellow 'push' lights was no different to the no light control, white light was more attractive to *P. reticularis*, but less attractive to *A. ferus.* Low *A. ferus catch* under white lights is counter-intuitive given that white light is known to be more attractive to this species than yellow light (Figure 1.).

Figure 4. UV traps were highly effective at removing residual *A. ferus* attracted to yellow 'push' lamp treatments. Control was not effective beneath white lights or in the no-light control situations.

Figure 5. UV traps were highly effective at removing residual *P. reticularis* beneath control and yellow lights, but was not as effective beneath white (metal halide lights).

Conclusions

- **Yellow lights are most appropriate for site lighting as they do not attract more wood borers than a no light situation.**
- **Strategic use of UV traps are effective at removing residual beetles attracted by site lighting and other stimuli, e.g., wooden posts (tree mimics).**
- **Tandem deployment of yellow site lighting and UV mass trapping has potential for non-toxic control of unwanted wood borers.**
- **Future large scale commercial trials and optimisation of UV mass trapping techniques are required.**

Acknowledgements

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