The battle for our birds

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He huruhuru te manu ka rere:
When the bird has feathers it flies away.

Abstract

The threat to New Zealand's wildlife from invasive species is ever present. The Department of Conservation (DOC) has the mandate to protect native species, and with recent innovations in understanding pest behaviour predicting their population trends, it has been able to minimise that threat. The prospect of a predator free New Zealand by the year 2050 means that this country needs to continually investigate options for pest control. In the meantime, the battle for native wildlife continues with the tools available.

Plight of native birds

The recent report by the Parliamentary Commissioner for the Environment on the state of our native birds, 'Taonga of an Island Nation: Saving New Zealand Birds', draws attention to their desperate plight. According to the report four out of every five are in trouble – and some sit on the brink of extinction. 'Do nothing' is not an option. Let us consider how New Zealand got to this state, what can be done, and the role of DOC in ensuring that species persist and thrive.

The old threats

Our natural landscapes have taken a thumping. Early colonisation and the introduction of pests over time, land clearances and resulting loss of habitat have all contributed. Even as recently as the early 1980s the government of the day provided subsidies to maximise the extent of farm land to the detriment of native forests and their inhabitants. On top of that, by the mid to late 20th century, excessive deer browsing changed forest structure by eating out preferred plants and seedlings.

By the time DOC was formed in 1987, the impact of deer browsing had lessened as lucrative venison exports and recreational hunters kept deer numbers down. Native forest condition began to improve, and by the mid-1990s this country stopped logging native timber. Possums were still spreading to the far corners of mainland New Zealand. Rodents and stoats were playing a part in the demise of native species and conservationists were beginning to understand the extent that small mammal pests impacted on forest ecosystems.

The newer threats

Fast forward more than 20 years and rodents, mustelids and possums are at the centre of concern for conservationists. We've come a long way and we've learned a lot about their threat to forest regeneration and native wildlife. But stoats and rats still carry out nocturnal attacks on nesting birds. Kākā and whio nests are robbed. Rock wren and kea are threatened. Possums prey on birds, continually browse forest canopies and graze on tussock grasslands.

Getting smart

The Battle for our Birds is DOC's nationwide programme to counter the pervasive threat of these three introduced pests, but it's never straightforward (see www.doc.govt.nz/our-work/battle-for-our-birds). In the past, DOC had focused on possum control to reduce their impacts on native species and habitats. Rats were a low-level by-kill of the targeted possum control and large-scale rodent control had always been ineffectual. However, with new knowledge of the drivers of pest populations and a way to accurately target rodents on a large scale, multi-species pest control has become a reality. Armed with this knowledge, in 2014 the Battle for our Birds began with a response to a massive beech mast that had driven rodent populations to record levels. Rats were the prime target using methods that also controlled possums and stoats – the latter through secondary poisoning. DOC had learned to take on all three pests simultaneously.

Understanding the boom and bust of rodent populations is the lynchpin in understanding the threats to native species. DOC scientists have made giant strides in knowledge in recent years. Rodent numbers rise and fall with the availability of seed. Knowing the best time to respond to those threats gives pest control managers the chance to prioritise landscape scale pest control where and when its most needed.

The development of a climate model to predict forest seeding allows conservation scientists to forecast areas where this is happening (Kelly, 2013). Then seed sampling is used to confirm whether seeding has occurred and how heavy it is in a given year. Beech flowering occurs when the previous summer is warmer than the one before that. So a cool summer followed by a warm summer leads to flowering, but so does a warm summer followed by a hot summer.

Priorities

Conservation managers focus on several key matters when prioritising pest control operations. First, does a site hold nationally significant threatened species populations or ecosystem types? Secondly, is that site at high risk from rodent, mustelid or possum predation? The simplicity of these questions masks the complexity of information considered in prioritising sites for pest control and investment in monitoring pest levels over hundreds of thousands of hectares.

Seed monitoring starts with a snip in time

Seed fall monitoring gives us a picture after the seed has fallen. An advantage would be to be able to assess the potential seed fall as soon as possible, maybe well before it occurs. A rapid assessment method has been developed to determine trends in forest seeding. Samples of beech and podocarp tree species are taken from the crown of the trees. Samples are gathered by a ranger with a pair of secateurs dangling out of a helicopter. This quick assessment method leads to early identification of areas that are about to experience mast events and helps DOC plan its pest control operations. In 2017, DOC snipped branches from 5,200 beech trees at 140 sites nationwide.

In addition to seed sampling for early warning of mast events, DOC monitors seed production at over 70 locations across New Zealand. Rangers collect the falling seed and send it to the University of Canterbury for counting. This information helps to confirm if a mast event has occurred and how much seed was produced at sites dominated by beech or rimu trees.

Conservation scientists look at trends over time across multiple sites. Where there is evidence of seed production above normal annual levels, rats are likely to take advantage of the abundant food source and this triggers the rodent and stoat plagues. By monitoring where seed may be abundant, and cross-referencing that with the sites where threatened species persist, scientists are able to make informed decisions on the most effective species protection in the most susceptible areas.

Figure 1: DOCs GPS pest control can be likened to ploughing in the sky. The straight furrows of the GPS plot are an integral part of total coverage. The width of the broadcast, and the placement and distribution of the baits, are all calculated to put exactly the right amount of bait on the hill for the best possible outcome

Beech *(Fuscospora cliffortioidies)*

Snipping beech seed from helicopter

Pest monitoring

As the seed falls, the abundant food supply causes rat and mice populations to grow exponentially. Chew track cards and tracking tunnels are simple multi-species detection devices designed to map the distribution of small mammalian pests such as possums, rodents and other pest species (see www.landcareresearch.co.nz/science/plants-animals-fungi/animals/vertebrate-pests/pests-in-forests/chew-track-cards). Left in the field for about a week, the devices identify animals present by tooth impressions or footprints made as they investigate and consume bait material applied to the device. This year, there are approximately 13,000 tracking tunnels in the field to help monitor the rate of expansion of rodent populations.

Control methods

A well-timed and large-scale control response is needed to combat the expansion of rat populations. DOC uses all possible tools for pest control, and although trapping is currently possible over smaller areas, the effort needed to cover thousands of hectares simultaneously requires a different method. The control must be timed to knock down rats before they reach damaging levels, as well as to poison stoats before they breed, and cover a large area simultaneously. This is where aerial 1080 comes into its own.

Knowledge gained from the 2014 and 2016 Battle for our Birds programmes is being used to fine-tune our predator control operations for 2017.

Consistent coverage

The area covered by current methods is designed to put bait in front of every target animal. Refinements over recent times have seen a reduction in application rates to as low as 1.5 kg/ha of bait. That's about four to six baits in an area about the size of a tennis court. Depending on terrain, the bait density will be 2 kg/ha in some places to ensure full coverage at consistent density.

Getting a rat to love your food

Rats have survived wherever humans have colonised and it is because of their suspicious nature that we have been unable to deal with them easily. One of the rat survival strategies is to be wary about eating novel foods. Rats will always try a small portion of any offering to ensure palatability. They only eat a little bit, and they then wait a while and come back and have some more. If they feel a bit sick they will not eat the pellets again.

By pre-feeding with non-toxic cereal baits we can ensure that rats are accustomed to the baits as a good food source. The rats drop their guard when the toxic bait is distributed and we get a very high level of knock down of the pest population. The proof of this concept came in 2006, west of Lewis Pass in the Maruia. Pre-feed non-toxic bait was applied about two weeks before the toxic 1080 drop. In another area, no pre-feed was applied. Where there had been pre-feed the rat populations were decimated. Where there was no pre-feed there was very little uptake of the unfamiliar toxic baits and rat populations showed a negligible difference to areas where rats were not controlled.

Figure 2 shows that tracking rates, the percentage of monitoring tunnels containing tracks of rats, go from 75% to less than 5% if pre-feed is used, but stay at 73% if none is used.

Trapping

The humble trap has undergone a revolution in the last decade. The economics of large-scale long-term pest suppression has taken a step up with the advent of the self-resetting traps. Like any great tool, these traps are undergoing constant improvement to reduce the level of effort required to maintain efficiency 'on the hill'. DOC is using these traps in areas like the Haast Kiwi Sanctuary to protect Haast tokoeka kiwi and in Canterbury high country valleys, such as the South Branch of the Hurunui and Poulter, to protect the critically endangered orange-fronted parakeet.

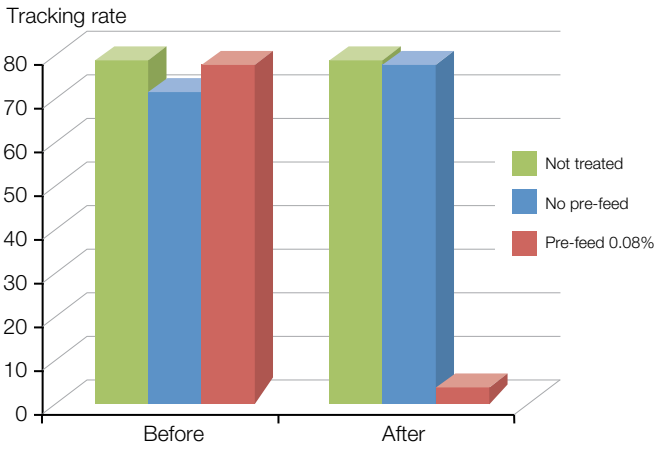

Figure 2: Tracking rates before/after toxic bait showing the advantage of pre-feed at Maruia. Source: Maruia, 2006

The new traps are being used in combination with traditional DOC 200 single-set traps. Both areas need constant intensive pest control, which would otherwise be very labour-intensive. When a long-life bait is fully developed for the self-resetting traps there will be a reduced need to constantly check the traps. In the meantime, checks are undertaken at the same rate as for a single action model.

The DOC series of traps is invaluable in keeping pests at bay. The Murchison Mountains has a network of 5,000 DOC series traps covering 50,000 ha to protect takahe from stoats during the masting events.

Possums – the curse in the canopy

Possums are not driven by the forest seed boom and bust cycle as they munch their way through preferred foliage. Dealing with possum control is relatively straightforward. By periodically knocking down the possum population with aerial 1080, their recovery rate is slow enough that the benefit of reduced browsing and predation can persist for a few years. It helps too that possums are the target for OSPRI, and where they knock down possums to suppress the transmission of Bovine TB there are conservation benefits. Where the two agencies work in tandem we can get mutually beneficial outcomes. Pest control for conservation is in the order of about 800,000 ha during a mast year, which is only about 10% of all conservation land.

Yeah ... but does pest control work?

To prevent rodent and stoat plagues and knock down possum numbers over large areas has benefits for populations of birds, bats and invertebrates at risk. With widespread knock down, the re-invasion rates for rodents are slower and it enhances the prospects for good breeding for native species.

The benefits of the use of 1080 are well documented and recent results have proven that where DOC does this pest control work we make a positive difference to native species (see www.doc.govt.nz/our-work/battle-for-our-birds/battle-for-our-birds-monitoring-results/).

Evidence of the knock down of rats can be readily demonstrated, but the real payback is the success of the birds to breed and produce young in the absence of pervasive pest threats. It's about timing. After aerial pest control, rat numbers stay low in beech forests until the next mast, but at lowland sites rat populations can come back relatively quickly (see www.landcareresearch.co.nz/publications/newsletters/kararehe-kino/kararehe-kino-23/rat-populations-recovery). If pest control operations can take place around critical nesting times, the benefit of the pest control is seen through the nesting success.

Battle for our Birds – outcomes

Results from monitoring rodents show that rats were knocked down to undetectable or very low levels at most Battle for our Birds sites in 2016 (see www.doc.govt.nz/our-work/battle-for-our-birds/rodent-monitoring-results). Our studies of a range of bird species show improved survival, better nesting success and more juveniles raised to independence in areas after aerial 1080 treatment than areas without (see www.doc.govt.nz/our-work/battle-for-our-birds/battle-for-our-birds-monitoring-results). Also, despite its name, the Battle for our Birds also benefits bats and frogs and invertebrates.

Self-resetting A12 possum kill trap

1080 pellets

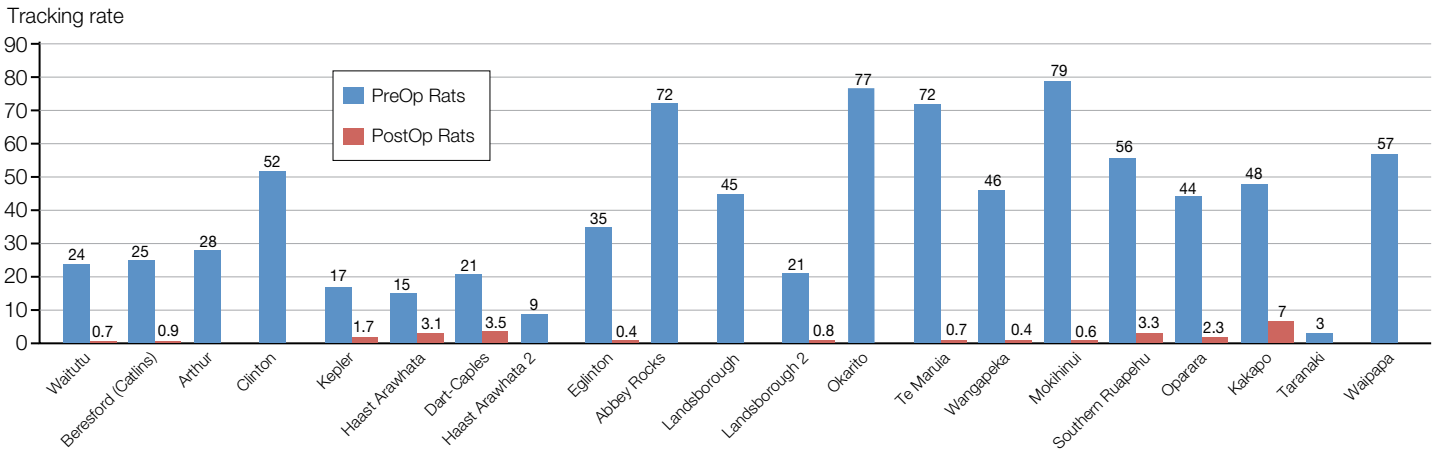

Figure 3: Rat index monitoring before and after 1080 operations 2016–17

Rock wren success

A good example of the benefit of timely pest control is illustrated by the work over the last few years with the shy and diminutive rock wren. DOC has monitored rock wren in the Grange Range, Lake Aorere and Shelter Rock Basin areas of Kahurangi National Park between 2014 and 2017. There were two separate 1080 treatments in 2014–15 and 2016–17. Our researchers tracked nesting in areas with 1080 and without. Monitoring over the first breeding season showed that the birds in the 1080 areas raised three times more chicks than birds in the non-treatment area.

The benefits continued when the birds bred again a year later. That season rock wren produced five times more offspring than the birds in the comparison area. Without 1080 treatment high stoat levels wipe out most nests and kill adult birds.

In 2016, a return to the study area where 1080 was not used found the rock wren population had dropped from 25 birds in 2014 to just two. To avoid losing this population altogether the area was treated with 1080 and these birds are now on the increase. Further monitoring in 2016 showed nesting success in the 1080 treated areas was also much higher than in untreated areas in previous years.

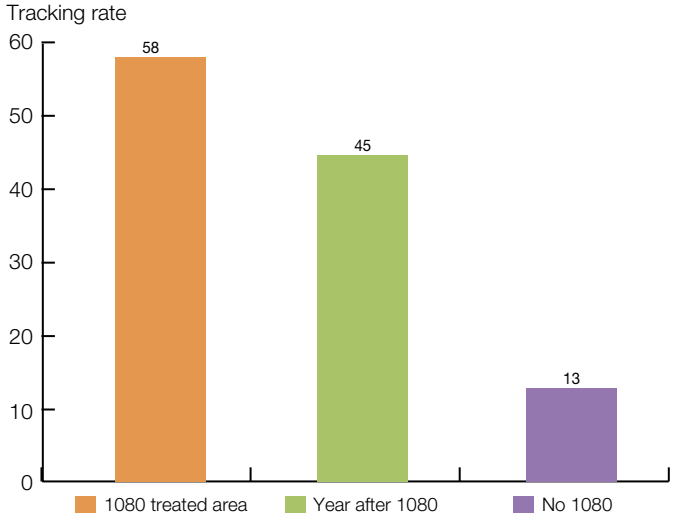

Figure 4: Rock wren nesting success 2014–2017

These results take time to accumulate, and it is the longer monitoring of nesting success and subsequent increase in the number of breeding birds that heralds the benefit of aerial pest control.

Kākā calling

Slower breeding, long-lived birds like kākā have a different dynamic to the smaller birds that can produce multiple clutches in a good breeding year. Like their cousins, the kea, any response to regular pest control takes years to show net benefit to kākā populations. DOC scientists monitored kākā nests in breeding seasons from 2010 to 2015 after aerial 1080 treatment and in an area where 1080 had never been used.

Results show on average that 55% of kākā nests were successful at rearing young up to a year after 1080 treatment. By contrast, less than 2% of nests produced chicks in the non-treatment area. That chicks produced in the area after 1080 treatment compared to the area where no 1080 was used. Adult birds also had a much higher survival rate in the area where predators were controlled with 1080. Only 3% of adult kākā died in the 1080 treated area, whereas 20% died in the area that was not treated.

This result is significant for this relatively long-lived parrot and results from Waitutu in southern Fiordland endorse this result. In 2004, DOC began a study of the significant and apparently healthy population of kākā. Using mist nests they caught about 120 birds and there were no juveniles caught or seen. Monitoring showed that males outnumbered females by an average of six to one. This was an ageing kākā population on the verge of collapse.

By carrying out sustained pest control using aerial 1080 and monitoring the outcomes, DOC has gathered evidence that there are now a lot more kākā in the system. The proportion of female kākā has increased almost four-fold since the last survey and juvenile kākā by a factor of 20. The final part of the research was to recapture a bunch of kākā to see how the population demographics have changed. In 200–2007 male kākā outnumbered females by six to one and no juveniles were seen or caught. Currently, the margin has dropped to 1.7 times more males than females, and 20 juveniles were caught as well as many fledglings seen.

Whio callout

Since the last full survey five years ago in Kahurangi National Park, whio numbers have increased by 48% from 29 pairs to 43 pairs today (see www.doc.govt.nz/news/media-releases/2017/great-gains-for-blue-duck-whio-with-docs-predator-control/). The Battle for our Birds operations in 2014 resulted in high duckling numbers of 65 in 2014 and a drop to a respectable 40 ducklings in 2016. Scientists found some nests were preyed on by stoats a year after the pest control operation. This suggests that 1080 treatment strongly benefits whio breeding in the first season, but this benefit declines a year later without further protection. Scientists are looking at whether further research is needed into ongoing benefits to whio from 1080 pest control.

Battle for our Birds in 2017

This year is another widespread heavy seeding year. Unlike previous years, areas of greatest risk are concentrated in North Island forests, with fewer South Island areas affected compared to 2016. By the time this goes to print, the Battle for our Birds 2017 predator control programme will be underway. It will cover over 800,000 ha of conservation land. Monitoring of beech, rimu and tussock has confirmed that widespread seeding will again lead to an increase in rodents and stoats, putting native wildlife at risk.

The Battle for our Birds 2017 is increasing the area under predator management and collaborating with Zero Invasive Predators (ZIP), and other research agencies, to improve predator eradication tools to demonstrate that on the mainland predators can be taken to extremely low numbers before re-invasion (see http://zip.org.nz/).

The next stage is to plan further than one year ahead by developing a medium-term predator control plan. A four-year DOC predator control plan (2018–22) will be developed in the second half of 2017. This will strengthen collaboration with OSPRI and regional councils, support consultation with iwi and community groups, and inform DOC business planning in 2018–19.

Whio *(Hymenolaimus malacorhynchos)*

Where are we going with all this pest control?

DOC launched a draft Threatened Species Strategy in May 2017, which sets out a plan to halt the decline in our threatened species and restore them to healthy populations (see www.doc.govt.nz/get-involved/have-your-say/all-consultations/2017/draft-threatened-species-strategy-consultation/draft-threatened-species-strategy/). This builds on existing commitments like the Battle for our Birds, which is a first step in the restoration of bird species and their habitats. This Strategy links into existing national initiatives including Predator Free 2050, Battle for our Birds and War on Weeds at the heart of achieving this vision. Support will be essential from the wider community and everyone has a responsibility and a role to play in protecting our species.

The government has a goal of eliminating rats, stoats and possums from the New Zealand mainland by 2050 (see www.doc.govt.nz/nature/pests-and-threats/predator-free-2050/). The Battle for our Birds is a key element in this strategy. Pest control will need to continue to expand and to be refined to ensure that species and their habitats will be in the best possible health under current regimes of species protection. The choice of pest control methods is determined by what is most efficient and effective at each site. Research will continue within DOC and beyond, looking for new ways to manage pests, but also refining current techniques to ensure the protection of vulnerable species at risk. There is no point waiting around for a 'magic bullet' – the Battle for our Birds must continue.

Conservation and restoration groups may be getting more popular than golf clubs these days. Maybe it's about a shift in values. When the Parliamentary Commissioner for the Environment was asked about the plight of New Zealand's birds after the release of her report on Birds, Dr Jan Wright said:

> *The Department of Conservation has a crucial role to play in protecting our birds. However, restoring abundant, diverse, resilient birdlife to the mainland will require the efforts of many others, including private land owners, councils, iwi, and community groups. This is a battle for all New Zealand.*

Reference

Kelly, D. et al. 2013. Of Mast and Mean: Differential-Temperature Cue Makes Mast Seeding Insensitive to Climate Change. *Ecology Letters*, 16: 90–98.

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