Options for Controlling Feral Pigeons (*Columba livia*) in New Zealand

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Summary

Project and Client

Feral pigeons (*Columba livia*) can be agricultural and urban pests and the following report summarises methods that can be used to mitigate the impacts of these pigeons in New Zealand. This report was completed by Landcare Research for the Hawke's Bay Regional Council during July–September 2009 and funded by the Foundation for Science, Research and Technology Envirolink fund (Project HBRC101).

Objective

- To provide information for pest managers within New Zealand so they can consider which control options for pigeons may be suitable in their particular region.

Main Findings

- Feral pigeons damage buildings and decorative structures, are a nuisance in urban areas, and cause crop losses in rural areas.
- Feral pigeons are known carriers of zoonotic diseases but evidence of pigeon-to-human transmission is scarce.
- Pigeon damage may be mitigated by:
    - Shooting with shotguns in rural areas and air rifles in urban areas
    - Poisoning using alphachloralose
    - Trapping using multi-capture traps
    - Exclusion from nesting and roosting sites using angled plates, plastic and metal spikes, tensioned line or wire, netting, electrified wire, barrier coil and repellent gels
    - Removal of food sources
    - Roost disturbance
    - Fertility control
    - Egg oiling or pricking
    - Artificial breeding facilities, public education and exclusion
    - Enhanced predator populations

Conclusions

- There is a polarised view of feral pigeons in urban society with some people considering them pests and others as feathered friends. This difference of opinion will always create difficulties in trying to manage urban pigeon populations. Using non-lethal methods that leave some resident pigeons to satisfy the demands of individuals who value pigeons may be the best compromise in current New Zealand society.
- Pest managers need to determine the extent of their specific pigeon problem and decide whether the cost of remedial action is less than that of maintaining the status quo through repairs and cleaning.
- A control programme should not start unless its outcome is first clearly and measurably defined, there is some certainty that the planned control will achieve the desired outcome, and there is a commitment for ongoing funding to ensure the outcome is sustained.

- If lethal control is deemed necessary then managers should assess where pigeons are congregating to feed, roost, and nest and decide which of these areas can be targeted most effectively to reduce pigeon occupation and/or numbers.
- Lethal control can be effective in rural areas and may reduce urban-based pigeon numbers in some situations. Lethal control is not recommended in urban areas due to the likelihood of adverse public response.
- Minimising the resources that enable a pigeon population to exist at a level where they cause problems is likely to be a more sustainable method of pigeon control than short-term lethal control.
- Fertility control is untried in New Zealand but has been used for managing pigeon numbers overseas. The cost (including registration and use) of using this technology is likely to be expensive but it may be useful for regulating discrete pigeon populations.

Recommendations

- An analysis of economic, environmental and social costs and benefits should be carried out before a pigeon control programme commences, to ensure the benefits exceed any cost and that these benefits can be sustained.
- In addition, if lethal control is used, the animal welfare cost also needs to be justified by ensuring measurable benefits are achieved.
- In rural areas shooting is the most effective way to mitigate localised pigeon impacts on crops.
- In urban areas food reduction and exclusion devices should be used to limit pigeon impacts and, in entrenched problem areas, the combined use of the above, dovecotes to manipulate breeding success, and public education should be considered.

1. Introduction

Feral pigeons (*Columba livia*) can be agricultural and urban pests and the following report summarises methods that can be used to mitigate the impacts of these pigeons in New Zealand. This report was completed by Landcare Research for the Hawke's Bay Regional Council during July–September 2009. It was funded by the Foundation for Science, Research and Technology, Envirolink fund (Project HBRC101), and is designed to provide information for pest managers within New Zealand so they can consider which control options may be suitable in their particular region.

2. Biology, Status and Damage Caused by Pigeons

2.1 Description and biology

The feral pigeon (otherwise known as the rock pigeon) is widespread and locally common in New Zealand (Heather & Robertson 2005). Feral pigeon populations are supplemented constantly by lost dovecote and racing pigeons as evidenced by the variation in plumage of feral birds (plumage variation is common in domesticated varieties) and the proportion of birds which have leg bands among those shot during control programmes. Feral pigeons roost and nest on man-made structures (e.g. buildings and bridges) and also in crevices and holes in cliff faces. Nesting may also occur in large trees that provide secure sites for their typically loosely structured nests. Pigeons can breed at any time of the year but do so most commonly over the spring and summer. The average clutch size is two eggs and in a normal year a breeding pair may raise two or three broods. Both sexes incubate the eggs and feed the young. The young fledge at c. 30 days and are capable of breeding at 6 months old. Feral pigeons may commute over 20 km between their nesting and roosting sites and their feeding grounds. A study in Slovakia found that feral pigeons may live 8 to 9 years but 30% are likely to die before they are 1 year old, and 80% die before the age of 4 (Johnston & Janiga 1995). The age structure and survival of New Zealand populations are unknown, but are likely to be similar to that reported by Johnston & Janiga (1995) with food and nesting site availability being the main factors limiting population size. Colonies of pigeons may number from tens to thousands of birds.

2.2 Legal status of pigeons

Under the Wildlife Act 1953, Schedule 5, feral pigeons are listed as an unprotected species in New Zealand, and therefore it is lawful for anyone to hunt, kill, or have in their possession this bird if it is not domesticated (http://www.legislation.govt.nz/act/public/1953/0031/latest/DLM276814.html, accessed 5 August 2009). This status means that city or regional councils may carry out lethal control on public property subject to availability of funding, but have no obligation to do the same on private property. There have been recent moves to change this by including feral pigeons as a listed pest in regional pest management strategies under the Biosecurity Act 1993 (http://www.legislation.govt.nz/act/public/1993/0095/latest/DLM314623.html, accessed 5 August 2009). Feral pigeons are listed in the proposed Gisborne Regional Pest Management

Strategy (RPMS) for 2009–2014 as a limited control animal pest and the Wellington City Council has proposed they be included in the Wellington RPMS. RPMSs could provide a strategic and statutory framework for efficient and effective management of pigeons. A challenge for developing such a strategy for feral pigeons is in having effective rules that deal with a species having separate (often many tens of kilometres apart) breeding and feeding sites.

2.3 Damage caused by feral pigeons

Feral pigeons cause damage and are a nuisance in urban areas, and cause crop losses in rural areas.

Urban impacts

Feral pigeons damage buildings by accumulating nesting material in guttering and causing blockages that result in water penetration to the building structure (http://www.handr.co.uk/literature/feral_pigeons.htm, accessed 9 July 2009).

The most visible evidence of pigeon damage is the defacing of statues, other decorative structures, and window ledges by deposition of excrement. Water mixes with compounds present in the excrement to form acids that may erode limestone, masonry and to a lesser extent metal (Johnston & Janiga 1995). There is the possibility of risk to public health from zoonotic diseases. Pigeons have been recorded overseas as infected with coccidiosis, equine encephalitis, influenza, paramyxovirus infection, ornithosis, paratyphoid disease, toxoplasmosis, Lyme disease, tuberculosis, histoplasmosis, and aspergillosis (Johnston & Janiga 1995), but the extent to which some of these diseases are present in New Zealand pigeons is not well characterised. The risk of humans being infected is low with very few cases verified as being sourced from pigeons. People cleaning up accumulated excrement from long-standing pigeon roosts may be at risk from respiratory diseases such as histoplasmosis and cryptococcosis, which grow in bird droppings (http://www.techletter.com/Archive/Safety%20articles/pigeonsdisease.html, accessed 8 July 2009).

There have been cases of ectoparasites (e.g. mites carried by pigeons) infesting parts of buildings where pigeons are roosting and nesting and being transferred from there to humans, e.g. in Christchurch in the late 1960s and early 70s eight buildings around Cathedral Square reported mite infestations that were attributed to pigeons (Heath et al. 1971).

Rural impacts

A study in England (Lawson 1979) quantified the impact of feral pigeons on field beans (*Vicia faba*). Pigeons dug up seeds and seedlings and reduced plant populations by over 95% on plots sown at 1–6 cm depth. Damage was also noted at harvest time.

In New Zealand twenty to thirty percent of 100 farmers surveyed in 2000 reported pigeon damage to wheat, barley and pea crops (Fig. 1) (Coleman & Spurr 2001). Pea losses were estimated to be up to 20%. Fifty-four percent of farms growing peas reported damage at sowing and emergence. Dilks (1975) found that free-ranging feral pigeons in Hawke's Bay had an annual diet of 54% peas (n = 120) but only a third of these were from newly sown and sprouting peas (i.e. damage to a crop) and the balance appeared to have been gleaned from stubbles. That study would not, however, have been able to distinguish peas eaten on plants approaching maturation (pre-harvest) from those spilt in the paddocks post-harvest, assuming

these were seed peas. Porter et al. (1994) states that pigeons, predominantly in the South Island where peas are grown for seed, cause damage by ripping open the pods and flattening the vines as the peas approach maturation. Pigeons can also cause damage to newly planted and germinating ryecorn, maize and sweetcorn (Porter et al. 1994). The degree of damage is dependent on the total number of pigeons (and other pest birds) feeding in a particular paddock. Some Canterbury farmers are reported to have had to replant pea paddocks due to excessive losses attributed to feral pigeons.

Feral pigeons were documented as the cause of an outbreak of paramyxovirus (Newcastle disease) in domestic fowl in England in 1984 when pigeon faeces contaminated food that was destined for commercial poultry farms (Alexander et al. 1985). This disease is currently not present in New Zealand.

In the USA it has been calculated that pigeons cause damage to property and agricultural crops estimated at $1.1 billion a year (Pimentel et al. 2005). No estimation of economic loss has been carried out in New Zealand.

Fig. 1 Large flock of feral pigeons flying over barley stubble where they had been feeding on waste grain, Lincoln, Canterbury.

3. Control Options

3.1 Shooting – rural locations

Recreational or professional shooters can target pigeons when the birds congregate to feed on crops such as peas, maize, barley and wheat. This method may also put urban-based pigeons at risk if they fly out of built-up areas to feed, e.g. a large colony (several thousand pigeons) lives in the basalt cliffs at Sumner, a suburb of Christchurch, but predominantly feed on crops outside the city limits. Shooters need to be well camouflaged and use convincing decoys to lure pigeons within shotgun range. The use of movement decoys such as the Pigeon Magnet (http://www.pigeon-decoys.co.uk/catalog/index.php?cPath=24_37, accessed 2 July 2009), or the Mojo Dove motorised decoy (http://www.cabelas.com/prod-1/0016108224937a.shtml, accessed 2 July 2009) may increase the proportion of birds attracted to a shooting location. A shotgun using cartridges loaded with 7–9 shot is the most effective firearm for this type of shooting. Although shooters may kill hundreds of pigeons on one paddock in a day (Fig. 2), only prolonged shooting effort is likely to reduce the local feral pigeon population significantly. There is probably some localised benefit to individual cropping farmers when shooters target pigeons that are feeding on newly sown or sprouting crops. Some shooting at this stage may dissuade the pigeons from feeding there, assuming they can find an alternative food source which more often than not may be another farmer's crop. Birds that are targeted regularly by shooting may become increasingly wary and difficult to shoot (Dilks 1975), but when newly fledged birds join the feeding flock they may mitigate some of this wariness as the young tend to decoy more readily. Also, because of the rapid turnover of pigeon populations, any individuals that become wary from regular shooting are unlikely to persist for an extended period.

Fig. 2 A recreational shooter with 210 feral pigeons shot over pea stubble, using decoys to lure the birds within shotgun range.

3.2 Shooting – urban locations

Using firearms in urban areas may be problematic. The noise created by discharging a shotgun would preclude its use due to the potential disturbance of neighbours, but a .22 rimfire using birdshot could be useful in certain circumstances, e.g. to shoot pigeons at night with the aid of a spotlight in parkland areas. The use of air rifles would be a safer and less contentious option but they should be treated the same as any other firearm and the seven

basic rules of the Arms Code obeyed (http://www.police.govt.nz/service/firearms/arms-code.pdf, accessed 7 July 2009). If a pigeon control operation is planned using firearms in a public area, it would need to be publicly notified. The Police would need to be notified when pigeon control is to take place so they are forewarned if complaints from the public are received. Adequate signage would need to be posted, and probably security guards used to avoid public interference. Undoubtedly some members of the public will be against this type of lethal control work either because of the use of firearms or because animals are being killed, and will attempt to stop it (e.g. Wellington's anti-cull coalition, which generated media attention and public awareness in 2008 and played some part in changing plans to cull feral pigeons in Wellington). This type of control work would need to be sustained long term to have any impact and would probably be ineffective with scattered feral pigeon populations in urban areas.

3.3 Poisoning

Alphachloralose is the only pesticide registered for pigeon control in New Zealand and is manufactured by Animal Control Products, Wanganui. It is a stupefying agent that works best in colder conditions. Some birds eat a lethal dose and die, but others are only incapacitated (drugged) and would need to be collected and euthanased. The advantage of using this pesticide is that if valued non-target birds accidentally eat bait, they may be revived if kept in a warm dark place. The main disadvantage is that birds may fly off after eating bait and end up dying or behaving strangely elsewhere, which may upset members of the public. The effectiveness of a single application is likely to be short term and localised.

DRC 1339 is another pesticide that has been used for controlling pigeons but is currently only registered for use for rook and starling control in New Zealand (Bill Simmons, Animal Control Products, pers. comm.). It is currently registered as a pigeon control agent in the USA and baiting programmes in the early 1990s achieved up to 100% control of flocks numbering 95–735 birds (Blanton et al. 1991). To get DRC 1339 registered for pigeon control in New Zealand an approval from the Environmental Risk Management Authority (ERMA) would be required. In addition the Agricultural Chemical and Veterinary Medicine (ACVM) branch of the Ministry of Agriculture and Fisheries (MAF) also needs to approve vertebrate pest control agents in terms of efficacy, toxicology, animal welfare, residues, public and operator safety, and non-target risks.

3.4 Trapping

Multi-capture cage traps can be used to remove pigeons from specific sites where they are creating problems (for one design see http://www.nopests.co.nz/bird_traps.html, accessed 7 July 2009). In an urban situation traps would need to be sited where they are not interfered with by members of the public, e.g. roof tops. Traps would need to be left open and prefed with grain for at least a week before being set.

Where physically possible, roosting or nesting pigeons may be captured using a hand-held landing net. This technique could be used when pigeons have a single entry point into a roof space that can be covered by the net. Another option is to use rocket-propelled nets to capture flocks of pigeons when they congregate at a feeding site. A specialist would need to be employed to carry out this type of trapping (e.g. Guus Knopers, Aotearoa Wildlife Export NZ). It is unlikely that trapping would be a cost-effective option for reducing pigeon numbers.

3.5 Exclusion

Where pigeons are creating a specific problem by nesting or roosting on man-made structures, physical barriers can be installed to prevent them using these sites. The following are some of the exclusion devices that can be used (Table 1).

Table 1 Options for preventing pigeons from roosting

Device	Description
Angled plates	Wood, plastic, metal or glass plates set at 45° or greater along horizontal surfaces. These need to cover the whole surface to prevent pigeons roosting (Fig. 3).
Metal and plastic spikes	Fixed to roosting surfaces. Suitable for use on trusses, ledges, gutters, ridge lines and gables (Fig. 4).
Monofilament line or fine wire	White nylon line with a breaking strain of 75 kg is recommended. String between fixed points about 5 cm above the surface to be protected. Multiple strands 60 cm apart can be used on large flat surfaces.
Netting	Nylon, galvanised, stainless steel or plastic coated mesh used to cover roosting and nesting sites. Nylon netting can be less visible but metal mesh can be used where aesthetics are not a factor (Fig. 5).
Electrified wire	Powered by an electric fence unit. Lines are run 5 mm above a surface and 20 mm apart.
Barrier coil	Similar to spikes in that it is fixed to roosting surfaces (Fig. 6).
Gels	Applied with a caulking gun to surfaces to create a sticky barrier which pigeons avoid perching on. Can last 2–12 months.

Fig. 3 Angled plates (photo sourced from http://www.pigeoncontrolresourcecentre.org/html/reviews/bird-slope-bird-repellent.html, accessed 13 July 2009).

Fig. 4 Anti-roosting spikes (photo sourced from http://www.pigeoncontrolresourcecentre.org/html/reviews/pigeon-spikes.html, accessed 8 July 2009).

Fig. 5 Netting (photo sourced from http://www.pigeoncontrolresourcecentre.org/html/reviews/wire-mesh-exclude-nuisance-pigeons.html, accessed 8 July 2009).

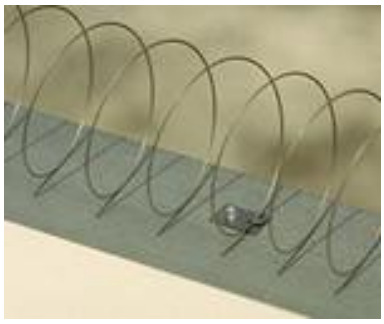

Fig. 6 Barrier coil (photo sourced from http://www.pigeoncontrolresourcecentre.org/html/reviews/pigeon-repellent-bird-barrier-coil.html, accessed 8 July 2009).

Used appropriately, these exclusion methods can reduce the number of roosting and nesting sites available for pigeons and, if this is one of the factors limiting the local pigeon population, can reduce the total numbers, but this will be site specific. Putting exclusion devices in place usually merely shifts the resident pigeons to a nearby area where they may create the same problems. At the very least, exclusion devices can stop pigeons from congregating and causing damage in a specific location.

3.6 Removal of food sources

Removing food sources for feral pigeons in urban areas completely may be difficult due to members of the public feeding them. Cleaning up spilt food waste would only solve part of the problem. Urban-based pigeons may expand their feeding areas to rural sites if their urban food supplies are reduced. An extensive public education campaign and signage in problem areas may help to curb the number of people feeding pigeons. Legislation to make it illegal to feed pigeons (i.e. spot fines) may also help.

3.7 Roost disturbance

There are several designs of laser emitters that are marketed as being repellent to birds. These include an indoor laser bird repeller (http://www.easytek.co.nz/downloads/BirdBlazer.pdf, accessed 8 July 2009) that is available in New Zealand, and two hand-held laser guns marketed overseas (http://www.pigeoncontrolresourcecentre.org/html/reviews/lasers-avian-dissuader-bird-phazer.html, accessed 8 July 2009). These products may disturb roosting pigeons but their long term effectiveness is unclear. Pigeons may eventually become habituated to their use. Caution would need to be used when using a laser device outdoors, particularly in urban areas. Likewise noise used as a scare technique at roost sites is likely to have limited effect.

3.8 Fertility control

A bait containing nicarbazin (OvoControl® P) has been developed in the USA as a fertility control agent for pigeons. To be effective pigeons are treated daily using an automatic feeder that distributes bait at a certain time every day (usually dawn). Pigeons quickly become accustomed to this feeding regime. The product prevents treated birds from laying viable eggs thereby reducing recruitment into a population. It can only be effective if all pigeons in a treated area are exposed and there is not significant external recruitment. Baiting would need to continue throughout the year. Costs are estimated at US$8.50 per day of OvoControl® P bait to treat 100 pigeons (http://www.innolyticsllc.com/new%20pigeon%20pages/pigeon_FAQ.html, accessed 9 July 2009). Though OvoControl® P has not been registered for use in New Zealand, nicarbazin is registered as an anticoccidial agent in poultry. Before OvoControl P could be used for fertility control of pigeons in New Zealand it would need to be assessed as a hazardous substance by ERMA, with approval sought for either its experimental use in containment or its full-release. In addition approval would be required from the ACVM branch of MAF for its use as a pest control agent, in terms of its efficacy, toxicology, animal welfare, residues, public and operator safety, and non-target risks.

3.9 Egg oiling or pricking

Pigeon eggs can be coated in liquid paraffin or corn oil, or a hole can be bored in them to prevent the embryo developing. The adult pigeons continue to brood the addled eggs, whereas if the eggs are removed the pigeons will quickly re-nest and lay again. Pigeons will eventually desert the clutch of eggs after the normal incubation period. The difficulty with this method is finding sufficient nests and eggs to treat to have any impact on the population. Additionally, pigeons nest all year round so egg oiling or pricking would need to be continuous.

3.10 Artificial breeding facilities, public education and exclusion

Dovecotes or pigeon lofts can be provided in urban areas (Fig. 7), and alternative roosting and nesting sites removed by using exclusion devices so that once the pigeons start nesting in the provided facilities their breeding success can be manipulated (e.g. by oiling, pricking or replacing eggs with fake eggs). This method has been used in some towns in Europe. In Basel, Switzerland (http://anatomie.unibas.ch/IntegrativeBiology/haag/Feral-Pigeon-Strassentauben/pigeon-management.html, accessed 9 July 2009), the feral pigeon population was halved from 20 000 to 10 000 over 4 years using a combination of public education to curb people's bird-feeding behaviour, trapping, and provision of pigeon lofts that served two purposes: firstly, to provide a core healthy population of pigeons for people who value them to feed, and secondly, so the pigeon eggs could be removed to regulate the resident population size. Providing dovecotes or lofts and collecting eggs are unlikely to be adequate by themselves. The underlying problem is the food resources that sustain the pigeon population. Modifying people's behaviour to limit the food supply is essential to reduce pigeon populations in urban areas.

Fig. 7 A dovecote built in a public area in Leamington, Warwickshire, England.

3.11 Enhanced predator populations

The New Zealand falcon (*Falco novaeseelandiae*) is currently being used experimentally to reduce bird damage to grapes in some Marlborough vineyards (http://www.falcons.co.uk/images/nzf/ffgmanagement%20plan%202008-2011.pdf, accessed 13 July 2009). Captive-bred falcons have been supplementary fed and have established home ranges within the vineyards with some breeding successfully. Reduction in bird damage to the grapes is yet to be quantified. The falcon can be a very effective predator on pigeons (much to the chagrin of pigeon fanciers), but it is unlikely that they could have any effect on the total pigeon numbers.

4. Comparative Effectiveness of Control Options

A control programme should not start unless its outcome is first clearly and measurably defined, there is some certainty that the planned control will achieve the desired outcome, and there is a commitment for ongoing funding to ensure the outcome is sustained. Lethal control has tended to be a 'knee-jerk' reaction once pigeons are considered to be creating a problem and usually only has a short-term effect. The first step in any pigeon control activity should be to confirm they are the key pest species. For example, pigeons may be blamed for fouling in public areas because they are the most visible, but other bird species may also be contributing to the 'mess' and may be present at higher densities than the pigeons. Removing pigeons may just create a vacuum for other species to fill; e.g. the red billed gull may increase in numbers and cause the same problems that pigeons once did. If it has been clarified that pigeons are causing problems that need to be resolved, as much information as possible should be collected about where the pigeons are roosting, nesting and feeding so that most individuals can be targeted by a control operation. The economic, environmental and social costs and benefits of various options need to be considered. The funds spent on pigeon control may be better spent cleaning up fouling caused by a stable resident population of pigeons.

To best compare the different options we need to relate them to specific New Zealand situations. Below are two potential scenarios and the options for control.

4.1 Rural scenario

A crop farmer has planted a paddock of seed peas and the peas are sprouting. A flock of 500 feral pigeons are feeding on the crop pulling up and eating sprouting peas (Table 2).

Table 2 Options for control of feral pigeons in a rural setting

Control strategy	Example	Pros	Cons
Do nothing	Pigeons will eventually stop feeding once the crop has grown large enough but may destroy a significant proportion of the crop before that happens.	-	Some economic loss to the individual farmer.
Shooting	A competent shooter targets the paddock using movement decoys. He continues shooting on the paddock until pigeons stop feeding on the crop.	Little cost to the farmer (may pay for ammunition).	Competent shooters may not be available when and where needed. The noise of shooting may disturb neighbours and/or stock. Surviving pigeons may shift to another farm and cause damage there. There is also a welfare cost to shot pigeons and dependent nestlings.
Poisoning	The farmer attempts to poison pigeons with alphachloralose.	Can have immediate benefits if sufficient pigeons eat lethal doses.	Variable results because the pigeons may not eat bait if another food source is readily available. Non-target species may be poisoned. There is also a welfare cost to poisoned pigeons and dependent nestlings.
Scaring devices	The farmer sets up a gas gun which creates noise to scare away the feeding pigeons.	Can protect the crop for the critical period when peas are first sprouting, and if the pigeons eventually accustom to the sound of a gas gun, by then, the crop may be too large for them to create further damage.	Some cost to hire/buy a gas gun. The noise of the gas gun may disturb neighbours or stock. The pigeons may shift to another farm and cause damage there.

4.2 Urban scenario

A colony of 500 pigeons has established nesting and roosting sites in the buildings and trees in the park at the centre of a mid-sized town. Pigeons congregate to feed on handouts and rubbish left by people in the town square (Table 3).

Table 3 Options for control of feral pigeons in an urban setting

Control strategy	Example	Pros	Cons
Do nothing	The total pigeon population will be regulated by food supply and suitable nesting sites.	Pigeons remain part of the urban scene and satisfy the demands of those who value pigeons.	Damage mitigation costs, e.g. cleaning statues. Aesthetic cost of pigeon excrement over public features.
Shooting	A professional shooter targets roosting/nesting pigeons at night with an air rifle.	May cause a short-term reduction in pigeon impacts, and could create an opportunity to initiate habitat manipulation by using exclusion devices.	The losses are quickly replaced by immigration and juvenile recruitment. Contract rates to employ professional shooter. PR costs to mitigate public concerns. Ongoing damage mitigation costs. There is also a welfare cost to shot pigeons and dependent nestlings.
Scaring – laser emitter	A laser beam is shone in the eyes of roosting pigeons to disturb them into flight.	May cause pigeons to desert a specific site.	Pigeons become accustomed to disturbance or shift to roost/nesting sites where they can't easily be accessed. Some cost to buy a laser emitter. Ongoing damage mitigation costs.
Trapping	A multi-capture cage trap is deployed on a roof top near the town centre and trapped pigeons are euthanased.	May cause a short-term reduction in pigeon impacts, and could create an opportunity to initiate habitat manipulation by using exclusion devices.	The losses are quickly replaced by immigration and juvenile recruitment. Some cost to buy a trap and service multiple trapping episodes. The pigeon population may become trap-shy. Ongoing damage mitigation costs. There is also a welfare cost to euthanased pigeons and dependent nestlings.
Reduction of food	Additional cleaners are employed to remove spilt food/rubbish in the town centre. Public awareness campaign started to curb people's tendency to feed pigeons. Legislation to prohibit feeding.	Potential to create a permanent solution.	Cost of cleaning up spilt food/rubbish, public awareness campaign and anti-feeding legislation. There is also a welfare cost to pigeons which may starve when food is reduced.
Exclusion devices	As many as possible of the roosting/nesting surfaces currently used by pigeons are treated with exclusion devices. Best effect if used in combination with food reduction and public awareness campaign.	Pigeon can be excluded from specific sites where they are causing the most damage.	Cost of buying and installing devices. Aesthetic cost of the devices installed on public features. May have localised effectiveness but the problem may be shifted elsewhere.

Control strategy	Example	Pros	Cons
Fertility control	An automatic feeder is established on a rooftop near the town centre. The pigeons are fed contraceptive bait daily at dawn. Best effect if used in combination with food reduction and exclusion devices.	Pigeons remain part of the urban scene and satisfy the demands of those who value pigeons.	Expensive. Cost to get OvoControl® P registered in New Zealand. Ongoing expense of bait (would cost NZ$24,000 per year to feed 500 pigeons). Immigration may negate any reductions caused by lack of fertility.
Artificial breeding facilities	A dovecote or coup is set up to provide a managed nucleus of pigeons. Eggs are pricked or replaced with dummies. People are allowed to feed pigeons at designated sites and other potential food is reduced. Exclusion devices are employed.	Pigeons remain part of the urban scene and satisfy the demands of those who value pigeons.	Cost of establishing dovecote and servicing it (volunteer may do the egg manipulation). Cost of cleaning up spilt food/rubbish, public awareness campaign and anti-feeding legislation. Cost of buying and installing exclusion devices.

See Appendix 1 for a list of suppliers of pigeon control products.

4.3 Social constraints on pigeon control

As society has become more urbanised pest control has come under increased public scrutiny. Pest control professionals need to take heed of this pressure and modify their techniques if their work is to remain effective. Some people view pigeons favourably and would protest against the use of lethal control (e.g. the Wellington anti-cull coalition), or indeed any control. Lethal control targeting adult birds has welfare costs, not only for the adult birds, but also for any dependent chicks. Because this species breeds all year round it is not possible to restrict control to any non-breeding season, but this welfare cost could be minimised by avoiding the peak spring/summer breeding season. Using non-lethal methods such as exclusion and fertility control is likely to be more acceptable but the cost of using these methods needs to be weighed up against the benefits of reduced pigeon impact. Changing people's attitudes and actions towards pigeons through public education is an essential component of lessening the problems that urban pigeon populations can cause.

In rural areas lethal control using shooting and poisoning still remains an option for localised pigeon control but land subdivision and urban sprawl may modify where and when these tools can be used.

5. Conclusions

- There is a polarised view of feral pigeons in urban society with some people considering them pests and others as feathered friends. This difference of opinion will always create difficulties in trying to manage urban pigeon populations. Using non-lethal methods that leave some resident pigeons to satisfy the demands of individuals who value pigeons may be the best compromise in current New Zealand society.
- Pest managers need to determine the extent of their specific pigeon problem and decide whether the cost of remedial action is less than that of maintaining the status quo through repairs and cleaning.
- A control programme should not start unless its outcome is first clearly and measurably defined, there is some certainty that the planned control will achieve the desired outcome, and there is a commitment for ongoing funding to ensure the outcome is sustained.
- If lethal control is deemed necessary then managers should assess where pigeons are congregating to feed, roost, and nest and decide which of these areas can be targeted most effectively to reduce pigeon occupation and/or numbers.
- Lethal control can be effective in rural areas and may reduce urban-based pigeon numbers in some situations. Lethal control is not recommended in urban areas due to the likelihood of adverse public response.
- Minimising the resources that enable a pigeon population to exist at a level where they cause problems is likely to be a more sustainable method of pigeon control than short-term lethal control.
- Fertility control is untried in New Zealand but has been used for managing pigeon numbers overseas. The cost (including registration and use) of using this technology is likely to be expensive but it may be useful for regulating discrete pigeon populations.

6. Recommendations

- An analysis of economic, environmental and social costs and benefits should be carried out before a pigeon control programme commences, to ensure the benefits exceed any cost and that these benefits can be sustained.
- In addition, if lethal control is used, the animal welfare cost also needs to be justified by ensuring measurable benefits are achieved.
- In rural areas shooting is the most effective way to mitigate localised pigeon impacts on crops.
- In urban areas food reduction and exclusion devices should be used to limit pigeon impacts and, in entrenched problem areas, the combined use of the above, dovecotes to manipulate breeding success, and public education should be considered.

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Appendix 1 Suppliers of pigeon control products

Poisons	Products
Animal Control Products (www.pestoff.co.nz) Wanganui Ph: 06 344 5302	Alphachloralose treated peas
Traps	
Pest Management Services (www.nopests.co.nz) Christchurch Ph: 0800 111 466 Ph: 03 348 9291	Multi-capture traps
Excluder devices	
Ace Birdproofing Systems (www.birdproofing.co.nz) Auckland Ph: 09 273 4970	Netting Tensioned wire Electrified wire Bird spikes Barrier coil
Bird Proofing NZ (www.peskybirds.co.nz) Dunsandel, Canterbury Ph: 03 325 4664	Bird spikes
Easy Technology Solutions (www.easytek.co.nz) Christchurch Ph: 03 341 5625	Bird spikes Repellent gel
Pest Management Services (www.nopests.co.nz) Christchurch Ph: 0800 111 466 Ph: 03 348 9291	Repellent gel
Roost disturbance devices	
Easy Technology Solutions (www.easytek.co.nz) Christchurch Ph: 03 341 5625	Indoor laser bird repeller
Information on pigeon control	
Hutton + Rostron Environmental Investigations (www.handr.co.uk) Pigeon Control Resource Centre (www.pigeoncontrolresourcecentre.org)	