PRODUCTIONISED AUTOMATED LEG HOLD SYSTEM FOR POSSUMS

Phil Bell – November 2017

This project was one of a suite of projects carried out during 2015-2017, with funding from six New Zealand dairy companies: Fonterra, Tatua, Synlait, Westland Milk Products, Open Country Dairy and Miraka.

INTRODUCTION/BACKGROUND

Leg hold traps are generally considered to be the most effective trap for possums as they take advantage of 'disguised danger' (i.e. the possum doesn't realise it is a trap) and therefore require limited interaction to result in a capture. Capture data from Bottle Rock field development site in Marlborough Sounds demonstrates that leg hold traps are the most effective tool for intercepting possums in the barrier system, with our analysis suggesting that currently 65%(+/- 8%) of all possums that attempt to breach the first line get caught by the leg hold traps. This rate is at least 25% higher than when kill traps formed the first line in the barrier (between 2015-2016).

ZIP had completed development of a prototype leg hold system. It comprised a zinc coated steel leg hold trap (PCR #1), positioned within a machined wooden (kwila) platform screwed to a tree at least one metre above the ground to avoid interference by weka. To minimise the risk of possums being able to disturb the trap before capture, the machined platform supports the trap so that it is held stable and flush with the top surface of the platform. A ramp is attached to the platform to improve the possum's access to the trap. This ramp angle is 60 degrees to reduce the risk of weka accessing the trap. The ramp idea, dimensions and length for non-target exclusion were obtained from Thomson et al (2001).

The trap is lured with a visual 'flag' made of white corflute. Our catch data over time has shown that possums are often attracted to the trap site by sight alone (and food scent does not increase that). Whilst investigating the visual lure, possums stand on the trap and are caught by the leg.

The trap is attached to the platform by a length of chain that enables the possum to reach the ground comfortably. Approximately 10% of possums were able to escape from the prototype design due to a combination of chain fouling and jerking.

Live capture traps must be checked by law within 12 hours of sunrise the day after the trap is set (to meet animal welfare requirements). The electronic node (sitting within the platform, directly beneath the trap) detects the capture (via a magnetic switch) and transmits this event to the field team automatically via a very high frequency (VHF) and satellite based wireless network. The node based reporting system has multiple fail-safes built into it to ensure animal welfare is not compromised. This prototype system had DOC approval for use at Bottle Rock Peninsula, but still required regulatory approval from MPI.

Figure 1. The prototype automated leg hold trap system set up at Bottle Rock Peninsula

Given the apparent effectiveness of the leg hold trap system, it is ZIP's intention to productionise the platform and refine the remote reporting system. In late 2016, it cost $45 (excl. GST) to produce each platform; while the cost of the prototype nodes is $220. Up to 252 nodes can report via a single satellite base station ($2,000) to a webserver. These costs need to be greatly reduced to make it a cost-effective option for inclusion in scaled up Remove and Protect sites in future. Productionising the leg hold system was expected to greatly reduce that unit cost.

OBJECTIVES

The objectives of this project were to productionise a leg hold trap platform that:

- Lasts greater than 10 years in forested environments.
- Minimises the chance of escape.
- Integrates the automated reporting system.

In addition, we sought to:

- Upgrade the reporting system (transmitter nodes and satellite base stations) into the most up-to-date transmission technology available.

- Gain regulatory approval for the automated reporting system for live capture trapping.

DESIGN PROCESS

Leg hold trap platform

In order to achieve the objective that the platform last more than 10 years in forested environments, we initiated the design process in the knowledge that the platform would need to be constructed out of some form of plastic material. The design work for the platform was undertaken by Motovated Ltd, an engineering firm based in Christchurch. Achieving the necessary strength and stiffness was a significant part of that work to make sure that the new platforms would replicate as closely as possible the performance of the kwila wood prototypes that had proven so successful.

Two initial prototypes were designed, to allow for the trap orientation to be face on or side on. Basic testing and analysis of catch data (capture by which leg) from Bottle Rock led to the orientation of the trap remaining face-on (as per the prototype wooden platform).

Discussions with SCION alerted us to the existence of wood-fibre filled composite plastics – giving the option to manufacture using plastics with slightly more natural wood-like attributes than 'normal' plastics. The wood-fibre filled polypropylene smells like MDF and has a mottled composite particle board type look, however the feel (to the touch) is very similar to standard plastic because the wood fibres are fully encapsulated to prevent them decomposing, absorbing moisture, etc.

'Production' tool trials indicated that the tool temperature and injection temperature combined with cycle time were critical to avoid burning the wood fibre fill. Burning the fill created a very natural and cosmetically appealing look to the parts, but resulted in unacceptable brittleness and a pungent smell of burned MDF. Subsequent testing and trials eliminated these issues (by reducing the proportion of wood fill and careful process control).

The final material chosen for the field prototypes is a natural UV stabilised polypropylene with 16% wood fibre fill. The first run (450 platforms) was produced and installed at Bottle Rock Peninsula in the defence system to test its effectiveness relative to the wooden prototype platforms.

The decision was initially made to not include the ability to attach a ramp to the leg hold platform, as field trials at Bottle Rock Peninsula implied that capture rates of ramped and non-ramped platform traps were similar. Eliminating the ramp detail made the tool simpler and cheaper and also led to a more optimised platform surface that was considered to be likely to result in increased captures. A production tool was made in China, and then shipped to NZ where Talbot Technologies were contracted to produce the platforms.

Figure 2. Pre-production prototype of leg hold trap platform (without ramp attachment).

Unfortunately, since that decision was made and production tool completed, the capture rates shifted and it is now clear that ramped leg hold traps catch significantly more possums (by approx. 20%). Therefore, the decision was made to redesign the production tool to make a 'ramp-enabled' leg hold platform.

To address the escape risk, we added a section of 'bungee cord' to the trap chain to reduce the shock from the chain jerking when the possum is moving around after it has been caught. This addition is still a prototype and undergoing testing; however indications are that it has significantly reduced the incidence of escape.

Upon analysis, the cost of the wood-fibre composite plastic is considered to not be worth any potential benefit. As such, the decision was made to move to a glass-reinforced plastic. In addition to an improved cost, this plastic operates better within the production tool during manufacturing (without the complications of burning). The modifications to the tool for the ramped version were carried out 'in house' by Talbots.

Capture data from the defence system at Bottle Rock indicates that the plastic platform is performing as well as the wooden platforms.

We have conducted lure trials for possums, in an attempt to further lift the performance of the leg hold trap system (to support the productionising process). Our initial capture data indicated that a visual lure is effective in attracting possums to the trap site, and that food scent did not increase that rate. We therefore focussed our lure trials on enhancing the visual lure. We tried two visual lures – a flashing LED light (to increase the range of the visual lure), and a fluorescent pyramid (to provide a 3D visual cue from any viewpoint) – both as comparison trials vs our 'standard' white card. The LED light performed poorly as a lure, and was quickly shut down – we suspect the dim flashing light may have acted as a minor deterrent. The fluorescent pyramid (which appears much brighter to the human eye) is showing promise, and testing is continuing to build a robust sample size to confirm the result.

Figure 3. Pre-production prototype leg hold platform, including the ramp modification (with possum caught) at Bottle Rock Peninsula. The final product is made of dark bluey grey coloured plastic to maximise the contrast to the white lure flag or fluorescent pyramid and avoid the platform being interesting in its own right.

Remote reporting system

ZIP use of leg hold traps is reliant on the ability to use remote reporting of trap status (e.g. possum caught) to minimise the labour burden involved with live capture trapping. ZIP took a lead role in advocating for the use of automated reporting systems for live capture trapping, in light of this importance to our 'virtual barrier'. Extensive discussions with the Ministry for Primary Industries (with support from the Department of Conservation and Hawkes Bay Regional Council) resulted in the

approval being granted from MPI for the ZIP automated reporting system for leg hold traps (under the Animal Welfare Act).

Subsequently MPI have developed 'Guidelines for good practice on the use of remote monitoring technology to provide inspection of live-capture traps for vertebrates'. ZIP provided considerable advice during the drafting of those guidelines.

To support the regulatory discussions, ZIP made continuous refinements to the automated leg-hold reporting system. One particular inclusion was the addition of the 'responsible trapper' function. In standard live capture systems, the responsibility for checking a trap sits with the trapper who set it. Under the ZIP system (which is aligned with the MPI guidelines), the responsible trapper function formally transfers responsibility from trapper who set the trap to any trapper within a field team as workload dictates.

Throughout this project, we made numerous modifications to our hardware – improving the robustness and weatherproofing of the satellite boxes, creating unique ID's for each node to avoid any chance of 'cross communication' between lines, developing the ability to update running parameters via Bluetooth or satellite (rather than open up all units), and upgrading the transmission system to LoRa (low powered radio) which has greatly increased range. All developments were to further enhance the fail-safe communication or usability of the system, and all were successful.

RESULTS

We now have a production tool capable of manufacturing ramped leg hold platforms using glass-reinforced plastic. The unit cost is approx. $10 (ex. GST).

Our field testing indicates that this plastic platform performs as well as the wooden platforms, both in terms of capture rate and durability.

We may also have found an enhanced visual lure, a fluorescent pyramid, to further increase the effectiveness of leg hold traps. Testing is ongoing.

In addition, we have regulatory approval to use remote reporting to check the status of the leg hold trap system.

DISCUSSION

Productionising the leg hold trap platform has been a successful engineering project. Through this process, we have managed to reduce the unit cost per platform from $45 to $10. This reduction in cost is a vital step to making the remove and protect model a viable option for large-scale sites on mainland NZ.

Securing approval, under the Animal Welfare Act, to use remote reporting systems for live capture trapping was critical. The support of DOC and Regional Councils (especially Hawkes Bay Regional Council) throughout that process played a significant role in outlining the case for this technology to MPI (the regulatory authority). The leg hold trap forms the basis of the virtual barrier for possums, with its

effectiveness unrivalled by any other possum device. However, without a remote reporting system, the labour burden would be too great to be cost effective or manageable. Using our self-developed reporting system, we are able to check approx. 1,000 leg hold traps with the equivalent labour of 0.2 FTE - to check this number of traps manually would require 4 FTE's! Our system therefore enables a 95% reduction in the cost of servicing the virtual barrier possum traps.

The leg hold trap platform has been sought by other conservation groups. To date, we have supplied productionised platforms to the Chatham Island Taiko Trust (Chatham Islands), Project Janszoon (Abel Tasman), and DOC Marlborough Sounds (Picton). We will secure a long-term supply contract with a manufacturer and retailer to provide the outlet for others to purchase and use this tool. A final market price has not been identified yet, and will be based on the cost of material, manufacture, and supply. ZIP has no profit motive and will therefore set this price point to ensure accessibility for the conservation industry here.

ACKNOWLEDGEMENTS

John Wilks led the design process for ZIP. We thank Motovated for their design work on this project – they became 'invested' in the challenge which was great to see.

The ZIP Bottle Rock Peninsula field team undertook significant work during this project, testing the various platforms and lures – including lots of installing and uninstalling and then installing again the platforms! Nick Mulgan crunched the data to help answer the questions of whether the platform and/or lure were working as intended.

REFERENCES

Thomson C., Warburton, B., and Moran L. (2001) Weka- and kiwi-safe possum trap sets. *DOC Science Internal Series 24*. Department of Conservation, Wellington. 16p.