# Kangaroo Island Felixer™ Deployments

## January to July 2021

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## Summary

*The Office of the Threatened Species Commissioner sponsored 5 new V3.1 Felixers™ each from January to July 2021 for use on both the feral cat eradication program for Dudley Peninsula, conducted by the Kangaroo Island Landscape Board, and protection of key fire refuge habitat by Kangaroo Island Land for Wildlife. A total of 26 feral cats were targeted by these Felixers (in addition to 40 other feral cats targeted by existing Felixers on Kangaroo Island in 2021). Their deployment was considered by KILfW to be critical for protecting endangered Kangaroo Island dunnarts restricted to remnant vegetation from the 2019/20 bushfires. KI Landscapes consider the key value of the Felixers will be in being able to be set continuously to target the cats that evade other control tools, which will be essential for eradication efforts.*

*The efficacy of Felixers peaked at Land for Wildlife deployments along fence lines or fire edges where feral cats were invading refuges, and were lowest at Dudley Peninsula sites behind the cat control front, where cat density and focus were probably lower. Successful targeting rate varied from 36% to 55%, likely due to Felixer set up differences and the vagaries of cat movements. A number of technical issues mainly arising from deployment of prototype upgraded V3.1 Felixers reduced the operation time for both trials. Of the 4 issues detected, 2 were resolved by software upgrades developed in response to these trials and released in March and August 2021 and the other two resolved by replacement parts. Future developments to further improve Felixer efficacy on Kangaroo Island are now being addressed in a follow-up R&D project funded by a grant with KI Land for Wildlife.*

## Introduction

Felixers are automated tools that use an array of LiDAR sensors to distinguish feral cats from wildlife and deliver a dose of toxic gel that is ingested by the cat whilst compulsively grooming. Felixers have been trialled on Kangaroo Island, South Australia since 2019 as part of the long-term plans to eradicate feral cats from Kangaroo Island (KI Landscape Board), for immediate post bushfire protection critical remnant Kangaroo Island Dunnart populations (Kangaroo Island Land for Wildlife and KI DEW) and as a test of the efficacy of blocking firing on pet cats wearing an RFID tag.

All animals detected by Felixers are photographed and stored data-logs to enable reasons for false positive or false negative targeting to be evaluated, and ideally improved. Information is classified and uploaded into a cloud based Felixer Management System, which enables efficacy and detection statistics to be monitored and compared. These data also enable effects of time, temperature and lure on detection or activation by Felixers to be assessed.

A total of 74 feral cats have been fired on by Felixers on Kangaroo Island since active management commenced in 2019. The confirmed deaths of all 8 radio-collared cats targeted by Felixers in the

2019 Willson Farm research trial on Kangaroo Island (Hodgens 2019), along with comparable kill rates from other trials, suggests that most, if not all, of these cats would have groomed and died.

The Office of the Threatened Species Commissioner 'OTSC' loaned five (5) V3.1 Felixers for both Kangaroo Island Landscape Board and Kangaroo Island Land for Wildlife each to use for feral cat control on Kangaroo Island from January to July 2021.

The Landscape Board Felixers were set behind the active front of feral cat control heading from east to west across Dudley Peninsula and were designed primarily to 'mop-up' cats that had evaded cage trapping, baiting, and shooting (Figure 1).

The KI Land for Wildlife Felixers were primarily used as frontline control tools, along with cage trapping in remnant unburnt vegetation (Figure 2) where shooting and baiting were considered inefficient/impossible.

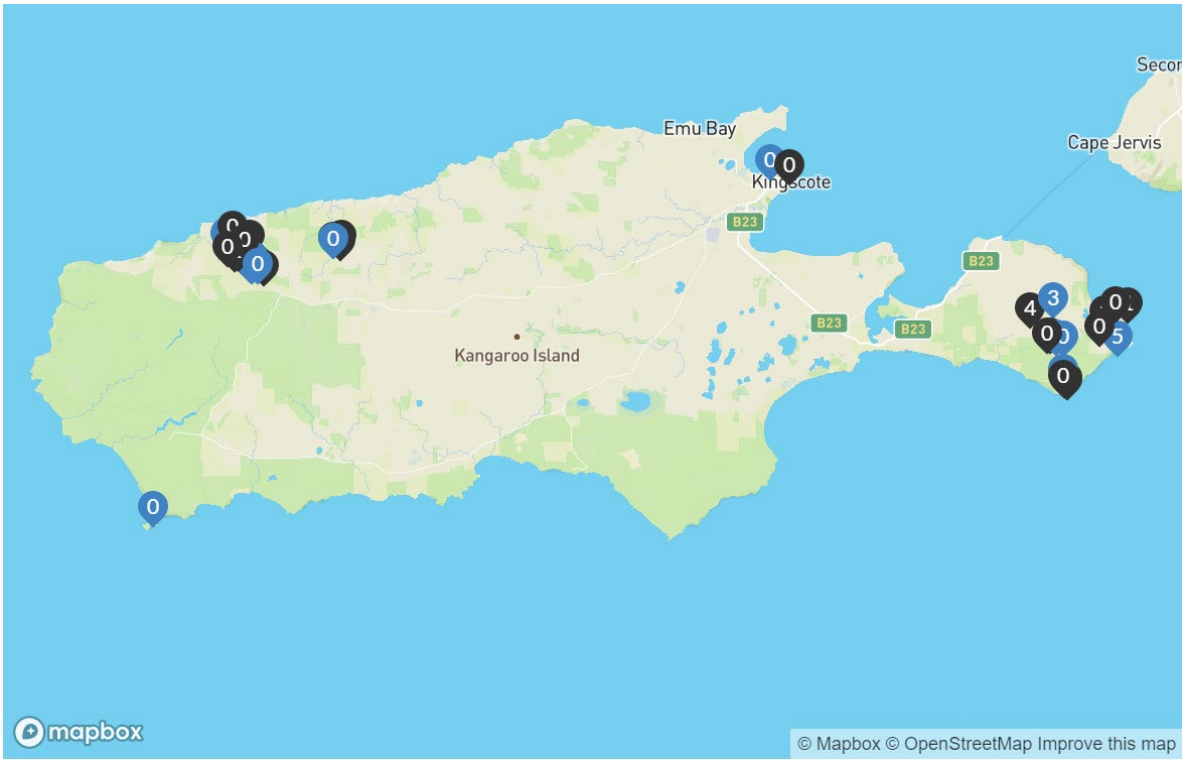



Figure 1. Felixer locations on Kangaroo Island (Blue is active, Black is old), this includes the OTSC Felixers, and Felixers owned by KI Landscape Board, SA Department of Environment and Water, KI Land for Wildlife. (Source: Felixer Management System on 22 September 2021)

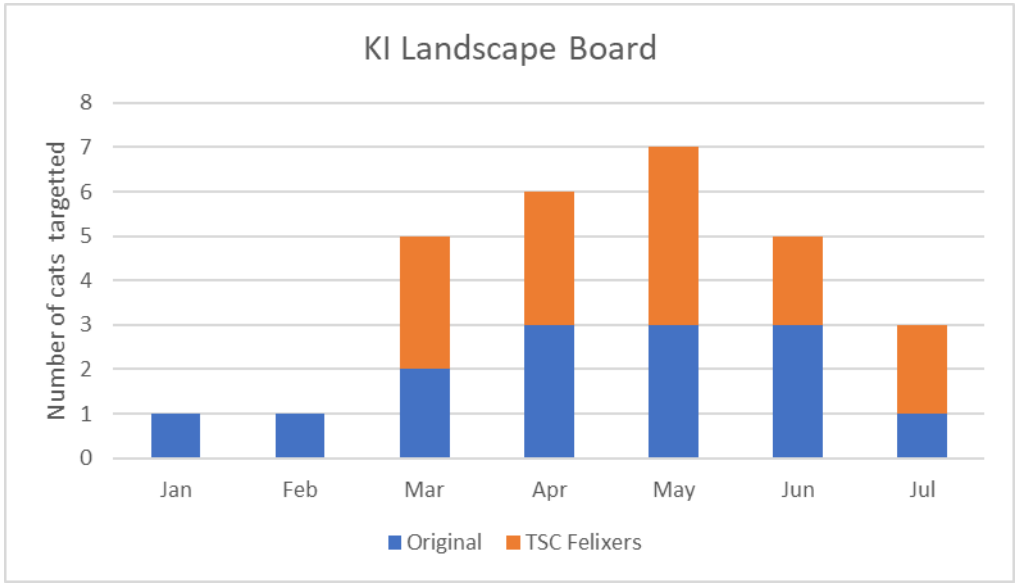
Figure 2. Deployment of Felixer outside and within new crates on Kangaroo Island fire refuges

This report summarises the outcomes of these trials, comparing results of the V3.1 OTSC Felixers with earlier V3.0 models owned by both organisations.

The OTSC V3.1 Felixers successfully targeted 14 feral cats in the KI Landscape Board Trial on Dudley Peninsula and 12 feral cats in the KI Land for Wildlife dunnart habitat on the north-western end of Kangaroo Island.

Targeting rates of the V3.1 Felixers were generally comparable with those of the earlier (original) models (Figure 3), although exact comparisons are not possible due to site specific vagaries of each Felixer deployment.

The higher numbers of feral cats targeted by KILFW Felixers compared to Landscape Board Felixers may be attributed to greater feral cat activity or more optimal Felixer installation at these sites.



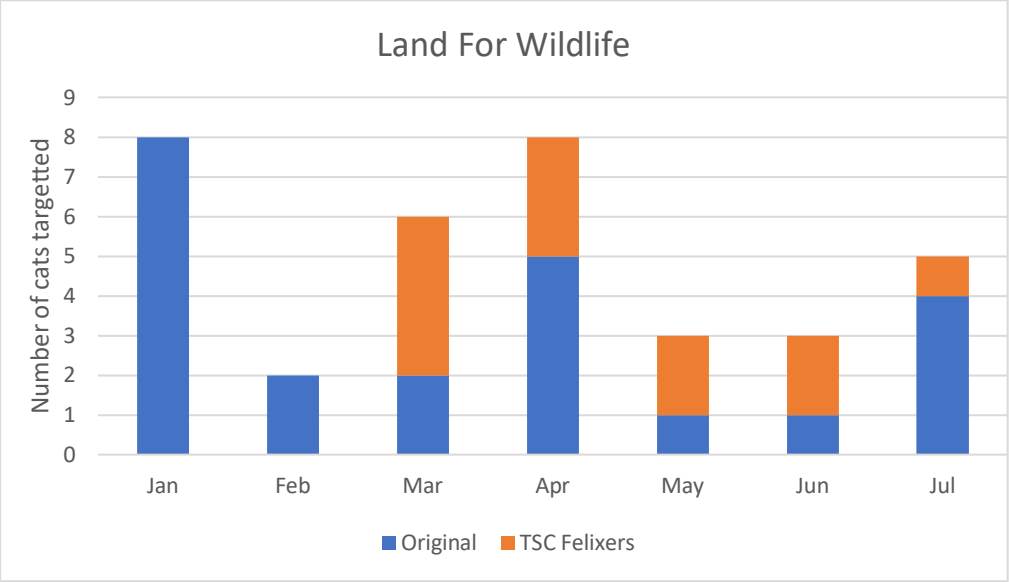



Figure 3. Feral cats targeted by Original and OTSC Felixers from the KI Landscapes Board and KI Land for Wildlife trials from January to July 2021. OTSC Felixers arrived at end of February.

Close inspection of distinctively marked 'swirly/target' cats fired on by KILfW Felixers was conducted after a cat was photographed with a bandicoot in the North West Conservation Alliance on 28th June 2021 (Figure 4). The same cat was successfully targeted by a Felixer 12 days later and neither this individual or any of the other 5 distinctively marked cats (Figure 5) were detected by Felixer or camera traps after being fired on by the Felixer (P. Hodgens pers comm).

Figure 4. Feral cat in the North West Conservation Alliance with a freshly killed Endangered Southern brown bandicoot.


SP030117 July 11 2021


SP030221 Aug 4 2021


SP030175 June 11 2021


SP030221 May 26 2021


SP030175 May 23 2021


SP030211 July 23 2021

Figure 5. Felixer 'Target Fired' images of 6 cats of similar appearance to the known bandicoot killer, which was targeted by Felixer SP030117 on 11/6/2021. Each of the other cats has unique markings and was not recorded after being fired on by Felixers.

<u>The Land for Wildlife Felixers targeted 55% of the cats encountered whereas the Landscape Board Felixers targeted 36% of cats detected by the Felixer. The Felixer Vs Felis project of 2019 on the Dudley Peninsula targeted 59% of feral cats encountered.</u>

To minimise false targeting of wallabies or other cat-sized wildlife that generally move faster or slower than typical cats, Felixers are blocked from firing if the speed of animal movement is not consistent with typical feral cats. This speed is determined from the time (measured in milliseconds) for each activation sensor to be intercepted. Over 2/3 of cats that were not targeted in both trials were moving too slowly, including stopping and only intercepting the left or right activation sensor (Figure 6).

Anecdotal evidence shows that some feral cats are distracted by adjacent wildlife cameras that may flash or activate prior to the cat being targeted by the Felixer and slow their walking pace (Figure 7). Positioning of adjacent camera traps may therefore have affected targeting efficacy of cats that waked past Felixers.

Lures were playing within 5 minutes of 29 of the 118 cats detected by Landscape Board Felixers with a 26% targeting rate and a 23% non-targeting rate when lures were recently active. KI Land for Wildlife did not use audio-lures in the early stages of the trial. One explanation for the greater targeting rate of KILfW Felixers and higher targeting rates of Landscape Board Felixers when lures had not recently played is that the cats stopped to investigate the lure and hence failed to trigger the Felixer. However, use of lures by KILfW later in the trial corresponded with increased firings on

cats (P. Hodgens pers. comm), so the relationship between lure use and Felixer efficacy may be complex. The value of specific audio-lures to draw cats in from a distance will need to be evaluated against the potential for lures to lower targeting efficacy once the cat is nearby. Therefore, the volume, frequency and type of lure should be optimised for each Felixer project.

Research currently being conducted at Venus Bay (SA) and Arid Recovery (SA) aims to determine whether aversive or disruptive behaviour of cats encountering Felixers is reduced with time of exposure and hence the value of leaving Felixers in the environment for extended periods.

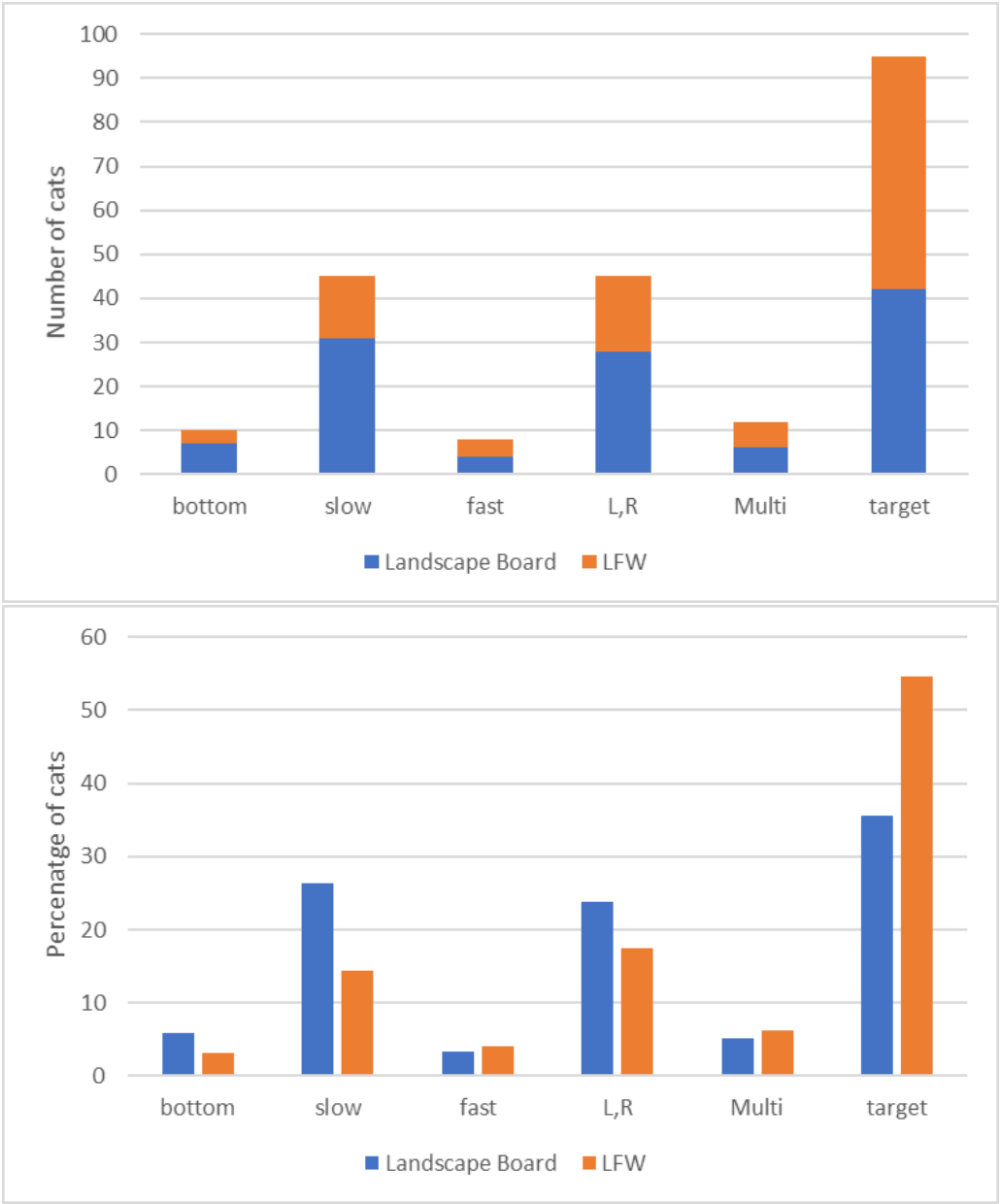



Figure 6. Trigger classifications for all cats detected by Felixers in the 2021 Kangaroo Island deployments. Only targeted cats were fired on by the Felixers.

SLOW, Data logs indicated this cat took 4 seconds to clear activation sensors and was likely distracted by the Felixer or the lure.

TARGET FIRED Data logs indicated this cat took only 2 seconds to clear activation sensors as it walked straight past the Felixer

Figure 7. Felixer images of a feral cats that were not, and were, targeted by a Felixer

Kangaroo Island Land for Wildlife used Felixers for feral cat control as part of their federally funded Bushfire Recovery project. Between 24 February 2021 and 30 June 2021, 12 Felixer grooming traps were deployed for a total of 884 active trapping nights. During this period, 21 cats were targeted and removed for a cumulative 55 cats removed between trapping and Felixer targeting. Felixers showed stable rates of cats removed per 100 trapping nights with the total number of cats removed from

Felixers per 100 trapping nights (2.66) being 5 times greater than cats removed per 100 trapping nights of regular trapping (0.49) (Figure 8).

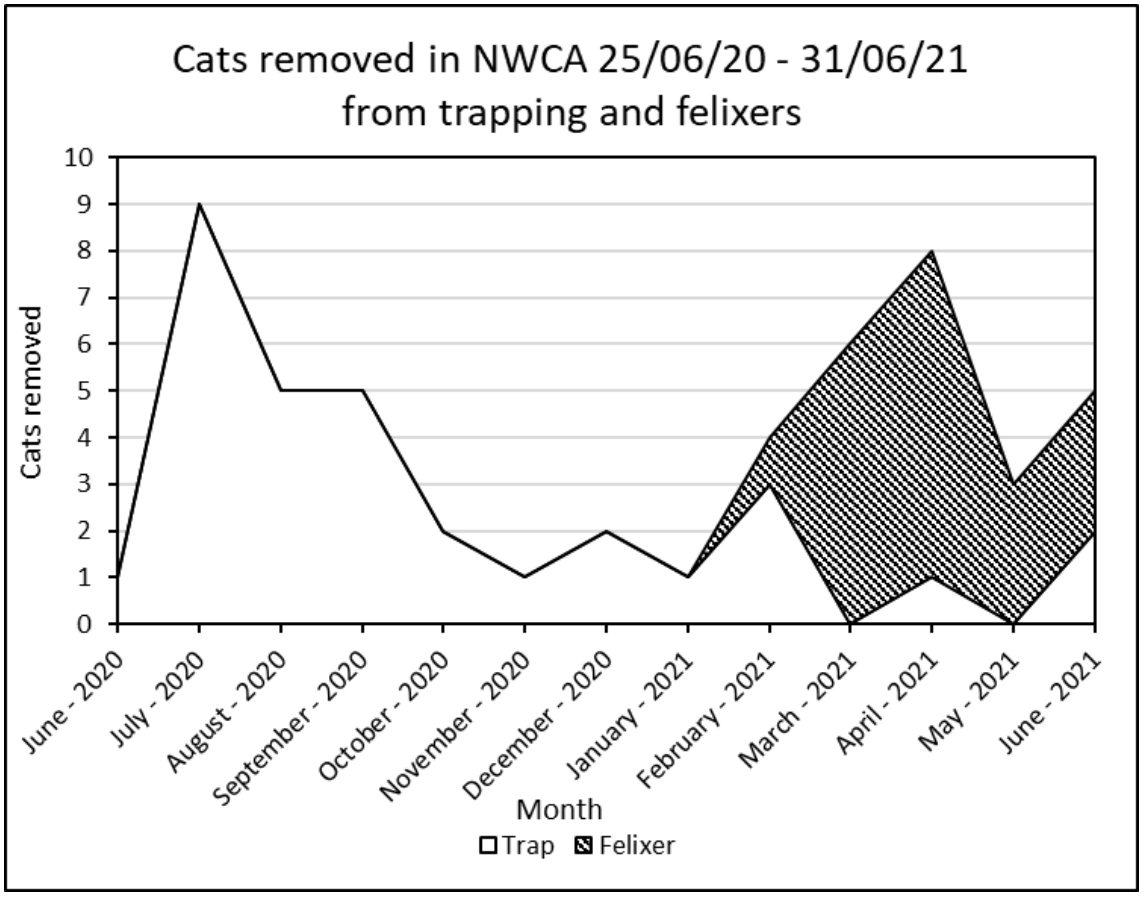



Figure 8. Feral cats removed from the North West Conservation Alliance 25/6/2020-31/06/2021.

Kangaroo Islands Landscape Board, by contrast, are primarily using Felixers to 'mop-up' cats behind their moving control front from east to west along the Dudley Peninsula. Even where firing rates are considerably lower due to reduced densities of cats, removal of the last cats in eradication programs are more challenging, important and resource expensive than early knockdowns, hence the value of Felixers should not be assessed by numbers of cats targeted alone, but rather their integration with other tools.

The most fired on nontargets were Tammar wallabies and western grey kangaroos (Figure 9), although false positive firings occurred in less than 3% of detections for any species (Figure 10). Half (7) of the 14 koalas intercepting the KILfW Felixers were recognised as a target in photo only trials (Figure 10). This high level of false positive targeting was deemed unacceptable and hence Felixers were not set in areas with high potential koala activity, which unfortunately disqualified Felixers from being set along the Western River Refuge fence line where feral cat encounter rates were likely high. No other nontargets experienced over the threshold of 5% false positive detections (Figure 10).

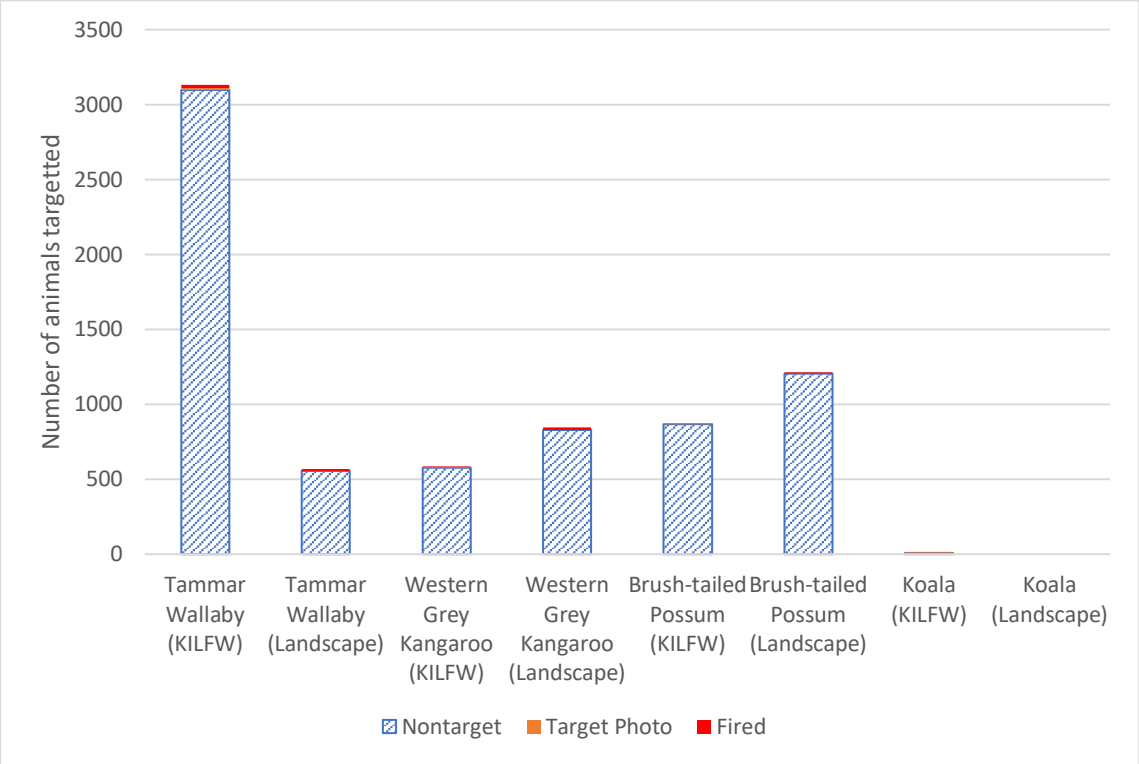



Figure 9. Number of nontargets correctly identified and nontargets by Felixer or falsely photographed or fired on as target

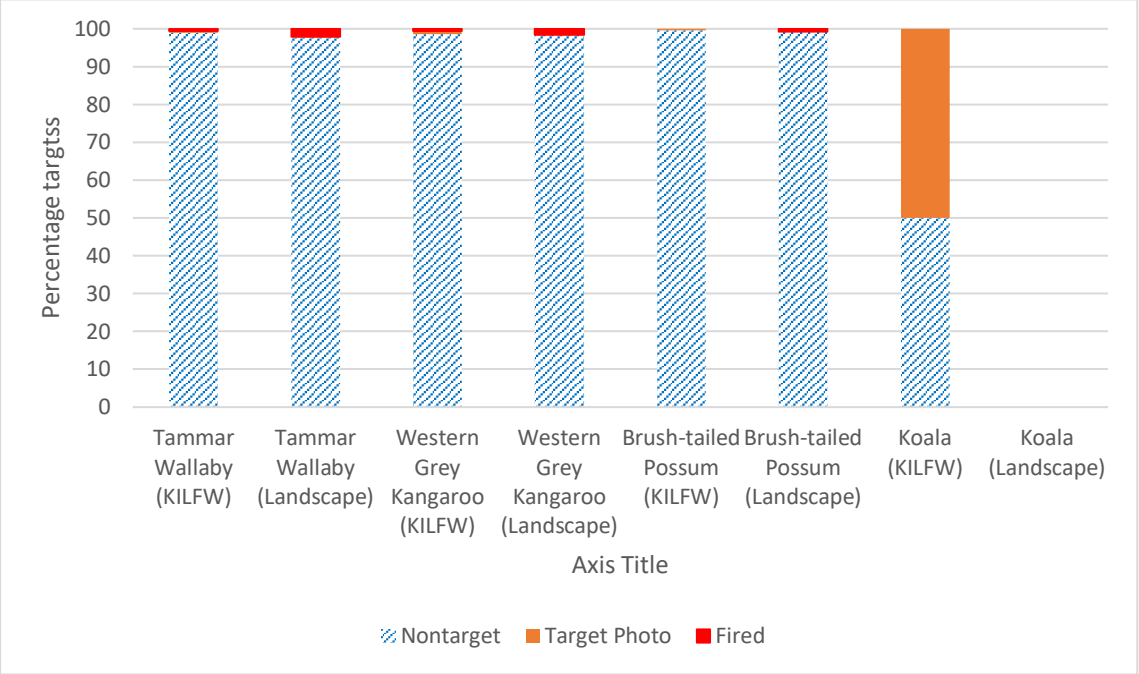



Figure 10. Percentage of Tammar wallabies, western grey kangaroos, brush tailed possums and koalas that were considered targets and nontargets in 2021 KI Landscape Board and KILFW trials.

Seven of the eight brush-tailed possums fired on in the Landscape Board trial were from Felixer SP030113 between 5 May and 9 July 2021. This suggests that rare large possums were likely responsible for these uncommon false positives and, if so, the Felixer firing had limited effect on their survival/behaviour.

Three of the four possums targeted by KILfW Felixers were from March 23-27 on Felixer SP030173 at NWCA Creek Site 1. At the NWCA creek line site, the sandy substrate in front of the Felixer on the creek was difficult to keep level and it is likely that this attributed to the possum non-targets. The Felixer was moved from this site soon after the non-target firings.

## Issues encountered

The OTSC grant that funded the manufacture of these V3.1 Felixers also funded the design and construction of the Felixer Crates and upgrades to address issues recorded in earlier Felixer models.

One of these was the inclusion of the Anderson Plug and solar controller initiated by Brenton Florance from KI Landscape Board in response to lower solar input on Kangaroo Island and this adaption was engineered into the V3.1 Felixers.

Other modifications were required due to change in availability of components or improved functionality. As such, these 2021 trials on Kangaroo Island were essentially field trials of a new Felixer prototype.

Several issues arose with both deployments, which reduced the operational period and increased costs associated with the deployments. All of these have been logged in Thylation's Issues Register.

They have been addressed in software upgrades released in March and August 2021, near the end of this trial (Table 1). Battery and/or camera replacement was also required for some of the Landscape Board's older V3.0 Felixers.

| | Issue | Reason | Fix |
|---|---|---|---|
| SP030171 KILFW (OTSC) | Camera producing dark images | Camera software corrupted | Firmware upgrade (V3.2.1) for all Felixers avoided unnecessary camera replacements |
| SP030172 KILFW (OTSC) | Magazine not homing. | Replaced shoulder screw and latch spring | Part mechanical issue and part resolved with software update V3.1.2 to optimise magazine handling in V3 and V3.1 Felixers |
| SP030211 KILFW (owned Felixer) | Magazine spinning and and piston slowly depressing cartridge | Discovery of magazine bore chamfer issue in April build that didn't fit cartridges | Recall and repair of all 50 V3.1 Felixer magazines under warranty. |
| SP030112 KILB (OTSC) | Magazine disarming errors<br><br>Fault with magazine motor | Software and hardware | Firmware upgrades (V3.1.2 and V3.2.1) for all Felixers in the fleet<br><br>Magazine motor replaced. |

Table 1. Faults detected and remedies from the 10 OTSC V3.1 Felixers used on Kangaroo Island

## Planned further Felixer research on Kangaroo Island

The efficacy of Felixers as a control and eradication tool for feral cats will be enhanced by reducing both the false negative targeting of feral cats and the false positive targeting of wildlife.

Thylation R&D has just optimised the Felixer targeting algorithms and is now likely to be approaching the limits of the discriminatory function of the four-sensor array.

KI Land for Wildlife have received a grant to enable incorporation of an AI-equipped camera into the Felixer which is expected will significantly reduce the false targeting of animals like koalas, geese and some wallabies that have limited the locations that Felixers can be installed.

The first prototype V3.2 AI enabled Felixers will likely be trialled on Kangaroo Island by December 2021, with retrofitting of KILfW Felixers with the new camera and microprocessor planned for early 2022.

If these trials are successful, the new cameras will be fitted into future Felixer models, enabling improved targeting efficacy, and facilitating the automated classification of detected animals.

Customers with existing V3.1 models will be offered a retrofit option to upgrade the capability of their device.

The completion of the cat proof fence on the Dudley Peninsula isthmus provides the opportunity for KI Landscape Board to test Felixer efficacy at restricting invasion of feral cats through the roadways and targeting cats with home ranges that abut the fence and hence render them easier to target with Felixers.

Thylation R&D will continue to assess and optimise audio-lures and provide advice on optimal deployment strategies for Felixers based on evidence from deployments on Kangaroo Island and elsewhere.