Trapping Results for AT220 Traps

What are we Missing?

Bluff Hill Motupōhue Environment Trust

The Bluff Hill Motupōhue Environment Trust (BHMET) was established in 2008 to restore native habitat on Motupōhue. Most of BHMET's mahi has been the control of invasive predators in order that our native manu can once again thrive on the hill.

Thanks to Department of Conservation Jobs for Nature funding, the trust has been able to accelerate our mahi and trial the tools and techniques that will allow us to achieve a predator-free peninsula. The trust's goal is to be able to reintroduce kiwi and tieke into the predator-free ngahere by 2028.

The most important 'game changing' technology are the automated traps that reset and rebait automatically. BHMET has been using the Goodnature A24 trap for rats (with a bycatch of mice) since 2019 and started using the NZ Autotraps AT220 traps for possums and rats (with a bycatch of mice) since 2021. This report will focus on the AT220.

BHMET uses automatic traps for several reasons. The most important is that they are more effective than manual traps. Because BHMET has controlled rats and mustelids on the hill, mouse numbers have climbed. Mice remove bait from manual traps within 1-2 days. With a rebait cycle of 14 days, that means manual traps are only baited for 10% of the time. Automatic traps remain constantly baited. When a manual trap kills (typically within 1-2 days of rebaiting), it remains inert for the remainder of the cycle. Automatic traps remain live continuously.

Automatic traps can also be more efficient. An AT220 only requires a battery charge and lure refresh every 100 cycles – typically 4-6 months. This is an important consideration for BHMET as we need to have a contingency plan for a post-Jobs for Nature reduction in staffing levels. Manual traps are considerably more labour intensive than automatic traps and the small Bluff community could never have enough volunteers to operate the scale of trap network required to control predators across the 1,000 hectares of Motupōhue. Our volunteer community of 20-30 volunteers is large enough to maintain an automatic trap network across this area.

The challenge is one of cost. A manual rat trap costs $15 (including the corflute trap box). A manual possum trap (such as a Trapinator or Flipping Timmy) costs around $60. An AT220 trap costs $500 plus $150 for a VHF sensor. So the investment in these traps is not to be taken lightly.

Are AT220 traps effective enough to justify the cost? This report examines the trapping results for the AT220 trap over the last 12 months of extensive use.

AT220 Traps

AT220 automatic traps have become an important component of our trapping on Motupōhue. The trust operates a fleet of 150 AT220 traps deployed across much of the 1,000 hectare peninsula. For the purposes of this report, we are considering three representative areas:

- Previously untrapped bush areas (just the other side of the isthmus) where possum numbers had not been controlled.
- Trap lines through moderately controlled bush areas which contain a mix of AT220 traps and manual traps (and therefore get visited fortnightly)

- Trap lines through moderately controlled bush areas which only contain automatic traps (and therefore get visited less than once a month.

We are now confident that they last six months before needing battery and lure refresh. And in that time, we know from carcass counts that they are considerably more effective than manual traps.

Kills and Monitoring

It is important to set a context that counting kills is not in itself a good way of measuring progress towards achieving predator free status. There will only be a kill if there is a predator, a trap, bait and trap maintenance. So in an incomplete trapping network, the absence of a kill is more likely due to the absence of a trap than the absence of a predator.

However, carefully analysed kill trends are a good way of monitoring progress during the journey from suppression to elimination. Once a trap network is established to an appropriate density and the traps are effective, then trends are an important indicator of success.

Across the DOC Scenic Reserve, Environment Southland (ES) conduct an RTI monitor across 6 monitoring lines. This is a dense trapping network (using mainly manual traps) and BHMET analysis shows a strong correlation between monitor results and kill counts.

Over the last year, the trust has extended a dense trap network across the whole hill. Since the monitoring networks do not have the same extent, we need to use kill counts as a proxy for monitoring results.

In order to do this, we need to understand kill counts on our fleet of 150 AT220 traps. That's because these are our most effective traps just based on carcass counts – but we know we're missing carcasses.

Kill counts are one measure of a trap's value – because the question is always asked: "why spend $500 on an automatic trap when a $50 trap does the job". So it is also important to understand the correct kill rates from that perspective.

AT220 Kill Counting

For a manual trap, a kill count is explicit. The trap is triggered, the carcass remains in place until the trap is reset.

For an AT220 the situation is rather different. When the trap is triggered, the animal is killed and then the trap releases the carcass which falls to the ground. We know that carcasses are predated – larger carcasses by cats, smaller carcasses by a wide range of predators. Indeed, we know from trail cam footage that rūrū are seen perching near AT220 traps. Our hypothesis is that the loud 'bang' of a trap has become associated with a free feed by rūrū – a sort-of rūrū vending machine. There's little doubt that other predators are making the same association. The result is an inevitable undercount of carcasses.

BHMET uses AT220s equipped with Celium VHF transceivers. These sensors send a message when the trap vibrates as a result of being triggered and also indicate when a vibration indicates a 'large predator' kill versus a 'small predator' kill. One challenge is that if a trap is knocked heavily (perhaps as a result of a large predator climbing on top of the trap), a false trigger might be recorded. Similarly, if a trap lid isn't correctly fitted, then a trap trigger might not be recorded because the vibration isn't transferred to the sensor. BHMET has also struggled to maintain our Celium network and there have been too many gaps in data coverage.

Finally, the AT220 computer keeps track of trap cycles. Every time the jaws of the trap open and close is a 'cycle'. Some of these are calibration cycles and others are caused during maintenance when a trap is safed. When a cycle is caused by a predator breaking the sensor beam, these are called 'triggers'. Of these, the accelerometer in the trap identifies the specific signal of a large predator kill – these are called 'possum' kills although they could equally be feral cats. For the purposes of this analysis, a 'possum' kill is referred to a 'large predator' kill and the remaining triggers are counted as 'small predator' kills.

BHMET has been monitoring these three sources of 'truth' across our AT220 fleet.

AT220 Kill Analysis Methodology

AT220 Computer

Each AT220's computer was queried to obtain the total number of triggers and the number of 'possum' triggers for the whole time that the trap was deployed.

Carcass Count

Trap.NZ was queried to identify the total count of kills since the trap was deployed. For the purposes of this analysis the "Small Predator" was the sum of rat, mouse, stoat and weasel carcasses. "Possum" was the sum of possum and feral cat carcasses (although very few cats venture into an AT220).

Celium Count

The Celium trigger count was painful, involving a manual trawl through pages of node messages. Single triggers were counted as "Small Predators" whilst multiple triggers within a few minutes were counted as "Possum". There are many difficult calls involved in this assessment – the accuracy is probably +/- 5%

Time Frame

The deployment date for each trap was extracted from Trap.NZ and an 'average' date of deployment calculated in Excel. This allows for the average age of the traps at the date of analysis to be calculated. This allows the calculation of kills per trap per month.

Number of Visits

Understanding the number of visits is important to understand the frequency of carcass counting. The longer the period between carcass counts, the more likely that carcasses will have been removed. The number of visits was extracted from Trap.NZ and an average number of visits per trap calculated using the average age of the trap.

Ratios of AT220 Count : Carcass Count : Celium Count

The ratio of the different kill counts (AT220, Carcass and Celium) was calculated from the totals of each count for small and large predators.

Corrected Carcass Count

The ratio of AT220 Count to Carcass count could be used to correct the carcass count. This will provide a more accurate indicator of trapping progress.

AT220 Kill Analysis

High Predator Activity, Frequently Checked

In this area, the trust has deployed 11 AT220 traps for an average of nine months. Because this area has a large number of manual traps, the AT220s have been visited twice a month on average with a carcass count conducted at every visit. Feral cats are a major challenge in this area and have become accustomed to scavenging carcasses from under the AT220 traps (we plan a leg hold campaign to tackle these feral cats later).

The results from this area are:

Source	AT220 Computer Count		Carcass Count		Celium Count	
Type	Small Predator	Large Predator	Small Predator	Large Predator	Small Predator	Large Predator
Totals	254	170	34	126	305	116
Ratios	1	1	0.13	0.74	1.20	0.68
Kills / Trap / Month	2.33	1.56	0.31	1.15		

Moderate Predator Activity, Frequently Checked

In this area, the trust has deployed 34 AT220 traps for an average of 11 months. Because this area has a large number of manual traps, the AT220s have been visited over twice a month on average. There is some feral cat activity in this area but not as bad as the first area. Unfortunately, there have been many challenges with the Celium network in this area and so we do not have complete Celium results for this area. (These problems have been resolved now)

The results from this area are:

Source	AT220 Computer Count		Carcass Count	
Type	Small Predator	Large Predator	Small Predator	Large Predator
Totals	1063	117	290	53
Ratios	1	1	0.27	0.45
Kills / Trap / Month	3.73	0.41	1.02	0.19

Low Predator Activity, Infrequently Checked

In this area, the trust has deployed 7 AT220 traps for an average of 8 months, along lines that have no manual traps. Therefore these AT220 traps are only visited every other month on average. There have also been Celium node problems on these lines and so no Celium data are considered.

The results from this area are:

Source	AT220 Computer Count		Carcass Count	
Type	Small Predator	Large Predator	Small Predator	Large Predator
Totals	147	13	24	4
Ratios	1	1	0.15	0.31
Kills / Trap / Month	2.5	0.22	0.41	0.07

Conclusions

Just the carcass count results had marked the AT220 traps out as highly effective traps. This analysis of trapping results suggests that the traps are even more effective than had been thought – particularly with respect to small predators.

Carcass removal is a major problem for understanding the role of automatic traps in a trapping network. One of the key advantages of an automatic trap is that trap visits are not required for resetting or rebaiting – AT220 traps have proven able to keep operating at high kill rates for as long as six months. But the longer the revisit period, the larger the disparity between carcass count and trap-recorded kills.

The ratios of computer count to carcass counts are significant. In the case of small predators they range from 0.13 to 0.27 and large predators from 0.31 to 0.74. The inverse of those figures provides a multiplication factor for carcass counts, ranging from 7.69 to 3.70 for small predators and 3.23 to 1.35 for large predators.

The ratios / multiplication factors vary considerably from trap to trap, so the data is only of use across the fleet of traps – it does not predict undercounts at any specific trap. That's a challenge because one of the important aspects of monitoring kill trends is to understand changes in the geographic distribution of kills, not least so that we can move traps to where the predators are active.

This analysis shows that carcass counts are a poor measure of AT220 effectiveness. It is far better to be using the AT220 computer to obtain the true numbers. But that leads to a specific problem in how to enter that information into Trap.NZ.

AT220 to Celium to Trap.NZ connectivity

Trap.NZ is our trapping record repository – it's what we rely on for identifying kill trends and measuring overall trapping effectiveness. As such, it is an essential tool for measuring our progress towards a predator-free Bluff.

If a six-monthly count of AT220 kills is added to each trap in Trap.NZ, it ends up badly distorting the monthly figures – which we use to monitor trends. And Trap.NZ has no mechanism for 'smearing' results across multiple months without using spreadsheets.

Fortunately, BHMET is already embarked on a project to provide real-time information from our AT220 traps. BHMET is funding a prototype wired connection between the AT220 computer and the Celium node. This will allow our Celium infrastructure to report AT220 kills in real time. Since Celium triggers are provided to Trap.NZ through a Celium to Trap.NZ connection, the information is available on one level in Trap.NZ.

The challenge is that Trap.NZ has no current mechanism for automatically adding triggers as a trap record. That can only be done at present by a complex and time-consuming manual intervention. BHMET has put a feature request into Trap.NZ to automate this process.

The remaining issue is that AT220 and Celium data can only differentiate between 'small' and 'large' predators. These can be assigned between mice, rats, weasels and stoats; and possums, cats and ferrets based on a statistical analysis of kill rates across manual traps in similar areas. No perfect, but better than the significant undercounts we see today.