

Sorry for the gap between this and the last Kereru News. Quite a bit has happened with regards to kereru/kukupapa/parea over the last 6 months, so this is a longish email. I've grouped items into three categories to make it easier find items of interest.

Please also remember to send me interesting items and news. Until next the next Kereru News

Astrid van Meeuwen-Dijkgraaf astrid@wildands.co.nz
Phone 04 2377341 Skype: [astrid.van.meeuwen.dijkgraaf](https://www.skype.com/people/strid.van.meeuwen.dijkgraaf)

Norwegian kereru items.....	1
<i>DoC on track of Norwegian kereru killers.....</i>	1
<i>Hunting row: Kereru in Kiwis' sights too</i>	2
<i>Report on kereru shooting accused due.....</i>	4
<i>Norway won't charge kereru shooters.....</i>	4
Other kereru new items	5
<i>Motorists warned to be wary of low-flying kereru.....</i>	5
<i>Big crowd celebrates at Lake Rotokare.....</i>	6
<i>Successful breeding of Puketi robins</i>	6
<i>New Kereru Aviary at Mataka</i>	7
<i>Wellington Zoo the Nest.....</i>	7
<i>Picture from Te Papa Photo library</i>	7
Recent papers featuring kereru	8
<i>Predation and other factors currently limiting New Zealand forest birds.....</i>	8
<i>Legacy of avian-dominated plant–herbivore systems in New Zealand</i>	8
<i>Mutualisms with the wreckage of an avifauna: the status of bird pollination and fruit-dispersal in New Zealand.....</i>	9
<i>Disperser communities and legacies of goat grazing determine forest succession on the remote Three Kings Islands, New Zealand.....</i>	10

Norwegian kereru items

DoC on track of Norwegian kereru killers

4:00 AM Tuesday Mar 30, 2010

http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10635227&ref=rss

Wildlife enforcement officials have identified the Norwegians suspected of having been involved in slaughtering protected native kereru in New Zealand.

"We have the full names and return travel details of all five persons related to the video clips," said Department of Conservation senior communications adviser Reuben Williams.

DoC is pursuing the five through an international treaty, but has not said what action it might try to take against them.

The five, who are understood to all have lived or worked at some point in the Arctic Norwegian town of Tromso, posted a clip on YouTube last week of them shooting New Zealand wildlife over five weeks during summer.

But their clip of a rifleman shooting at a kereru, the bird falling from a tree, and film of one of the tourists holding two dead, bloody birds took only three days to attract more than 400 scathing comments.

The kereru is an absolutely protected species under the Wildlife Act and Mr Williams said yesterday that the department was "outraged at the content of the video".

The maximum penalty for killing such protected wildlife is a \$100,000 fine and up to a year in jail.

The video also showed the tourists shooting a paradise shelduck with a rifle. Paradise ducks can be legally hunted only with a licence and a shotgun during the shooting season starting in May. Illegal hunting can bring a fine of up to \$5000.

But the Norwegian penal code is harsher. It provides for up to six years' jail for people convicted of wilfully or through gross negligence reducing a natural population of protected wildlife, in Norway or overseas.

DoC will be initially pursuing the Norwegians through an international treaty Cites (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) to which both countries are signatories.

"We will be in contact with the Norwegian authorities," said Mr Williams.

"No formal decisions have been made at this time as to what form the impending legal action will take."

Hans Tore Hoviskeland, a senior public prosecutor at the Norwegian National Authority for Investigation and Prosecution of Economic and Environmental Crime (Okokrim), told the nation's largest newspaper, Aftenposten, that if the men had shot protected animals in New Zealand, "it is very regrettable".

"The way I see it, they can also be prosecuted in criminal proceedings in Norway," he said. "We will do further research to see what has happened."

But another prosecutor at Okokrim, Aud Slettemoen, said the agency had not yet had any request from the authorities in New Zealand, or any advice that the kereru were an endangered or protected species.

An angling website, Fluefiske.net, reported the group of fly fishermen visited the North and South Islands and said one of them told it: "I have been completely bitten by this country." The man said he and his friends were planning to return for another, longer trip.

Hunting row: Keruru in Kiwis' sights too

By TONY WALL - Sunday Star Times

Every year, between March and May, Department of Conservation rangers wage a quiet war below the radar against mostly Maori poachers who shoot kereru for food or cultural reasons and believe they have a customary right to do so.

In Northland, DoC rangers have begun targeted patrols of forests where kereru hunting is known to happen, hoping to catch offenders in the act.

The law does not recognise customary rights - the birds are a protected species under the Wildlife Act and the maximum penalty for shooting them is a \$100,000 fine and up to six months' imprisonment. Many people discovered this last week when a group of Norwegians who had been on a hunting trip in New Zealand over summer posted footage on YouTube of themselves shooting kereru and other animals, including a paradise duck.

DoC has identified five Norwegians linked to the trip and is pursuing them through an international treaty. An official told a Norwegian newspaper the men could also face prosecution at home.

While the tourists bore the brunt of hundreds of scathing comments posted online from outraged Kiwis, what is not widely known is that every year New Zealand poachers also hunt kereru.

Since 2004, three Northland men - all repeat offenders - have been jailed for shooting the birds for food.

At this time of year kereru, or kukupa as they are known in Northland, are fat and flavoursome from gorging on the miro berry. Traditionally they are taken now because it is outside the breeding season.

The birds are usually shot with .22 rifles or shotguns, plucked in the bush, and later boiled whole and eaten. For Maori, kereru are a traditional source of food, but also have spiritual significance.

Dying kuia or kaumatua have called for a final meal of kereru in the belief that it will help them on their journey to the afterlife. This has been mentioned in sentencing submissions, but has generally not been an effective defence, says Ross Atkinson, principal compliance officer at DoC's Bay of Islands office.

Offenders have also tried to use a customary rights defence, Atkinson says, but that too has been rejected by the courts.

Applications can be made for permits to take protected species for cultural purposes but Atkinson does not know of any cases where this has been done for kereru.

Atkinson says kereru poaching is widespread. "Generally it happens throughout most of our forests in Northland and through other parts of the country as well." He says poachers are usually caught with two or three birds, but one person was caught with 13. Atkinson has taken about 70 cases to court throughout his career.

An affidavit by a scientist to the 2004 sentencing of Northland man Robert Cassidy, who had been caught red-handed, stated kereru in Northland were under threat from predators including humans and could become extinct in the region.

Atkinson says that since fines were increased from just \$1500 about nine years ago, fewer people have come before the courts. That, and working in with local iwi to put rahui (bans) on kereru harvesting, has led to an increase in the bird's numbers.

Atkinson can understand why people are so outraged by the Norwegian hunters' actions. "I think the impact of that is different. We know that traditionally kereru have been taken over many years - unlawfully, but traditionally. This is more about visitors coming to our country and blatantly shooting a native species and then posting that footage for the world to see."

Kevin Prime, an environmental co-ordinator with the Ngati Hine iwi, says a rahui on kereru hunting has been in place in his area in the mid-north since about 1996. "I think there is a clear understanding of what rahui means, but there is less understanding of what the actual law is, pertaining to harvesting native birds. I don't think anyone would know what the fine is for taking a pigeon."

Prime says the tribe has worked to reduce predators in order to revitalise the kereru population, and at some point it may be possible for a quota to be introduced. But the birds are not as sought after as they once were, he says.

"There was a time when it was an issue, but a lot of those older people are dying out now. I think lots of young people now would be just as happy with Kentucky Fried Chicken."

Aubrey Temara, of Tuhoë in the eastern Bay of Plenty, says a rahui was declared many years ago because of a decline in kereru numbers, not helped by humans taking the birds for food.

Despite the tribe's best efforts at education, there will be people taking kereru around about now, he says. "Many of our people see it as a customary right; we don't necessarily share that view. It is an issue - we rely on the goodwill of our people to observe the rahui and not go anywhere near the birds."

KERERU KILLERS

* In 2004, Robert Milton Cassidy, of remote Uakura, Northland, was sentenced to six weeks' jail after being caught the previous year at Horeke with six dead kereru and a shotgun. He ran away and resisted arrest, and later said in court he had found the birds and gun while pig hunting. In 1999, Cassidy had been caught in possession of kereru feathers.

* In 2008, Northland men Michael Stanley Sampson and Murray Williams Ogle, of Horeke, were jailed for six weeks after admitting killing kereru. DoC rangers had found

the pair on horseback in the Omahuta Forest with firearms and two dead, and still warm, kereru. Sampson had been caught for the same offence in the same forest in 2000.

* Currently in the South Island, a poacher is before the courts on charges of hunting and killing one kereru and will make their first appearance in the Christchurch District Court on April 29

Report on kereru shooting accused due

9:30 AM Wednesday Apr 28, 2010

http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10641352

The Department of Conservation (DoC) hopes to complete a report today on the Norwegians suspected of having been involved in slaughtering protected native kereru in New Zealand.

The report, prepared by DoC's national compliance team, will go to Conservation Minister Kate Wilkinson's office and also to Norwegian authorities with a number of recommendations, said DoC senior communications adviser Reuben Williams.

DoC has identified the five Norwegian men who posted a clip on YouTube last month of them shooting a wide range of New Zealand wildlife over five weeks during summer.

The clip showed a hunter shooting at a kereru, the bird falling from a tree and one of the tourists holding two dead, bloody birds.

The video also showed the tourists shooting a paradise shelduck with a rifle. Paradise ducks can only legally be hunted with licence and a shotgun during the shooting season starting in May. Illegal hunting can bring a fine of up to \$5000.

DoC initially looked at pursuing the men, who have since returned to Norway, through an international treaty Cites (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) to which both countries are signatories.

However, that treaty was more to do with trade and it was likely the five would be pursued under New Zealand's Wildlife Act, Mr Williams said.

The kereru is an absolutely protected species and under the Act the maximum penalty for killing such protected wildlife is a \$100,000 fine and up to a year in jail.

It would be up to the Norwegian National Authority for Investigation and Prosecution of Economic and Environmental Crime (Okokrim) to decide what action it would take against the men, Mr Williams said.

Norway won't charge kereru shooters

Published: 7:37AM Saturday May 01, 2010

<http://tvnz.co.nz/national-news/norway-won-t-charge-kereru-shooters-3504569>

Source: NZPA

Norwegian authorities say they cannot prosecute five tourists [videoed slaughtering protected native kereru](#) in New Zealand and are not looking at criminal charges.

But the Department of Conservation (DOC) says there are other laws that could see charges brought against the five men, who posted a clip on YouTube last month of them shooting a wide range of New Zealand wildlife over five weeks during summer.

The clip showed a hunter shooting at a kereru, the bird falling from a tree and one of the tourists holding two dead, bloody birds. The video also showed the tourists shooting a paradise shelduck with a rifle, well outside the duck hunting season.

The five men, who have since returned to Norway, have all been identified.

A prosecutor for the Norwegian authority Okokrim, Aud Slettemoen, told NZPA that illegal hunting abroad could only be prosecuted in Norway under Norwegian law where the hunt had diminished a species that was threatened by extinction.

"We understand that the kereru is not listed as threatened by extinction in the international red list," she said, referring to International Union for the Conservation of Nature and Natural Resources list of threatened species.

"Furthermore, on the basis of the information we have, it would not seem that the hunt was so extensive that it would have 'diminished' the species."

Therefore, the matter could not be prosecuted in Norway, and we have not opened a criminal investigation in the case, she said.

DOC spokesman Rory Newsam said it had always accepted it would be difficult to prosecute the men in Norway.

It was unlikely that DOC would seek to have five men extradited, even if the two countries had extradition legislation, just for the shooting of a kereru.

However, Norwegian authorities were keen to see the results of DOC's report into the case and there could be an avenue to prosecute the men through weapons legislation and the way the group's guns may have been imported, he said.

The report, prepared by DOC's national compliance team, was scheduled to land on Conservation Minister Kate Wilkinson's desk this week, and to also go to Norwegian authorities with a number of recommendations.

Other kereru new items

Motorists warned to be wary of low-flying kereru

By Anabelle Jackman

<http://www.3news.co.nz/Motorists-warned-to-be-wary-of-low-flying-kereru/tabid/361/articleID/155234/Default.aspx>

Including video

Naturally fermenting fruit is thought to be the cause of a rise in kereru vs car incidents in Invercargill.

A bird sanctuary on the outskirts of the city has seen more injured pigeons than usual being brought in by motorists this autumn, after the low-flying birds have crashed into cars.

"We've had 24 in the last year, but of that just under a third would be from road injuries," says May Evans, who runs Bush Haven Sanctuary.

Kereru expert Tabitha Becroft says it is the autumn fruit the birds gorge on that can prove their downfall.

"They are heavy with the fruit and so when they take off are flying low," she says.

Ms Becroft suspects the naturally fermenting fruit maybe the reason for the birds' wobbly take-offs.

"They probably get a bit drunk or something," she says.

Now Ms Evans and her husband Russell want warning signs put up around Otatara, alerting motorists to the low flying birds.

"Even if we can save the life of three or four birds – or even less, it would be magic," says Russell Evans.

Their hard work is for good reason.

It is estimated the kereru population decreases by 20 percent every decade. For this reasons, they are still a protected species under the Wildlife Act – meaning harsh penalties for anyone who kills a kereru.

A group of five Norwegian hunters were last week charged under the Act for shooting a kereru while holidaying in New Zealand.

Big crowd celebrates at Lake Rotokare

<http://www.doc.govt.nz/about-doc/news/whats-new/conservation-taranaki/conservation-taranaki-december-2009/>

A pest free reserve and the closing of the 8.4 km predator proof fence were just two of the milestones celebrated at Lake Rotokare Scenic Reserve in November 2009.

This forested hill-country area now contains extensive wetlands and 17.8 hectare natural lake. A loop track rambles through a forest dominated by mature tawa, rewarewa and mahoe. The bush is home to a variety of bird species including tui, bellbird, keruru, grey warbler and North Island robin and surrounding the lake is a pukatea/kahikatea swamp forest providing a habitat for fernbird and spotless crane, as well as tuna and banded kokopu in the streams and lake.

In time Rotokare will provide a safe habitat for translocation of endangered species such as tīeke (saddleback), hihi (stichbird) kiwi and kōkako.

Successful breeding of Puketi robins

The Bay Chronicle

Last updated 05:00 17/12/2009

<http://www.stuff.co.nz/auckland/northland/local-news/bay-chronicle/3165538/Successful-breeding-of-Puketi-robins>

Puketi Forest is continuing to benefit from six years of hard work and generous donations by volunteers and supporters of the Puketi Forest Trust.

At the end of October, the first North Island robins (toutouwai) to have hatched in Puketi in more than a hundred years left the nest. Robins are not the only species to benefit from the predator trapping. Tomtits, grey warblers, silvereyes, fantails, tui and kukupa (pigeons) are much more numerous than they were a few years ago. This year kiwi monitoring has shown that there has been a reversal in the decline of kiwi in the forest. Numbers have increased 75 percent on the average of the previous three years.

Pest control involves 100 kilometres of trap-lines, 700 stoat traps and 250 feral cat traps were installed covering 5500 hectares of forest and 2300 rat traps were installed on 700 hectares. Four contractors are employed to service the traps in the steeper and more remote areas. Those on easier country are serviced by volunteers.

Dedicated supporter and volunteer, Isabella Godbert, recently removed the 10,000th rat to be caught. Rat numbers are now so low in the forest it is possible to walk 2.5 kilometres of trap line and find only one rat. This is in sharp contrast to the 25 to 30 that were caught on a similar length of line when trapping first started. Over the last six years 742 stoats and 116 wild cats have also been trapped.

For more information go to www.puketi.org.nz or call John Dawn 407-4790 or Ian Wilson 401-9056.

New Kereru Aviary at Mataka

http://www.nzherald.co.nz/animals/news/article.cfm?c_id=500834&objectid=10616917&ref=rss

Injured and abused animals will always have a safe place to call home thanks to the Sanctuary.

Since 2002, Shawn Bishop and Michael Dixon have spent countless hours looking after over 100 animals of all shapes and sizes and fund much of the work themselves.

The couple live and work at the Sanctuary in Matakana, a 13 hectare property with grazing land to permanently home abused animals, surrounded by 162 hectares of protected bush where they can safely release rehabilitated native birds.

Ms Bishop has always been an animal lover and got involved with bird rescue through the SPCA.

"What started out as a small thing has just grown and grown and grown because somebody's got to do it."

The \$10,000 from the 12 Days of Christmas is going to build a new, four metre-high aviary specially for kereru.

Currently, kereru are housed with tui in a much shorter enclosure.

"With kereru we have to know that they can get height, because that's where they eat."

But sometimes they release kereru and find the birds can only get partial height and they must be recaptured.

"What we needed was a four metre-tall aviary and if they can get up to the high perches then we can know they have the criteria they need to survive."

Wellington Zoo the Nest

The first native bird to be treated at The Nest - a kererū - was successfully released at Welly's Botanic Gardens this morning. Sweet!

[6:51 PM Dec 15th, 2009](#) from web. Wellington Zoo Twitter

Picture from Te Papa Photo library

There are lots of photos of kereru and kukupa in the Te Papa photographic library including this one of an unknown woman with 3 Kereru (New Zealand Pigeons) on her arms, photo taken by Herbert Guthrie-Smith, Circa 1910

<http://collections.tepapa.govt.nz/ObjectDetails.aspx?oid=24616&coltype=Photography&refno=B.003954>

Fun to have a look through for other photos

Recent papers featuring kereru

Predation and other factors currently limiting New Zealand forest birds

John Innes, Dave Kelly, Jacob McC. Overton and Craig Gillies

New Zealand Journal of Ecology (2010) 34(1): 86-114 © New Zealand Ecological Society.

This special issue reviews the current status of New Zealand ecology, updating the 1989 *Moas Mammals and Climate* special issue (NZJ Ecol 12 supplement). Both issues are available at www.newzealandecology.org.nz/nzje/.

Abstract: Holdaway (1989) described three phases of historical extinctions and declines in New Zealand avifauna, the last of which (Group III, declining 1780–1986) was associated with European hunting, habitat clearance, and predation and competition from introduced European mammals. Some forest bird species have continued to decline since 1986, while others have increased, usually after intensive species-specific research and management programmes. In this paper, we review what is known about major causes of current declines or population limitation, including predation, competition for food or another resource, disease, forest loss, and genetic problems such as inbreeding depression and reduced genetic variation. Much experimental and circumstantial evidence suggests or demonstrates that predation by introduced mammals remains the primary cause of declines and limitation in remaining large native forest tracts. Predation alone is generally sufficient to explain the observed declines, but complex interactions between factors that vary between species and sites are likely to be the norm and are difficult to study. Currently, the rather limited evidence for food shortage is mostly circumstantial and may be obscured by interactions with predation. Climate and food supply determine the number of breeding attempts made by herbivorous species, but predation by introduced mammals ultimately determines the outcome of those attempts. After removal of pest mammals, populations are apparently limited by other factors, including habitat area, food supply, disease or avian predators. Management of these, and of inbreeding depression in bottlenecked populations, is likely to assist the effectiveness and resilience of management programmes. At the local or regional scale, however, forest area itself may be limiting in deforested parts of New Zealand. Without predator management, the number of native forest birds on the New Zealand mainland is predicted to continue to decline.

Keywords: competition; disease; food supply; fragmentation; inbreeding depression; population limitation

Legacy of avian-dominated plant–herbivore systems in New Zealand

William G. Lee , Jamie R. Wood, and Geoffrey M. Rogers

New Zealand Journal of Ecology (2010) **34(1): 28–47**
©New Zealand Ecological Society

Abstract: Avian herbivores dominated New Zealand's pre-settlement terrestrial ecosystems to an unparalleled extent, in the absence of a terrestrial mammal fauna. Approximately 50% (88 taxa) of terrestrial bird species consumed plant foliage, shoots, buds and flowers to some degree, but fewer than half these species were major herbivores. Moa (Dinornithiformes) represent the greatest autochthonous radiation of avian herbivores in New Zealand. They were the largest browsers and grazers within both forest and scrubland ecosystems. Diverse waterfowl (Anatidae) and rail (Rallidae) faunas occupied forests, wetlands and grasslands. Parrots (Psittacidae) and wattlebirds (Callaeidae) occupied a range of woody vegetation types, feeding on fruits/seeds and

foliage/ fruits/nectar, respectively. Other important herbivores were the kereru (Columbidae), stitchbird (Notiomystidae) and two honeyeaters (Meliphagidae). Cryptic colouration, nocturnal foraging and fossil evidence suggest that avian populations were strongly constrained by predation. With the absence of migratory avian herbivores, plant structural, constitutive defences prevailed, with the unusual 'wire syndrome' representing an adaptation to limit plant offtake by major terrestrial avian browsers. Inducible plant defences are rare, perhaps reflecting longstanding nutrient-limitations in New Zealand ecosystems. Evidence from coprolites suggests moa were important dispersers of now rare, annual, disturbance-tolerant herb species, and their grazing may have maintained diverse prostrate herbs in different vegetation types. The impact of moa on forest structure and composition remains speculative, but many broadleaved woody species would likely have experienced markedly reduced niches in pre-settlement time. Several distinctive avian-mediated vegetation types are proposed: dryland woodlands, diverse turf swards, coastal herb-rich low-forest-scrubland, and conifer-rich forests. Since human settlement (c. 750 yrs ago), c. 50% of endemic avian herbivore species or c. 40% overall have become extinct, including all moa, 60% of waterfowl and 33% of rail species. Numerically, avian herbivore introductions (c. 24 taxa) since European settlement have compensated for extinctions (c. 27 taxa), but the naturalised birds are mostly small, seed-eating species restricted to human-modified landscapes. Several naturalised species (e.g. Canada goose, *Branta canadensis*; brown quail, *Coturnix ypsilophorus*) may provide modes and levels of herbivory comparable with extinct species. The original avian and current introduced mammal herbivore regimes were separated by several centuries when New Zealand lacked megaherbivores. This 'herbivory hiatus' complicates comparisons between pre-settlement and current herbivore systems in New Zealand. However, predation, animal mobility, feeding mode, nutrient transfer patterns and soil impacts were different under an avian regime compared with current mammalian herbivore systems. Levels of ecological surrogacy between avifauna and introduced mammals are less evident. Ungulates generally appear to have impacts qualitatively different from those of the extinct moa. Because of New Zealand's peculiar evolutionary history, avian herbivores will generally favour the persistence of indigenous vegetation, while mammalian herbivores continue to induce population declines of select plant species, change vegetation regeneration patterns, and generally favour the spread and consolidation of introduced plant species with which they share an evolutionary history.

Keywords: divaricate; filirumulate; folivory; island ecosystems; plant-herbivore interactions; seed predation

Mutualisms with the wreckage of an avifauna: the status of bird pollination and fruit-dispersal in New Zealand

Dave Kelly, Jenny J. Ladley, Alastair W. Robertson, Sandra H. Anderson, Debra M. Wotton, and Susan K. Wiser

New Zealand Journal of Ecology (2010) 34(1): 66-85

This special issue reviews the current status of New Zealand ecology, updating the 1989 *Moas Mammals and Climate* special issue (NZJ Ecol 12 supplement). Both issues are available at www.newzealandecology.org.nz/nzje/.

Abstract: Worldwide declines in bird numbers have recently renewed interest in how well bird-plant mutualisms are functioning. In New Zealand, it has been argued that bird pollination was relatively unimportant and bird-pollination failure was unlikely to threaten any New Zealand plants, whereas dispersal mutualisms were widespread and in some cases potentially at risk because of reliance on a single large frugivore, the kereru (*Hemiphaga novaeseelandiae*). Work since 1989, however, has changed that assessment. Smaller individual fruits of most plant species can be dispersed by mid-sized birds such as tui (*Prosthemadera novaeseelandiae*) because both fruits and birds vary in

size within a species. Only one species (*Beilschmiedia tarairi*) has no individual fruits small enough for this to occur. Germination of 19 fleshy-fruited species, including most species with fruits >8 mm diameter, does not depend on birds removing the fruit pulp. The few studies of fruit removal rates mostly (7 out of 10) show good dispersal quantity. So dispersal is less at risk than once thought. In contrast, there is now evidence for widespread pollen limitation in species with ornithophilous flowers. Tests on 10 of the 29 known native ornithophilous-flowered species found that in 8 cases seed production was reduced by at least one-third, and the pollen limitation indices overall were significantly higher than the global average. Birds also frequently visit flowers of many other smaller-flowered native species, and excluding birds significantly reduced seed set in the three species tested. So pollination is more at risk than once thought. Finally, analyses of both species numbers and total woody basal area show that dependence on bird pollination is unexpectedly high. Birds have been recorded visiting the flowers of 85 native species, representing 5% of the total seed-plant flora (compared with 12% of those with fleshy fruit) and 30% of the tree flora (compared with 59% with fleshy fruit). A higher percentage of New Zealand forest basal area has bird-visited flowers (37% of basal area nationally) than fleshy fruit (31%). Thus, bird pollination is more important in New Zealand than was realised, partly because birds visit many flowers that do not have classic “ornithophilous” flower morphology.

Keywords: dispersal; frugivory; germination; *Hemiphaga novaeseelandiae*; honeyeater; kereru; Meliphagidae; mutualisms; pollination; pollen limitation.

Disperser communities and legacies of goat grazing determine forest succession on the remote Three Kings Islands, New Zealand

P.J. Bellingham, S.K. Wiser, A.E. Wright, E.K., Cameron and L.J. Forester

Biological Conservation

Volume 143, Issue 4, April 2010, Pages 926-938

[doi:10.1016/j.biocon.2010.01.001](https://doi.org/10.1016/j.biocon.2010.01.001)

Abstract

Many remote islands are degraded as a result of deforestation and browsing of vegetation by introduced goats. Goat eradication is therefore a focus for island restoration, but there are few long-term records of change on islands after eradications. In 1946, three permanent plots were established immediately after goats were eradicated from Great Island (Manawa Tawhi), 60 km from northern New Zealand, and provide a 57-year record of change across a sequence of forest succession. Since 1946, the native and non-native bird communities that disperse 75% of the woody flora have increased from six to eight species and bird-dispersed woody plants in plots have increased from 7 to 11 species. After 1946, palatable trees were recruited in the plots. Unpalatable understorey sedges, present when goats were abundant, have persisted and may impede tree seedling establishment. Of the bird-dispersed woody plant species, 41% occur in the plots compared with 67% of the non-bird-dispersed species. Large-seeded species were unable to germinate away from parents until native pigeons *Hemiphaga novaeseelandiae* were present during the last decade. Forest succession is a consequence of interactions between the legacy of goat grazing and current disperser communities. Survival of seed-limited rare plants is not guaranteed in these circumstances. Although non-native goats no longer influence succession directly, non-native birds have been and remain important components of the disperser community. Our study supports the view that a whole-ecosystem understanding of the interactions between native and non-native species is needed to predict the consequences of eradications on islands worldwide.

Keywords: *Carex* sward; Dispersal limitation; Goat eradication; *Kunzea ericoides*; Pigeon; Seed size