

Eradication in Galapagos Islands

QUITO, Ecuador (AP Frank Bajak) — The unique bird and reptile species that make the Galapagos Islands a treasure for scientists and tourists must be preserved, Ecuadorean authorities say — and that means the rats must die, hundreds of millions of them.

A helicopter is to begin dropping nearly 22 tons of specially designed poison bait on Pinzon island (1812ha), launching the second phase of a campaign to clear out non-native rodents from the archipelago. The invasive Norway and black rats, introduced in the 17th century, feed on the eggs and hatchlings of the islands' native species, which include giant tortoises, lava lizards, snakes, hawks and iguanas. Rats also have depleted plants on which native species feed and have critically endangered bird species on the 19-island cluster 1,000 kilometers from Ecuador's coast.

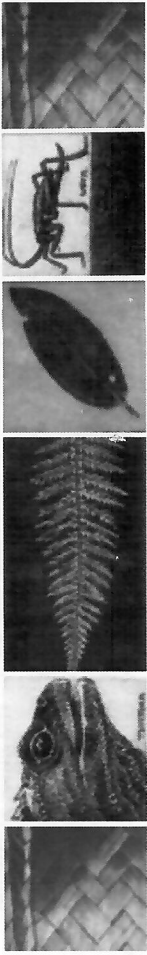
Phase I of the anti-rat campaign began in January 2011 on uninhabited Rabida island and about a dozen islets. The islands where humans reside, Isabela and Santa Cruz, will come last.

Dogs, people and New Zealand Dotterels (Continued from p22)

especially people with dogs, drive the adults off the eggs at a greater distance ('flush distance') and for a longer time ('time off nest') — thus increasing the probable death of the eggs before hatching. On busy beaches, such as Medlands and Awana from Christmas to after New Year, the situation is worse, although some birds do 'adapt' to people they still leave the nest as soon as a dog appears within 100 metres (see vertical scale on Fig1(a)). So this article is a plea to all readers: please keep away from dotterel nesting areas (often marked off

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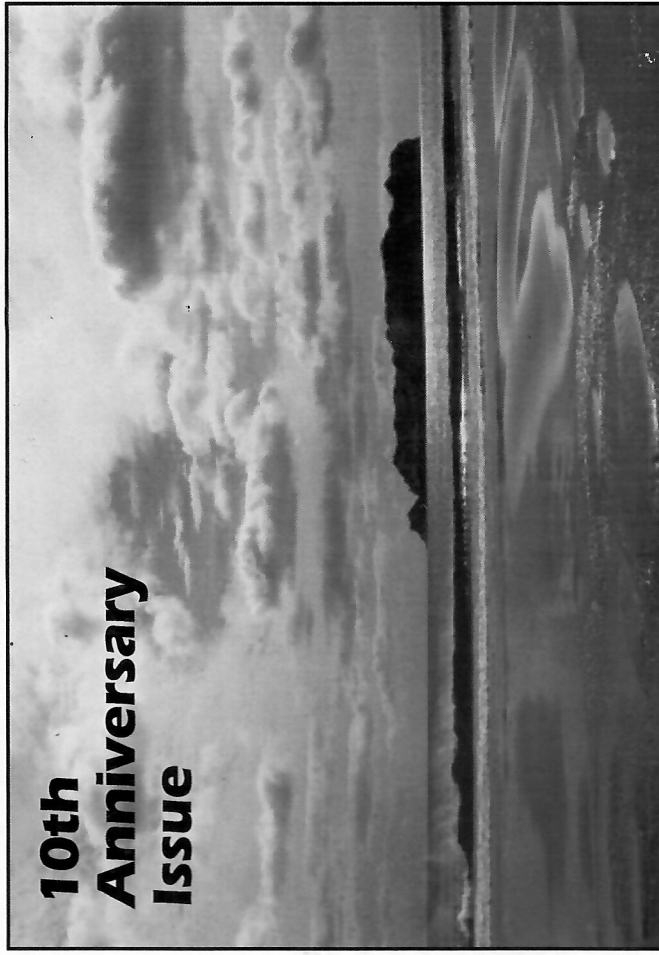


Photo: Kate Waterhouse

GBI's Future • Rakitu in Profile Bitterns on the Barrier Lord Howe Island Eradication Plans



Photo by Matt Binns

Vision: Bring back Kokako

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Editorial

The Great Barrier Slaughterhouse

BY CHAIR JOHN OGDEN



In the last issue I stressed that the forests of New Zealand – including Great Barrier Island – are cathedrals without choirs – the birds have largely gone and the whole ecology has been changed by introduced predators. Great Barrier currently has 18 bird species declining in numbers or vulnerable to extinction nationally. A few simple calculations based on published data (Innes et al. 2010) indicate the cause: *on Great Barrier at least 85,500 native birds are killed by rats (mainly) and feral cats every year*. Imagine what it would be like if even 10% of that number survived and bred every year! I have estimated that the Island has at least a quarter of a million rats, and at least a thousand feral cats (Great Barrier Island SOE, 2010, Chapter 14). This army of predators has to be fed every night of the year. Sure a few birds are increasing (kaka and tui for example); these have benefitted from protection and increased food availability as gardens have become more established and forest cover extended. But, while rats remain, the overall picture for native biodiversity remains grim.

This fact was brought home to me the other day. For years I have been monitoring a population of grey-faced petrels above the cliffs at Awana. These are large seabirds (c. 1m wingspan). Although they are not rare by national standards, and many of the Islands off the coast of northern New Zealand support large colonies, there are very few grey-faced petrels nesting on Great Barrier. The birds nest in burrows, laying a single egg in mid-winter. This is incubated, mostly by the male, for nearly two months. After hatching, the chick slowly grows to the size of an adult and eventually leaves for the sea in December. All the activity at the burrows takes place during the night, so we're generally unaware of it.

The number of grey-faced petrel burrows at Awana has been increasing since 1998, and, although I have found a couple of young birds killed by cats, I was optimistic about the future of the colony. However, the other day I found three eggs rolled out of burrows and predated by rats (see photo), and in the cold wind, another explanation hit me. Three eggs represent about 10% of those laid per annum, and this

• Grey-faced petrel burrow with egg predated by rat (yolk eaten out from hole at right end of egg). Awana Sept. 2012. The egg is the size of a big hen's (68 x 47 mm).



is almost certainly not all the predation occurring. What is probably happening is this: Great Barrier is surrounded by pest-free Islands with large grey-faced petrel colonies such as Cuvier (visible from the Awana colony), the Mokohinau and Little Barrier. These island colonies are doing really well and exporting surplus birds. Perhaps the birds are trying to establish on Great Barrier, but a significant proportion of their nesting attempts are destroyed by rats and cats. The same may apply to the smaller Cook's petrels, diving petrels, fluttering shearwaters and fairy prions. At night our pohutakawa clad sea-cliffs should be noisy with nesting sea-birds, coming to greet their partners and their young after days out at sea catching fish to feed them. Instead, the only sound is the wind in the branches and the waves below. When I saw those predated eggs at Awana I couldn't help but feel that the colony would be a sad place that night. This is not just speculation. For example, rats were eradicated from Little Barrier Island in 2004, and the following year there was a major influx of bellbirds onto Great Barrier. A few survived and at least one pair bred, but although annual inputs continue from Little Barrier (in the north), and Cuvier (in the south), this species cannot establish a viable population here in the presence of rats. A similar influx of bellbirds from Little Barrier to Tawharanui peninsula (from which rats have been eliminated) has resulted in a large viable breeding population there.

To protect Great Barrier's forest and birds, we currently have biosecurity

• The author recording grey-faced petrel burrows on a fine day at Awana in 2006.



tracking tunnels at wharves and airports so that we can prevent noxious animals such as possums and mustelids from getting here. How long before this biosecurity is seen not as preventing animals getting in, but more as preventing rats from getting out? Great Barrier Island is already a black-hole into which the surplus from the surrounding rat-free Islands disappears, and we may well become a biosecurity risk to those Islands.

To end on a lighter note: did you hear about the German sausagemaker who made sausages from seabirds then got sick? No? He took a tern for the worst.

REFERENCES:

Innes, J., Kelly, D., Overton, J. M & Gillies, C. (2010). Predation and other factors currently limiting New Zealand forest birds. New Zealand Journal of Ecology 34(1): 86-114. Great Barrier Island Charitable Trust. State of Environment Report, 2010. See: www.gbict.co.nz

Great Barrier's future is in islanders' hands

BY TIM HIGHAM Manager Hauraki Gulf Forum



Kiwis are the most unlikely birds: Pinocchio-beak, Lomu-legs and a Keira Knightley breast. I watched one on Motutapu recently, blinking, whiskers twitching, taking in the helicopter-assisted adjustment from the Coromandel, among the first to be returned to the island.

Who is behind such a moment, when news cameras whir, children gasp and hairs on the backs of necks stand on end? Literally thousands of people: political champions, business partners, supportive iwi, careful managers, technical experts, tireless workers, volunteer crews and supportive public – early adopters, main streamers and last-on-boarders ... Successes like this take time and Motutapu's kiwis are the latest reason to celebrate in a chain of island milestones.

In the 1970s there was no shortage of nay-saying when junior lecturers John Craig and Neil Mitchell suggested pest-plagued, sun-addled Tiritiri Matangi might become a forested wildlife sanctuary. Today it supplies and exchanges native birds and reptiles with a growing network of copycat and sister projects: Motuihe, Motuora,

Hauturu/ Little Barrier, Motukorea/ Browns, Rakino, Rangitoto-Motutapu, Mokohinau, Tawharanui, Waitakere's Ark in the Park as well as islands and sanctuaries outside the Hauraki Gulf.

The restoration of islands is a bright spot in an otherwise underwhelming story of environmental management around the Hauraki Gulf Marine Park.

The Hauraki Gulf Forum's 2011 *State of our Gulf* assessment compiled monitoring information from land and fishery management agencies and found most indicators showed ongoing decline or levels associated with poor environmental condition. It is easy to look out over the Gulf on a fine day, marvel at its natural beauty, unaware of the changes and stressors wrought upon it.

Around Barrier it can be hard to find a decent patch of legal-sized paua. I've heard it suggested they don't grow that big in these waters (perhaps justifying the taking of a few smaller ones?) Rather, remaining paua are likely to be relic populations (there are a few carefully hidden ones well over 125 cm around) and the attitude is known as using a sliding baseline: each generation sees as normal a reduced environmental state without memory of, or reference to, historical benchmarks.

Others might be surprised that hapuku – now caught at carefully-guarded GPS co-ordinates in deep-water – was once a top predator of inshore reefs. But left alone for a decent while, paua and hapuku would find their way back to their original densities and habitats.

Like at the Leigh marine reserve, where large snapper are nine times more abundant than surrounding areas, and at Tawharanui where the reserve's 3.5 km of reefs hold as many crayfish as 40 km stretches either side. Kelp forest and associated reef communities are markedly healthier in the reserves as the abundance and size of top predators keeps species like kina in a natural equilibrium.

To the west of Great Barrier the habitat type which once covered much of the Firth of Thames and Tamaki Strait has all but disappeared. Dense beds of sub-tidal green-lipped mussels were dredged until uneconomic in a 30-year period until 1967. Then the last few beds were heavily poached through the 1970s to sell in pub raffles.

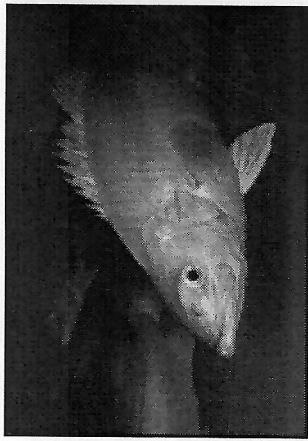
With them went one of the most productive ecosystems of the Gulf. Mussel reefs provide shelter for algae, small invertebrates and juvenile fish. Densities of fish are 10 times higher than surrounding sandy areas. And at their prime mussel reefs could have filtered the entire water of the Firth in a day compared to the two years it would take the remaining patches today.

Mussel spat has not been able to re-establish on the bare substrates left after dredging and the muddy sediments accumulating from land run-off. The cycle of natural regeneration has changed, and passed a tipping point. The beds won't return now without active intervention.

Shifting baselines and tipping points are important in understanding Great Barrier Island's future.

The big picture first: Since their arrival, humans have eliminated nearly half of New Zealand's original native bird species and, of the remainder, a large proportion are threatened.

Great Barrier has fared a little



...hapuku – now caught

at carefully-guarded

GPS co-ordinates in

deep-water – was once

a top predator of

inshore reefs.

better than most places, as its isolation meant some of the country's most voracious predators, like Norway rats, stoats and possums, were excluded. But ship rats and cats did make it and have thrived. Populations of birds, reptiles and insects that may be taken for granted and viewed as common, are slowly, sometimes suddenly, less abundant: kokako, whiteheads and rifleman are the most recent disappearances from the island; bitterns, kakariki and tomits are noticeably scarce; and kaka, black petrels and wood pigeons are likely to be next.

At a recent seminar organized by the Hauraki Gulf Forum the Prime Minister's Science Advisor Sir Peter Gluckman suggested we focus resources on preserving whole ecosystems. "We need to get cleverer at looking at species before they reach their tipping points."

Windy Hill and Glenfern Sanctuary enable comparison between environments where predatory pressures vary from intense to light. Where rodents, cats and pigs are kept at very low densities, plants such as nikau and puriri seedlings, insects such as weta, and birds like wood pigeons, kaka and tui are more abundant. Re-introduced New Zealand robins can survive and breed successfully.

Outside the sanctuaries, the island is noticeably quieter, and will become more so, as rats and cats work their way through fauna at a rate faster than it can reproduce.

Once a population is pushed past a tipping point it is lost from the island and won't come back, unless through active intervention (assuming a sanctuary exists elsewhere) and to an environment where the stressors are contained.

Glenfern and Windy Hill sanctuaries are proof of the possible. Critical to their success has been the regular application of predator control methods, including trapping and a range of toxic baits – carefully monitored for environmental impacts – and, in the case of Glenfern, a predator-proof fence. But surrounded by cat and rat infested land they have to deal with constant re-invasion and re-application of the control methods. If you want a battleground analogy think the Balkans conflict compared to the Battle of Britain. Rather than being called upon to fight incursions from multiple sides, an island with a moat proved more successful in defense.

If eradication was done once, everywhere, there would be no need for ongoing application of costly control measures and, for some people, concern about environmental effects.

By using a range of techniques Glenfern and Windy Hill are building

knowledge about whether a complementary mix and match approach might be possible at broader scale, according to environmental factors and community preferences.

Another lesson has been that economic benefits accrue for investments in enhancement. Windy Hill has created 18 jobs over the last 13 years and currently provides eight jobs for islanders, while guided walks and accommodation support Glenfern's mission.

A whole island as a lived in, worked in sanctuary, with regenerating and thriving native flora and fauna, is likely to create similar opportunities in biodiversity and tourism related business.

At the Hauraki Gulf Marine Park scale, a recent stock-take of economic activity commissioned by the Hauraki Gulf Forum showed tourism and marine recreational activity providing the lion's share of earnings and jobs. These sectors also have much greater capacity to grow than extractive uses, suggesting enhancement and economic development are broadly compatible and identifying the potential for an industry cluster with environment at the heart of its business case.

Great Barrier Island can gain from a "blue-green" economic growth agenda, increasingly recognized and promoted in business, local and central government circles. The Great Barrier Local Board's recent commitment to community consultation about the island's environmental future is timely and significant.

Like the cast of thousands that made Motutapu a place of celebration and wonder, there's a similar opportunity for the people of Great Barrier to think carefully and find their mojo.

The Great Barrier Island bittern hunt

The shy giant of the wetlands maintains a low profile on GBI

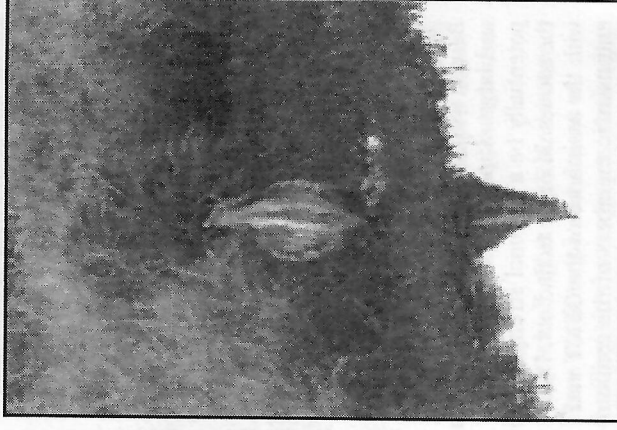
BY AMELIA GEARY

When talking to people about 'bitterning', usually the first question people ask is: what's a bittern? Bitterns aren't as conspicuous as the tui or as loud as the kaka on Great Barrier and only a few people have ever seen one. They are a member of the heron family and live in tall, dense beds of raupō and reeds in freshwater wetlands.

Bitterns are large, standing over half a metre high, and males can weigh 1.4kg. Given their size, it seems strange that so few people have laid eyes on one but that's because they are incredibly cryptic. Their feathers are different shades of brown which appear almost striped. This is important for camouflage because a defence (and hunting) mechanism they employ is to stand tall, with their beak facing the sky, swaying in the breeze like a piece of raupō. When they do this they are almost invisible, to predators and prey!

Bitterns nest in dense stands of raupō and reeds surrounding lakes and in swamps. Calling from within the reeds, males advertise their territories by giving a deep resonant booming call – a noise that sounds uncannily like someone blowing repeatedly across a glass bottle. Booming occurs all year round but peaks during the breeding season, from September to November.

Bitterns are nationally endangered; their threat status is only one category below 'nationally critical' which is reserved for species such as takahē and kakapō. Their populations have declined in the face of drainage and 'reclamation' of wetlands. Intro-



• They are here – this grainy photo of a real bittern was taken recently at Medlands by Fenella Christian.

duced predators are almost certainly having an impact on numbers as well. Bitterns are an Australasian species and breed in Australia and New Caledonia too but New Zealand has the best population with a national estimate of fewer than 1000 birds.

Unfortunately this is little more than an educated guess, their cryptic nature making it extremely hard to monitor these solitary wetland birds.

No one has ever done a thorough survey of the Barrier bittern population so we don't know how many we have! However, using the information we do have, it seems reasonable that we could be home to a significant number of these secretive locals. Great

RAKITU: Where the Light meets the Sky

A fascinating history – and a future as an eradicated sanctuary?

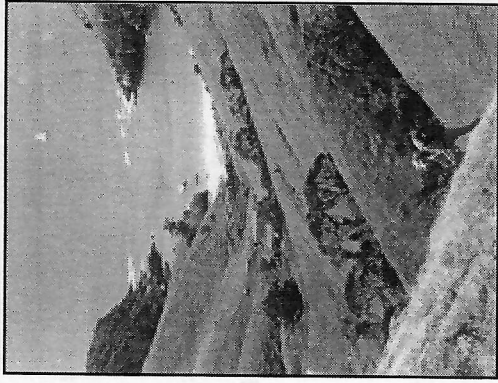
BY KATE WATERHOUSE

The Cove on Rakitu (Arid) Island, is the only sheltered anchorage on the east coast of the Barrier. Arriving by sea, the entrance is hard to spot, with cliffs towering on both sides, and clefts reaching far back and even right through the rock. Once inside the cove there's a sandy beach and ample anchorages. On a fine day, there are few more beautiful places to be.

Rakitu's isolation, size, history and spectacular landscape give the island the potential to be an extraordinary place for conservation and co-management with iwi. The Island was the home of Rehua, founding ancestor of Ngati Rehua, who was killed there by his rivals. The light from his burning whare is said to have been reflected from the rocks of Hirakimata. Rakitu was first sold to Europeans in 1883 and has been farmed and grazed for 120 years. Currently the subject of treaty negotiations, the island has been leased to its former owners since 1993. The lease expires in 2013, and both DOC and Ngati Rehua have shown support for eradicating rats to create a new island sanctuary. Rodney Ngawaka of Ngati Rehua describes a future for Rakitu as the *Tiritiri Matangi*, the jewel of the outer Hauraki Gulf.

A secret interior

The island is fortress-like, with cliffs rising 180 metres sheer from the sea in places. But invisible from the Barrier is the grassy, gently sloping interior



• A hiker ascends the slopes above Arid Cove. Photo: Mike Waterhouse

valley which splits the island in two. There are three pa and dozens of dwelling sites, storage pits, drainage ditches, middens and shelter rocks, providing evidence of year-round Maori occupation for 300 years. There's also the remains of a whale-watching station abandoned in the 1950s, and three houses and a woolshed used by the Rope and Foster families and their caretakers. This central farmed area separates the remaining original forests and kanuka on the high ground to the east and west.

Endemic birdlife on the decline

"Within 130 years the endemic bird fauna of Rakitu has been reduced to resemble that of the North Island mainland, through pasture development, vegetation succession, browsing of forests by stock and ship rat predation and competition for food". This was the sad assessment of Beauchamp, Blick and Chambers in their 2002 report to DOC on the Status



Barrier with its lack of ferrets and stoats and large raupō wetlands could potentially be a national stronghold for the species. In order to find out, DOC with the assistance of the GBICT and enthusiastic members of the community has started to listen out for them, attempting to develop an accurate population estimate.

In order to get an estimate of numbers, people sit at predetermined locations half an hour before sunset to listen for booming males over three consecutive calm nights. This year a total of 18 listening posts are located at Okiwi Station, Kaitoke Swamp and Policeman's Swamp as well as a site at

Medlands and at the bottom of Blind Bay Road. The first round of listening occurred in September with a highlight being the sighting of a bittern feeding at Medlands causeway (see photo), two nights in a row!

So far, most of the booming has been recorded roughly half an hour after sunset. The best night of listening was September 19 when six different bitterns were recorded. Interestingly, Policeman's swamp – a hotspot last year – was quiet in September, but it's hoped that after multiple nights over multiple months, we'll have a good population estimate by Christmas!

Bird Checklist for Great Barrier Island

THE TRUST HAS completed the first checklist of the bird species recorded on Great Barrier since 1868. The list comprises 124 species, ten of which are now extinct on the island, and one extinct nationally. There is coded information on rarity, status (e.g. endemic, migrant etc.), habitat and

current threat category. On the back is a map showing some key areas for birdwatching. It is hoped this free pamphlet will be of interest to visitors and residents, many of whom have an interest in birds. We welcome your feedback and any unusual bird observations.

of weka and other birds on Rakitu (Arid) Island.

The baseline research on Rakitu's biodiversity was carried out by the Offshore Islands Research Group, in 1981. Earlier observations were made by Hutton and Kirk in 1867, and Bell and Braithwaite in the early 1960s. By 1981, whitehead, kākāriki and tomtit had all died out. Pied shags were breeding then, but few have been recently recorded. In 2002 Beauchamp et al. noted that since 1981 bellbirds and pipits had also died out, and kaka were not seen (although it is assumed they are visitors). Kereru were estimated at 10 birds.

Tui, morepork, grey warblers, kingfishers, fantails, silvereyes, shining cuckoos, and little blue penguins are all still present, as well as introduced pasture birds, paradise shelducks, spur-winged plovers and welcome swallows. The introduced wekas seem to be thriving. Pateke have been observed breeding with up to 20 birds, assumed to come and go from Okwi.

Just one mammalian predator – the ship rat *Rattus rattus* appears to have been responsible for the extinctions; in 1867 Hutton and Kirk encountered a party of mutton birds from Aotea who said the birds had declined since the arrival of ship rats. Cats were reportedly once present, but apparently died out. In 1998 Phil Todd and colleagues from the Great Barrier field office undertook a trapping programme to assess rodent and cat numbers on Rakitu. Only ship rats were caught; no cats, kiore or mice.

A missing link in the chain of seabird islands

The absence of seabirds from our forests is perhaps one of the least visible and greatest losses of biodiversity in New Zealand. Clear evidence for this exists



• Koru (*Colensoa physaloides*) in flower. Photo by Halema Jamieson

and with huge seabird colonies. Like Rakitu, the nearby Mokohinau islands were also farmed before the eradication of rats in the 1990's. Seabird expert Chris Gaskin points out there are now 7 species of petrels and shearwaters breeding on the

Mokohinau group and these islands have the highest diversity of seabirds in New Zealand. Experience at Tawharanui 4–5 years after eradication of predators shows seabirds can be attracted back. There Gaskin says, four target species, including Cook's petrel turned up after speakers were used to play calls to entice birds to land. He sees potential for this on Rakitu, combined with the use of artificial burrows, as on Raoul Island, Tiri and at Tawharanui.

Reptiles in jeopardy

In 1981 there were at least five reptile species on Rakitu – the Pacific gecko, common gecko, copper, ornate and moko skinks. This survey has not been repeated but low numbers of lizards and skinks may indicate ongoing attrition due to rats and possibly weka.

A rat-free Rakitu would have great potential for reptiles. Monitoring on the Hen and Chickens group includes Hen Island where kiore were not removed. Other predator-free islands

in the group show the dramatic recovery that reptiles, including skinks, geckos and tuatara can achieve where young are not taken by rats or cats. Evidence is also to be found on Great Barrier, where Little Windy Hill sanctuary has enjoyed a resurgent reptile population. This includes the rediscovery of Duvauchelle's gecko, which is thought to have held out on the cliffs while rats prevailed in the bush. Although chevron skinks have not been found on Rakitu, the Oligosoma (chevron skink) Recovery Group has highlighted Rakitu as a potential release site for this iconic Barrier species if rats are eradicated in future.

Original vegetation hangs on

Rakitu is larger than Tiri at 245ha, but has more intact forest cover: In 1981 about 50% was in grass, 25% kanuka and 25% original bush. The sides of the central valley and the ridgelines are now covered in mature kanuka, while pohutukawa and taraire dominate the original forest with kohekohe, tawaroa, nikau and a few isolated kauri and miro. Also present are rewarewa, puriri, tawapou, karaka, maire, and mahoe. Large leaved forms of rangiora and kawakawa also occur. Of the 321 plant species recorded in 1981, 240 are native, making Rakitu highly diverse for its size. The lichens and seaweed floras are also diverse.

Following a long history of burning and farming, stock were removed from Rakitu in 1994. Some paddocks have returned to gorse and manuka but DOC have managed weeds such as pampas grass. Some steep gullies and cliffs were not reached by stock, resulting in the preservation of some plants not found elsewhere, notably koru (*Colensoa physaloides*). Halema Jamieson describes koru as a

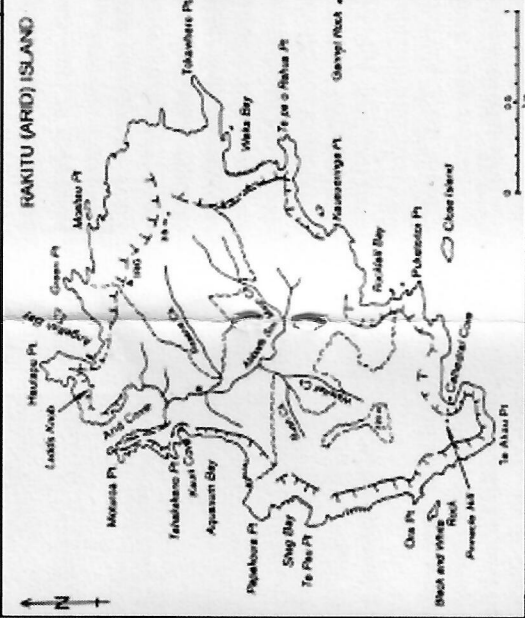


• The Subritzki Shipping barge coming into Arid Cove to load stock c.1994. Photo: Mike Waterhouse

Hydrangea-like plant which prefers shaded habitat and produces spectacular purple flowers in late summer. The remnant forest patches represent a crucial seed source for future restoration.

A swampy area formerly existed at the head of the central valley but by 1981 raupo had disappeared and other swamp plants were eaten down by cattle. The swamp and stream were home to kokupu (native fish), eels, pateke and paradise ducks.

Some cattle were recently reintroduced by the lessee, to reduce fire risk to buildings. Regeneration in Te Paparahi following the eradication of goats and cattle, shows forested areas will recover once browsing animals and rats are removed. Aside from predation of birds and eggs, rats also take seed and slow regeneration of some tree species. Large areas of the centre of Rakitu remain in grass and will require intensive planting to support natural revegetation.

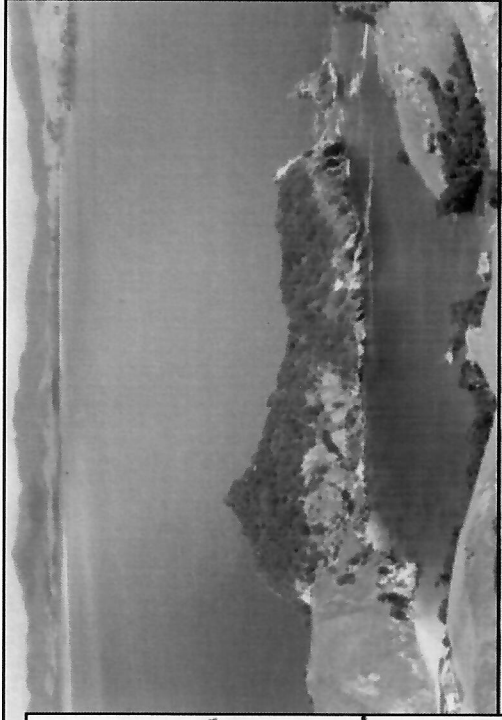


• Rakitu from Tane 1982 map

The Tiritiri Matangi story

Comparison of Rakitu with Tiri is both interesting and useful. After 117 years of farming and burning of grass and forest cover, Tiri has been intensively replanted, starting in 1984. Only 6% of the island's 220ha was original forest at the time reforestation began. These few patches included large pohutukawa trees and were important seed sources for the revegetation which followed.

Tiritiri Matangi is one of the most successful community-based conservation projects in the world, creating a home for some of our most endangered birds. The transformation of Tiri has taken more than 20 years, thousands of volunteers and funding from numerous national bodies and private donors. Between 1984 and 1994, 283,000 trees were planted covering 60% of the island. The sanctuary is a partnership between DOC and the community, through The Supporters of Tiritiri Matangi, a



• Looking down into Arid Cove with Whangapoua in the distance. Photo: Mike Waterhouse

non-profit community conservation organisation. This support group was formed in 1988 to continue the planting programme and work in the on-site tree nursery.

The main focus on Tiri has been to re-establish the forest ecosystem, complete with native birds and reptiles. Bellbirds and tui had hung on, and red-crowned kakariki were brought over as early as 1974. Tiele (saddlebacks), mohua (whiteheads), pateke (brown teal) and takahe were trans-located over the course of 10 years, prior to the eradication of kiore in 1993. After this, the programme of translocations accelerated to include little spotted kiwi, kokako, hihī (stitchbird), fernbird, rifleman, tomtits, tuatara, Duvauchel's gecko and shore skink. Forty percent of the island has been left in open grassland for species such as Takahe, and humans, which prefer open habitat. In a sense, as one specialist remarked to me recently, Tiritiri Matangi is effectively a zoo. But it is also a place

where everyone can see a part of New Zealand which has largely disappeared elsewhere.

Out damn rats!

Eradication of rats is likely to involve aerial drops of broadfoucoum followed by monitoring. At least 3 species of birds – pateke, banded rail and weka, would need to be captured and removed during this process because they are likely to feed on dropped baits. Experience on Ulva Island indicates more than 90% of weka died after a poison drop.

Rakitu is too far from the mainland of Aotea for even the most determined ship rat – their swimming range is approximately 1km and the island is 2.5kms from Harataonga and 3.5kms from Waikaro Point. The main risk of reinvasion will be from stowaways on visiting boats or floating debris. To ensure any reinvasion will be detected and managed, regular monitoring using biosecurity sentry stations will be required, employing live-on rangers or volunteers.

The vexed weka question

Weka are not endemic to Rākītū, ten birds were introduced in 1951 by wildlife officers concerned about the reduction of North Island weka numbers elsewhere (they are a separate species to the more plentiful South Island weka). This concern proved well founded, and the national Weka Recovery Group now recognises that the Rākītū population could be used for trans-location. In 2002 Tony Beauchamp estimated there to be 240 weka on the island. Weka are thought to have had a deleterious effect on seabirds, land snails, lizards and skinks, but to what degree is not known because of the simultaneous effects of ship rats. If weka need to be removed to avoid mortality during a rat eradication, two questions arise: where should they be removed to; and should they be re-introduced back onto Rākītū, or permanently trans-located elsewhere (such as to an existing weka sanctuary island – Kawau, Mokoia or Pakatōa)

Restoration vs island arks

There is a growing realisation that the remaining ecosystems of mainland New Zealand are under siege by introduced mammals. The network of sanctuary islands, particularly in the Hauraki Gulf, are the last and possibly only hope for the survival of many bird species, such as tieke, kakapo, takahe, hīhi and kokako. In theory, all species present on Tiritiri Matangi could be introduced to Rākītū, but there are a number of caveats. Assessment of adequate quality habitat to support kokako, saddleback and hīhi has not been done. Extensive planting of feed-trees and installation of nesting boxes has taken place for saddleback and hīhi on Tiri because of poor habitat. Little spotted kiwi, introduced to Tiri, may never have been present on Rākītū or

Aotea and could present a risk to lizards and skinks.

Rākītū has a head start in many ways – more intact forest cover and seed sources, and local (on Great Barrier) expertise in eradication, regeneration and translocation. On Great Barrier, kakariki and tomtits are at very low numbers. Relocating the survivors to Rākītū could help them, although kakariki could easily return to a rat-free Rākītū without human help. Bellbirds are known to visit Ōkiwi from Hauturu and may also find their way across. Then there are the seabirds which may return naturally or need to be enticed; and reptiles, such as chevron skinks, which are threatened elsewhere, or others which may yet be surviving on the cliffs.

Partial restoration can be achieved quickly on Rākītū with removal of rats, followed by reintroduction of species such as kākārīki and tomtits. Bellbirds and mohua could be brought in from Tiri, where they are numerous. Use of speakers to entice seabirds back is straightforward, but removal of weka is not. Beyond this, other species which may have been present historically include riflemen, saddleback and hīhi and these could all be released. Yet other species have and will be proposed: takahe (for the grasslands) and tuatara.

Cash and carry

Any replanting programme will require an on-island or Aotea-based nursery and volunteer labour. Managing volunteer and visitor programmes will be a major challenge. Protecting the island from reinvasion by boat-borne predators is a considerable commitment. Budget pressures on DOC mean funding is hard to come-by. A financially and

logistically sustainable solution is needed.

Treasure island

There seems to be strong support amongst iwi and within DOC to eradicate rats and restore Rākītū to something like its original state in terms of habitat and biodiversity. The success of the project will depend on a collective will to work together to conserve what remains and restore what has been lost. The challenges ahead lie as much in agreeing on principles and securing funding, as in

the practical difficulties of access, eradication, translocation and biosecurity.

Whatever the solutions, surely they must reflect Rākītū's deep and unique significance for Ngāti Rehua, its size, isolation and variety of habitats. It is an extraordinary presence in a chain of seabird islands stretching from Northland to the Bay of Plenty and in a growing network of predator-free islands of the Hauraki Gulf. It is a treasure island, a taonga, of that there is no doubt.

REFERENCES & ACKNOWLEDGEMENTS

Grateful acknowledgement is given to Rodney Ngawaka, Halena Jamieson, Rebecca Gibson, John Ogden, Chris Gaskin, and Tony Beauchamp for their input and guidance in the preparation of this article. References used include:

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EcoBriefs



OUR FOUNDING Chairperson John Ogden has been awarded the "Ecology in Action" award of the New Zealand Ecological Society. Partly in recognition of his involvement with community and ecology on Great Barrier, and partly for his history of activity in other environmental and ecological issues over many decades. For example the campaign to stop the logging of native forests at Whirinaki in the 1980s. John's award also demonstrates an increasing level of national publicity for the Great Barrier Island Trust.

John was nominated by the GBICT and other bodies and will be presented with the award at the annual general meeting and dinner of the Society at Lincoln in November. The award comes with \$500 donation for the environmental cause John chooses, and support to attend a joint conference of the New Zealand and Australian Ecological Societies in 2013, where he will present a talk about the work of the Trust in furthering the vision of a rat-free Great Barrier.

Congratulations John — Great Barrier's residents (human and otherwise) are privileged to have a conservation advocate of your stature in residence.

The main activities of the Great Barrier Island Charitable Trust
and a selected few of the many related matters with which it was involved.

YEAR	EVENTS, SUBMISSIONS, ACTIVITIES
2002	<ul style="list-style-type: none"> ◦ GBICT formed with vision of rat and feral-cat free island
2003	<ul style="list-style-type: none"> ◦ Adopt plan to research the ecological and economic benefits to GBI of pest-free status, and develops mission statement and policies ◦ Trust has first Open Day at Windy Hill
2004	<ul style="list-style-type: none"> ◦ First issue of 'Environmental News' ◦ Subsidises cat spaying (petscan) ◦ Contributions to DOC Conservation Management Strategy (CMS) ◦ Open Days Benthorn Farm and Glenfern Sanctuary
2005	<ul style="list-style-type: none"> ◦ Trust runs Summer Lecture series with guest speakers ◦ Trust runs first of three trips to Tiritiri Matangi Island for Islanders to see results on a rat-free island ◦ Website started ◦ First Primary School Prizes for environmental awareness  <p>• Judy Gilbert & Fenella Christian with some of the returned questionnaires</p>
2006	<ul style="list-style-type: none"> ◦ 'Referendum' gives massive support for Trust to continue research into methods for rat and feral cat eradication ◦ Presentation to Auckland Council on World Heritage Status ◦ Trust commenced two year program of community bird counts ◦ Rat research papers placed in local library
2007	<ul style="list-style-type: none"> ◦ First "Rat attack" workshops ◦ First community kaka count ◦ Submissions to Auckland District Plan ◦ Contributions to ARC Biosecurity Management Plan for GBI and Regional Pest Management Strategy ◦ Trustees attend "Rats, humans and their impacts on Islands" conference in Hawaii and present paper
2008	<ul style="list-style-type: none"> ◦ Trust submits on Kiwi recovery plan ◦ Trust draws attention to algal bloom and stream quality in Tryphena ◦ Trust starts research for State of GBI Environment Report (SOER) ◦ Three "Rat Attack" workshops ◦ Carbon credits and weeds workshops ◦ Sponsorship by Natural Habitats

YEAR	EVENTS, SUBMISSIONS, ACTIVITIES
2008	<ul style="list-style-type: none"> ◦ Website development
2009	<ul style="list-style-type: none"> ◦ State of Environment Report occupies Trust most of year ◦ Trust produces report to Council on state of Tryphena stream ◦ Final Report on Bird Counts ◦ Ngati Rehua representative at Trust meetings ◦ DOC and Local Board representatives at Trust meetings ◦ Trustees publish "Prospects for the eradication of rats" plan "Biological Invasions"
2010	<ul style="list-style-type: none"> ◦ SOER published and widely acclaimed. ◦ Attended and presented paper at International "Island Invasives" conference ◦ Trust submits on proposed DOC cut-backs to staffing on GBI and relocation of managerial team to Warkworth. ◦ Trust submits on proposed changes to Schedule 4 of Mining Act (Te Ahumata-Photo) and presents at public hearings ◦ Sue Daly (former trustee) elected to Community Board ◦ Ngati Rehua commence process for return of kokako to Te Paparahi ◦ Work with Hauraki Gulf Forum ◦ Input to DOC's Conservation Management Strategy  <p>• Te Ahumata from Kaitoke dunes</p>
2011	<ul style="list-style-type: none"> ◦ Trustees publish "Running the gauntlet" paper about the process of pest eradication on an inhabited island in "Island Invasives: Eradication and Management" (International Union for the Conservation of Nature) ◦ Local Board forms Environmental Strategy Planning Committee (ESPC) ◦ Trust revises long-term strategic plan and submits ideas to ESPC ◦ 17 October, founding trustee Tony Bouzaid dies leaving a legacy of environmental initiatives and dedication to the GBI community ◦ Kauri die-back seen as threat to GBI kauri forest ◦ Hui to support the return of Kokako hosted by Iwi at Motairehe ◦ Black Petrel Action Group formed in response to decline of GBI's most iconic seabird – Photo  <p>• Most iconic seabird</p>
2012	<ul style="list-style-type: none"> ◦ Trust brokers meeting between ESP and DOC representatives on community consultation process ◦ Local Board commits to community consultation on options for the ecological future of Great Barrier, including possible pest eradication ◦ Trust ensures that the long-term vision of rat eradication is included within DOC's Conservation Management Strategy

Lord Howe Island moves closer to rat eradication

The Aussies intend going where others fear to tread

EDITED BY JUDY GILBERT AND DAVID SPEIR*

Like New Zealand and other geographically isolated islands of the Pacific, many of Lord Howe Island's endemic species of birds, reptiles and invertebrates has been decimated by the aggressive and highly competitive European mouse and the black (ship) rat. Like Great Barrier Island, Lord Howe is inhabited by people, visited by tourists and has farmed animals and domestic pets. The Aussies however are intending to boldly go where others have yet to tread – they intend to eradicate mice and rats from Lord Howe.

Planning for the eradication of rodents from Lord Howe Island has progressed with financial support from the Australian Government's Natural Heritage Trust, the NSW government, the Foundation for National Parks and Wildlife, and the Lord Howe Island Board. Recently the Board has received all the funding to implement its proposed rat and mice eradication programme.

The Lord Howe Island group is 760km north-east of Sydney and the group consists of Lord Howe Is (1455ha), Roach Is (15ha), Mutton Bird Is (4.5ha) and Blackburn Is (3 ha) plus smaller rocks and islets. Great Barrier, by comparison, is 28,000 ha including all its outlying islands, islets, and rock stacks. The resident population on Lord Howe is around 350 in approximately 150 households.

The outstanding natural beauty, together with its diverse flora and

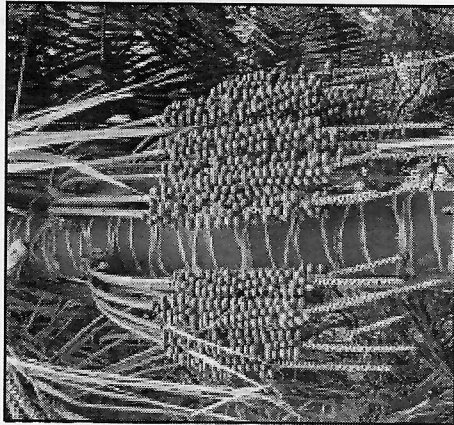
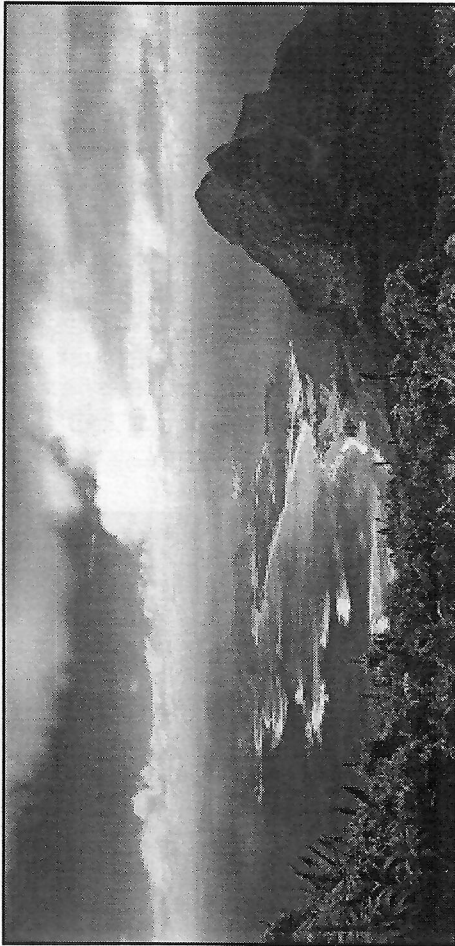


Photo by Dianne Lac

• Kentia palm seeds are prime rat diet on Lord Howe Island.

fauna, was recognised in 1982 when the island group was made a World Heritage Site. Tourism is one of two major sources of income with about 16,000 visitors each year (Great Barrier is estimated to have about 28,000 visitors a year.) Visitor numbers on Lord Howe are regulated to a maximum of 400 on island at any one time. The growth and export of kentia palms provide the other main source of income for the islanders with the Lord Howe Board operating a nursery that exports 2-3 million palm seedlings annually.

The first mice reached the islands in the 1860s followed by ship rats in 1918. Within two years the rats were so widespread that a bounty system was implemented to try and control them. The environmental effects were noticed immediately with one local commenting in 1921 "one can



• The topography of Lord Howe contains rugged bush clad peaks as well as lowland pasture – very similar to Great Barrier Island.

scarcely imagine a greater calamity in the bird world than this tragedy which has overtaken the avifauna of Lord Howe Island".

Rats are implicated as the "key threatening process" in the extinction of five species of endemic birds, two species of plants, and at least 13 species of invertebrates with another 13 species of birds, two species of reptiles, 51 species of plants, and numerous invertebrates now threatened.

The Lord Howe Island (LHI) Board embarked on eradication planning in 2006 following a study in 2001 which concluded that the eradication of rats and mice was technically feasible. A cost benefit study in 2003 demonstrated that costs of the eradication would be quickly offset by discontinuation of the current rat control programme and increased yields of commercial palm seed. If undertaken, Lord Howe and its smaller islands would be the largest, permanently inhabited island, on which the eradication of ship rats and mice has been attempted.

Control or Eradication

There have been attempts to control

rats on LHI since about 1920. Currently control includes protection of the kentia palm over about 10% of the island using about 1000 bait stations replenished 5 times a year with anticoagulant baits. Brodifacoum is used around the island's commercial palm nursery and by residents in and around residences. This control effort currently costs the LHI Board about A\$65,000 per year.

The increasing frequency and success of island eradication programs and the increasing costs and limited success of control on LHI led the Board to examine the feasibility of eradicating ship rats and mice from the islands.

In 2003 the the LHI Board reviewed the risks and constraints around eradication and assessed the various costs and benefits involved. This report demonstrated the financial benefits if rats were eradicated and also acknowledged the biodiversity benefits. An eradication would thus provide overall benefits greater than can be achieved through the current control programme.

A draft plan for the eradication was

developed in 2009 in consultation with expert planners and practitioners from around the globe together with the LHI community.

The challenges include: (1) the complexities of targeting two pest species; (2) the existence of threatened endemic species that are susceptible to poison; and (3) the presence of a resident human population, a well developed tourist industry, domestic animals and livestock.

The plan recognises that:

- Eradication rather than ongoing control is the most effective long-term option;
- The impacts of rodents on LHI are significant and ongoing;
- Eradication is feasible using current techniques without unacceptable risks to non-target species and humans.

The operation will utilise the cereal based Pest-Off Rodent Bait containing brodifacoum at the concentration of 20 ppm. The primary method of bait application will be through 2 aerial broadcasts 10-14 days apart, with hand broadcasting or bait stations used in areas not suitable for aerial application, such as in the settlement area or where livestock are present.

Mitigating Potential Impacts on Threatened Species

Brodifacoum has been used effectively to eradicate rodents on islands and in fenced sanctuaries worldwide more than 200 times. It does however, affect some non target species and for LHI an evaluation of the potential risk to these species has been carried out and been given prime consideration.

Birds – There are four endemic species that survive on LHI: the LHI woodhen, the LHI pied currawong, the LHI golden whistler and the LHI silvereye. Since 2007 the numbers and habitat of these species has been



• Lord Howe's iconic woodhen – focus of the mitigation effort.

carefully monitored. From trials using non-toxic baits it is known that the woodhen (similar to our weka) and the currawongs would be at risk of taking bait or secondary poisoning from eating poisoned rats. To minimize the potential impact at least 85% of the woodhen and 50% of the currawong population will be placed in captivity for the duration of the risk.

Captive management will require the construction of a precision built, rat-proof enclosure for woodhen and aviaries for other species. The surrounding areas will be baited before and after the main eradication to ensure they do not harbor any rats.

Reptiles and Mammals – Two species of native reptiles are present on Lord Howe and its nearest neighbour Norfolk Island: LHI skink and LHI gecko. The insectivorous diet of the species exposes them to the risk of ingesting brodifacoum if they feed on invertebrates that have ingested the bait. However, the risk of secondary poisoning is low because of the different blood chemistry of these reptiles and because the baiting will take place in the winter when reptiles are less active. There have also been no widespread deaths of reptile species following rodent eradications. In many instances the removal of rodents has resulted in a substantial increase in



• The black rat, a very successful stowaway.

the abundance of reptiles. For example the number of skinks on Korapuki Island increased 30-fold within five years of rats being removed.

The only extant native mammal on LHI is the large forest bat, a species that is common throughout much of southern Australia. It is insectivorous and is therefore considered to be at low risk of poisoning.

Invertebrates – The LHI group has numerous endemic species of terrestrial invertebrates and predation by rats is regarded as a significant threat to many. Only one species is considered to be at low risk from bait, the Lord Howe flax snail, so a number of snails will be collected and housed in captivity for the duration of the baiting programme.

Effects of Human Habitation on Eradication Design

A human population and their associated pets and livestock raise issues rarely encountered on other large islands where eradications have occurred. However, modifications made to ensure the safety of the community need not jeopardise the success of the operation.

Currently there are 100 beef cattle and a herd of 14 cows provides milk for local consumption. There are also 3 horses, 12 goats, and 300 chickens on

the island. Pigs are prohibited. Beef cattle will be destocked through slaughter during the two years leading up to the eradication. Owners will either be compensated financially or given replacement stock brought to the island when the breakdown of bait is complete. Most owners of stock have indicated their willingness to cooperate in this process. The dairy herd as well as goats and horses will remain on island throughout the operation, with animals confined to a small paddock connected to the existing milking shed by a narrow race. Confinement will extend until baits disintegrate. Cattle proof bait stations will be placed within the 30 m buffer zone of this paddock.

All poultry will be eliminated from the island at least a month before the eradication and be replaced after the eradication. Poultry owners will be compensated for lost egg production.

There are approximately 48 domestic dogs on LHI. Cats are prohibited. The option of removing dogs to kennels on the mainland will be available for all dog owners at no cost. Given the current high use of poisons in the settlement are now, most dog owners are aware of the risks to dogs, nevertheless an education programme will be implemented to advise island residents of the potential risks to pet dogs and how to avoid them. Any cases of poisoning will be treated locally.

Community baiting strategies

The proposed operation on LHI will utilise a combination of aerial, and broadcast, and bait station techniques in order to deal with issues associated with human habitation, public concern about aerial baiting in a residential area, and to protect potable water storages. Each property will have a negotiated 'property action plan' with agreements with the LHI

Board about effective and safe actions on each property. These plans will detail: how and where the bait will be distributed on each property; methods to control rodents in the lead up to the eradication; management of pets; procedures to ensure the health and safety of all family members; and procedures to dispose of compost and food waste before and during the eradication.

Biosecurity

A biosecurity strategy current exists for LHI. Additional measures needed to ensure that rodents are not reintroduced once they have been eradicated include; improved checks of cargo before departure from the mainland; in-transit checks of sea freight; pre-landing inspections of the cargo vessel and private yachts; arrival inspections of all aircraft and passengers using trained detector dogs.

Socio-political planning

Several community meetings and focus groups have been held on LHI to inform the community about the need for an eradication, how it would be undertaken, and when it is likely. The meetings outlined environmental benefits of rodent eradication, along with the potential flow-on effects for tourism. Explanations were made of the operations' best practice and how it drew on the wealth of previous successful operations. The potential risks were identified and the contingencies built into the planning process to ensure risks were mitigated. What was also explained was the continued risk to children, non-target species, livestock and pets with continued use of baits over time.

A survey on LHI in 2009, approximately 15 months after the commencement of consultation, indicated that 96% of the 126

respondents agreed with the need to eradicate the rats from the island. Many concerns raised by the community can be addressed through appropriate information. Topics include ; (1) impacts of rodents on islands; (2) the benefits of rodent removal; (3) the impacts of baiting on non-target species; (4) the choice of poison; (5) the methods of bait dispersal; (6) human health risks; (7) risks to the marine environment.

Where is it up to now?

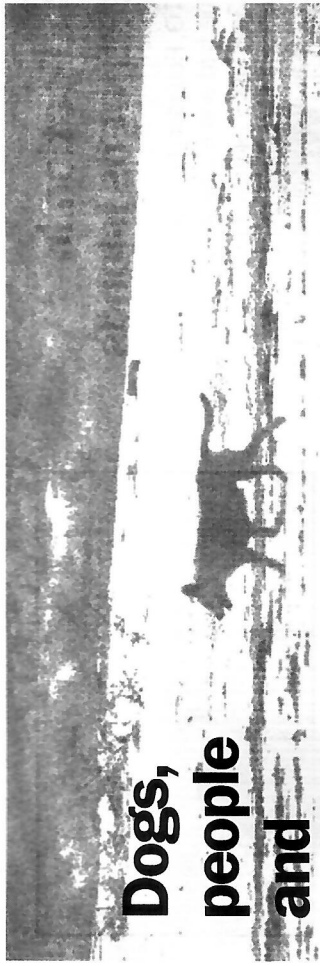
Currently the project managers are preparing a brief to engage specialist consultants to:

- (a) Provide strategic advice on the approach to inform, consult and engage the community (and other relevant individuals and groups) on the development and implementation of the Rodent Eradication Plan.
- (b) Assist with the establishment of a Community Liaison Group and provide professional facilitation of the initial 3 meetings of the group.
- (c) Provide Draft Communication/Community Engagement Plan in consultation with CLG for review by Steering Committee.

The GBI Trust is keeping in close communication with the project as its complexities are similar to those that would be experienced by Great Barrier if it were to undertake a similar type of eradication.

If the eradication of rodents from this World Heritage Site can be achieved it will arguably be one of the most significant management actions undertaken for threatened species conservation in Australia and provide a blueprint for other inhabited islands keen to restore their biodiversity.

*Extracted from the paper "Rodent eradication on Lord Howe Island: challenges posed by people, livestock, and threatened endemics" By I.S.Wilkinson and D. Priddel.



Dogs, people and

New Zealand Dotterels



BY JOHN OGDEN
on behalf of
Awana Beachcare

MOST OF US who live on Great Barrier are aware that New Zealand dotterels nest on the eastern beaches (Medlands, Kaitoke, Palmers, Awana, and Whangapoua/Okwi Spit). They try to nest at Okupu also. The species is found only in New Zealand and is in the 'nationally vulnerable' category. Great Barrier Island is one of the North Island's strongholds for the species. Annual counts since 2000 show that the Great Barrier New Zealand dotterel population fluctuates around 48 birds.

Leg banding has shown that the Island has some exchanges with birds from the Coromandel peninsula, but overall the number has remained consistent for many years. However, the research also shows that our current population is only just hanging on – it wouldn't take a big increase in chick or adult mortality to tip the population into decline. This is where you, your dog, and your summer visitors, come into the picture, because the birds nest on the beaches just where you and they want to spend the summer. So what can you do? The key thing is to keep disturbance of the birds to a minimum – the longer the birds are off the eggs the more likely are the latter to get 'fried' in the hot sun. The more disturbance to the chicks, the

more time they spend running about wasting energy and the less time they have for feeding and growing. These are just two of the many risks in the precarious business of breeding on beaches. Figure 1 clearly shows that people walking near the nest, and

Fig. 1. Effects of people on beaches walking, running, or walking with a dog on dotterel behavior.

From: A Lord, A, Waas, J. R., Innes, J. and Whittingham, M. J. (2001). "Effects of human approaches to nests of northern New Zealand dotterels". *Biological Conservation* 98: 233-240.

