# FOREST & BIRD

NUMBER 282 • NOVEMBER 1996

kokako successes

fish trouble

caves or concrete

is biological control safe?

infill housing

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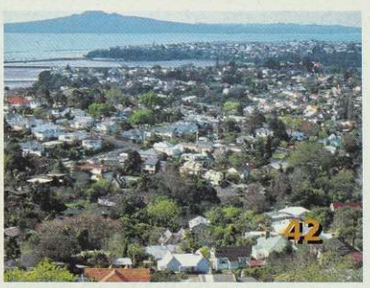
FOREST & BIRD

## FEATURES










## REGULARS



**Cover:**
*A fifteen-day-old kokako chick at Mapara Wildlife Reserve in the King Country – one of 54 which fledged in the 1994-95 breeding season. Intensive pest control in this reserve has helped turn around what had been a kokako population in serious decline (see story page 12).*

PHIL BRADFIELD

# Putting conservation on the front bench

BIODIVERSITY IS the jargon buzz word these days. Its spread through conservation circles has been rapid, paralleling the rise of the word ecology a generation or more ago.

This concerted focus on biodiversity flows from the 1992 Rio "Earth Summit" where the International Convention on Biological Diversity was one of the major outcomes. New Zealand signed the convention at Rio and it came into force the following year. The convention's 42 articles prescribe a charter for the conservation of the world's biological diversity which, if adopted and implemented by the 142 signatory countries, could have immense environmental benefits.

In its green package earlier this year, the National government allocated $410,000 for the development of New Zealand's Biodiversity Strategy. The Department of Conservation is coordinating preparation of the strategy over the next two years in conjunction with the Ministry for the Environment. At a time when the indigenous life of New Zealand's lands and waters has never been more diminished and threatened, an effective agenda for putting the conservation of biological diversity at the forefront of governmental, corporate, iwi and public priorities has never been more urgent.

The strategy can ensure nature thrives not just in our national parks, but in all other areas of the country. It would recognise that the frontline for nature protection is at our wharves and airports where new environmental pests are entering the country, and would recognise that those who live here, plus visitors from overseas, wish to see native wildlife flourishing in and close to settled areas.

Nature-friendly cities would be developed so our children can see kereru and tui feeding in kowhai trees in their street. The pioneering efforts of some farmers to protect their indigenous forest pockets, and to rid their farms of magpies, ferrets and possums would be celebrated and encouraged. Home gardeners, supported by their local council, would check the superb Good Plant Guide produced by the Northland Regional Council when buying plants to ensure none have the potential to become environmental weeds.

For the biodiversity strategy to be effective it will need to be promulgated as a national policy statement under the Resource Management Act. This would give guidance and direction to local authorities on issues such as habitat destruction, threatened species protection and restoration priorities. The worth of the biodiversity strategy will depend on the extent and quality of public input into its development. The kereru, kiwi, blue penguin and red moki cannot speak for themselves – it is up to Forest and Bird, its members and like-minded people to advocate their cause.

> "The concept of biodiversity must not become corrupted to encompass alien species harmful to our natural ecology. To do so would be contrary to the convention and contrary to the spirit and intent of our own conservation laws."

The material wealth of modern New Zealand society has been achieved by displacing nature from much of the country. We have a moral duty to ensure nature can co-exist with us on these ecologically amazing southern islands.

There must be no confusion about the coverage of a biodiversity strategy. Deerstalkers, duck hunters, anglers and at least one misguided academic have already argued that introduced plants and animals should now be embraced as part of New Zealand's biodiversity. This is dangerous territory. As the Kaimanawa horse debate demonstrates, every introduced species has its fan club.

DoC has even been tempted into exploring this off-the-wall notion.

A recent DoC brochure on the strategy divides New Zealand's biodiversity into two components – indigenous and exotic. The latter, we are informed, includes introduced species valued for recreational hunting and fishing. What nonsense. Those who wish to champion deer, trout or mallard ducks must find other forums. Deer and New Zealand's native forests are not natural partners.

The text of the Convention on Biological Diversity is emphatic on this point. It promotes "the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings". In other words the conservation of native plants and animals and their habitats and ecosystems. It also requires signatory parties to "prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species".

Attention is given to "ex-situ" conservation such as zoo breeding programmes for endangered animals, botanic gardens or seed banks and to the conservation of genetic diversity in domestic and cultivated species. But this should not threaten indigenous biodiversity.

Nowhere does the convention allow the concept of biodiversity conservation to be twisted to encompass the conservation of feral or wild populations of introduced species. Possums are part of Australia's biodiversity and thar are part of the Himalaya's biodiversity. Neither are part of New Zealand's.

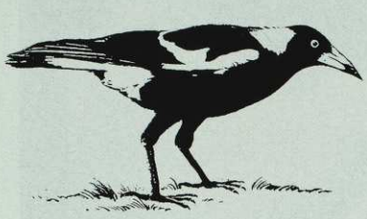
The World Conservation Union's guide to the convention identifies New Zealand as a country suffering from severe problems of plant and animal introductions. Don't we know it. The concept of biodiversity must not become corrupted in New Zealand to include alien species harmful to our natural ecology. To do so would be contrary to the convention and contrary to the spirit and intent of our own conservation laws. It might seem obvious, but it bears repeating: if we don't look after this country's unique native species, ecosystems and landscapes there is no-one else who will.

To have your say on the development of the biodiversity strategy, register your interest with the Biodiversity Strategy Coordinator, Department of Conservation, PO Box 10-420, Wellington (fax 04 471 1082). You could start by asking DoC to abandon its erroneous concept of exotic biodiversity. Copies of the convention are available from Forest and Bird, PO Box 631, Wellington, for $4.

*Keith Chapple*

KEITH CHAPPLE *was elected national president of Forest and Bird in September.*

# mailbag



## Magpie troubles

In your August magazine I was drawn to the article on magpies. We had a dreadful problem with them and although shooting is one option they are exceedingly cunning and just seem to sense when you have gone to get a gun. The viciousness with which they attack native birds is saddening. In our area, tui are starting to make a comeback but only last week one was found dead following a magpie attack.

Hopefully the installation of a trap in the area will make a difference.

Thank you very much for a wonderfully encouraging article.

**Alex Dempster**
*Pauatahanui*

## Soft on cats?

The Dog Control Act 1996 passed without a fall of government despite a provision that a dog causing death of any protected wildlife renders the dog owner liable for a fine or prison.

It may be that the passage of the Bill was helped by dogs frequently getting a bad press. Less publicity is given to infected cat bites, toxoplasmosis, worms, fouled gardens and other objectionable aspects of cats. It may be that before trying to get legislation controlling cats introduced, people with the welfare of wildlife at heart may help by being more forthright about the damage done by cats. A few bitten, clawed, cat scratched legs could well join the dog bites on television.

Why must the "acknowledged social role for the companion cat" (Ken Catt, May issue) continue unchallenged? The argument that cats must be exonerated because they cannot be trained suggests cats are unsuitable animals as domestic pets rather than that they should free of legal restraint.

Jacqui Barrington ("Boaties and Island Sanctuaries") in the August issue points out that both cats and dogs are carried on boats. Boat owners do, of course, take their cats ashore. A dog on the loose at Tiri or Kawau is far more visible than a cat. There is more chance of the dog being retrieved by the owner or picked up and impounded. The large feral cat population on Kawau makes a straying domestic cat less noticeable. A stray dog would be noticed by residents. Why did the article exclude the danger presented by domestic cats?

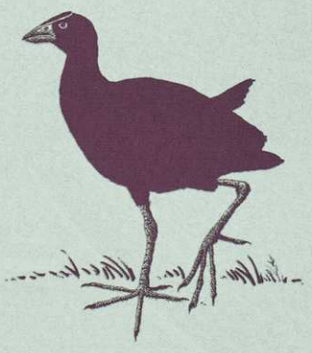
Not long ago felling forests to clear the land for farming was an accepted form of social behaviour. It no longer is. I suggest more publicity about many aspects of cats could reduce the unquestioning social acceptance of them.

People seem more timid about criticising cats than criticising dogs. Perhaps this is the first social attitude that needs changing.

**Constance Macnamara**
*Hamner Springs*

## Vanishing pukeko?

In the Taranaki area some of our



local members are worried about the fate of pukeko.

We have recently discovered that these native birds are on the list of game that may be shot during the shooting season, at the rate of up to ten each day.

Although there seem to be many still around and thriving, we have no idea of what actual population levels are in the whole of New Zealand or even in Taranaki. Is it possible that the pukeko is in danger?

Many of their swamp environments are being drained and this is also possibly a threat to their continued existence.

Can some other readers help us with this worry?

**Sandra Lawrence**
*Hawera*

**Conservation director Kevin Smith responds:**

*Pukeko are one of four native birds on the game bird list (the others are paradise duck, grey duck and shoveller). The management of these birds is the responsibility of the Fish and Game Council.*

*Little monitoring of wild population sizes for these species is undertaken by Fish and Game and none by DoC. Anecdotal evidence from good bird observers reports declines in grey duck (far easier to shoot than mallards) and shoveller. I have seen little information on pukeko population trends but the inclusion of pukeko on the game list has long been controversial with pukeko fans especially as the dead birds are not eaten but just thrown away.*

*Pukeko impacts on pastures – often overstated – are cited as a reason for them being on the game list.*

*Like Sandra, I would be interested in members' observations on pukeko population trends in their areas and in members' views as to the appropriateness of pukeko being on the game list.*

*Forest & Bird* welcomes comments on items in the magazine or on environmental matters generally. Please address letters (maximum of 250 words) to the Editor, Forest and Bird, Box 631, Wellington. We reserve the right to edit letters for length and sense.

## Kakapo recovery plan renewed

AN UPDATED recovery plan was launched in September to ensure that New Zealand's unique owl-faced parrot fares better in the 21st century than it has in the 20th.

In its initial six years, the Kakapo Recovery Plan saw a number of advances in the location of previously unknown birds and their transfer to safer offshore islands; in research techniques and understanding of kakapo behaviour; and in management structure – the Department of Conservation's National Kakapo Team now integrates kakapo research, management and recovery throughout New Zealand.

But dedication and good organisation line up against some pretty intractable problems.

Only 50 kakapo survive – on Little Barrier Island, Codfish Island off Stewart Island, and Maud Island in the Marlborough Sounds. Only 19 are females and, since 1989, only five have produced fertile eggs.

To the problems of very small populations past their breeding peak and the imbalance between the sexes, are added those arising from the birds' habits. Kakapo nest only every three to five years, and then on the ground, making them vulnerable to the kiore which still infest Little Barrier and Codfish Islands.

But in the six years since the programme was initiated, three chicks have successfully hatched. The use of night-vision equipment and miniaturised cameras, previously developed to study mating behaviour, is being expanded to closely monitor any kiore activity near eggs and chicks. Supplementary feeding of females appears to have had some success in increasing breeding frequency, and hormonal enhancement techniques being applied experimentally at present to more common species, may prove helpful over the next decade.

The aim of the new 1996-2005 recovery plan is "to establish at least one viable, self-sustaining, unmanaged population of kakapo as a functional component of the ecosystem in a protected habitat, and two or more other populations which may require ongoing management."

ROD MORRIS

*Hoki, the only kakapo reared in captivity, with her chief keeper Gideon Climo on Maud Island. The sole survivor of six chicks hatched on Codfish Island, Hoki was hand-reared at Auckland Zoo. At almost five years old, this precious female will be allowed to leave – and return to – her large pen later this year to socialise with other birds during the male booming season.*

Assistance will come from Comalco's agreement to provide more than $1 million funding over the next six years through the Threatened Species Trust (a partnership with DoC and Forest and Bird). In renewing the sponsorship, Kerry McDonald, Comalco's managing director, emphasised the long-term nature of the commitment.

"Our decision to reinvest in the kakapo programme," he said, "is a tribute to the capability and commitment of DoC staff, as much as it is to our determination to see the kakapo survive."

## Hitting the road

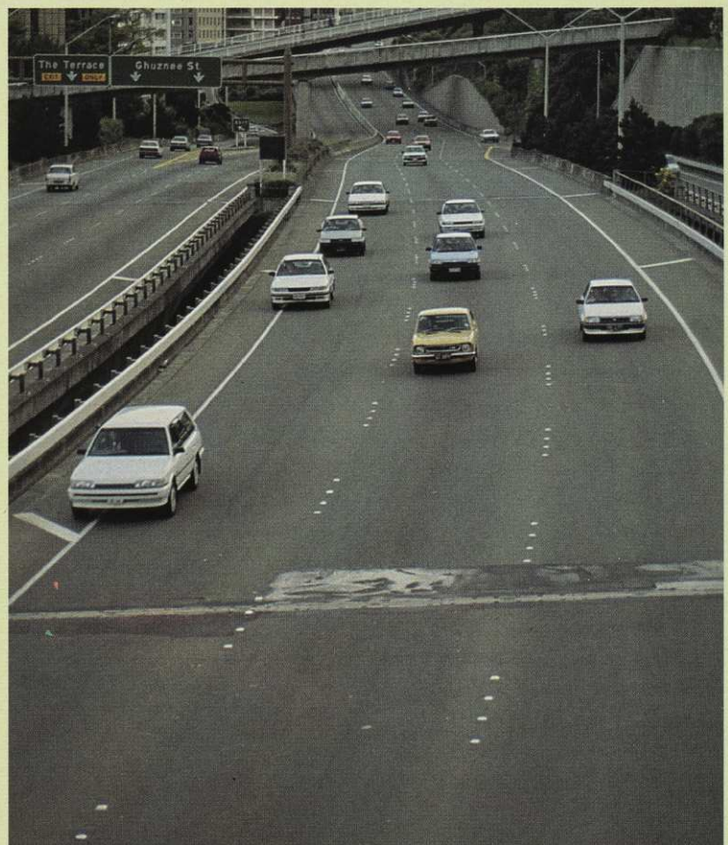
ALMOST 120 years after Robert Scott built Australasia's first motorcar in Christchurch, New Zealand has embarked on the most comprehensive review ever of its land transport system.

Although concern for the environment is only a small part of the drive for change, the review could provide the biggest shakeup yet for the dominant role of cars and trucks in moving people and goods about.

The transport overhaul is made up of a range of related reviews, planning exercises and organisational changes including:

- a Land Transport Pricing Study – quantifying the costs and benefits of road, rail and sea transport and identifying who should pay and how
- a National Land Transport Strategy – a ten-year plan for the future of our land transport system
- the creation of a new agency, Transfund, to allocate central government funding for land transport.

While the Land Transport Pricing Study is "designed to provide a framework for a rational and sustainable transport system for New Zealand into the 21st century",



the initial reports produced by the study have revealed how far away we are from these goals and the extent to which the community subsidises road transport.

The reports estimate the annual environmental costs of road transport as follows:

| | |
|---|---|
| noise | $290 m |
| local air quality | $700 m |
| greenhouse gases | $290 m |
| water quality | $100 m |

These are only "best estimates" in a range of estimates, and do not include other environmental impacts such as habitat destruction, or amenity and visual effects.

And this is only the beginning. The total annual social cost of road crashes in New Zealand is estimated at a whopping $3,400 million, with another $550 million spent by the government on road safety.

Currently, government gathers enough money through petrol taxes and other sources to cover the annual costs of maintaining the roading infrastructure. It gets no return, however, on its capital investment. With the road network worth about $25 billion, an appropriate rate of return on investment has been estimated at $1,435 million a year.

Road transport is clearly not paying its way. Unlike rail, air and sea transport it does not pay its full safety or infrastructure costs. None of the four forms of transport pay their environmental cost.

The government has made it clear that it expects the overall transport review to produce a system where each transport form pays its full economic, social and environmental costs. That would truly be a great achievement – a world first in fact.

Another arm of the transport overhaul was the creation in July of Transfund to provide a funder/provider split in central government administration of land transport. Until then, Transit New Zealand had both funded and implemented the development of the road network.

Transfund, however, has been set up with the surprisingly restricted purpose of allocating funds "to achieve a safe and efficient roading system".

Transfund is allowed to fund non-road transport projects, but only, it seems, if they have been proven a better option than any possible roading alternative. Fortunately, if we can get transport pricing right, that task might be easier.

*Duane Burtt*

## Mice menace Antipodes fauna

AN ALARMING insight into the impact of mice on Antipodes Island, in the New Zealand subantarctic, has come from the first entomological collections on nearby Bollons Island.

A recent Department of Conservation expedition to the Antipodes group provided the opportunity to compare the composition and abundance of the insect fauna between mouse-free Bollons and the mouse-infested Antipodes Island.

The differences were dramatic. Counts of the larger species of beetles – thought to be highly vulnerable to mouse predation – showed numbers were much greater on Bollons Island. An example was the darkling beetle, *Pseudhelops clandestinus,* which was found to be common on Bollons Island while only a few specimens on a single rock outcrop have ever been found on Antipodes Island. In other instances, more specimens from a wide range of larger beetle species were found during the half-day visit to Bollons than were found in more than three weeks work on Antipodes.

Mouse predation has probably caused the extinction of some insect species on Antipodes Island. A large, undescribed species of ground beetle belonging to the genus *Loxomerus* has not been seen since a 1969 expedition to Antipodes – and only then from fragments of a few specimens. Similarly, a species of weta is known from Bollons but no specimens have ever been collected from Antipodes.

Questions remain about the wider effects of the reduction in insect numbers and loss of species through mouse predation. A study of the impact of mice on Marion Island in the southern Indian Ocean showed that the reduction in numbers of a litter-feeding caterpillar by mouse predation had a marked detrimental effect on nutrient recycling on the island. A similar scenario could be true for Antipodes Island.

Time is running out for *Pseudhelops* and species like it on Antipodes Island. DoC has identified mouse eradication as a management priority for the Antipodes group but, at around 2,000 hectares, the main island represents a significantly greater challenge than any previously attempted mouse eradication. However, rapid improvements in rodent eradication technology give some hope that mice will one day be removed from Antipodes Island.

In the meantime we can be grateful for the insight that unmodified islands, such as Bollons, give to the conservation needs of our often neglected insect fauna.

*John Marris,*
*Lincoln University*

## Forest and Bird goes on-line

UNLESS YOUR HEAD is buried in a mountain of resource management plans, it would be difficult to avoid the hype about the Internet and World Wide Web.

Outgrowing its origins in a 1950s Pentagon strategy to develop a decentralised computer information network to avoid total shutdown in the event of a successful nuclear attack, the Internet has experienced a phenomenal growth since 1990 and has rapidly percolated the wider community consciousness.

The World Wide Web, or simply the Web, is a service used to browse Internet resources. A whole industry has developed around the Web, as companies and organisations race to take advantage of its potential to advertise their wares and activities.

Environmental organisations are among those using the

JOHN MARRIS

*Bollons Island and some larger residents: rockhopper penguins with Archway Island in the background.*

expanse of the Internet to disseminate ideas, share information and keep far-flung supporters in touch with campaigns.

Forest and Bird recently launched its own Web page or "site" – a type of electronic promotional shopfront or showcase.

A Web page is generally something of a "work always in progress", updated and expanded over time. Visitors to the Forest and Bird Web page will find information about the society, membership details, some articles from previous issues of *Forest & Bird*, and a selection of information brochures and factsheets. Plans are afoot to include recent press releases and submissions.

The "address" for Forest and Bird's Web page is http://www.nzwwa.com/conserve/treebird/treebird.htm. Email your suggestions about the homepage to: office@wn.forest-bird.org.nz.

*Clayton White*

## Cheltenham Beach rahui extended

THREE YEARS AGO, a ban was placed on the gathering of shellfish at Auckland's Cheltenham Beach (see *Forest & Bird* August 1993).

The ban, both in Maori traditional law (rahui) and by regulation, was the result of a long campaign by local residents alarmed at the abuse of the coastline and the particular loss of the tuangi (cockle) beds at Cheltenham.

Last April, the beach's rejuvenating shellfish bed was given further protection as the rahui was extended for three more years.

The ceremony that took place on the shore also commemorated four years of effort by the local community. In this time, they sampled the shellfish, argued with authorities and explained to a wider public so that here, on this beach, the conservation practice of restraint became a normal thing to do.

At the ceremony, a set of tiles was unveiled and later set into place in a seawall facing the beach. They tell the story of the tuangi by depicting their increase in numbers since the imposition of the rahui.

As the scientist responsible for the data collected by the community in their half-yearly sampling efforts, Mary Gardner developed the concept of the tiles so that the results would be available as public information to local people in a meaningful and immediate way. The final product was a collaboration with potter Kindra Douglas who had also worked for a year as a coordinator with the Cheltenham Beach Caretakers.

The tiles celebrate the hundreds of hours of sampling, in cold and wet; the effort in planning; the long consultations with iwi representatives, fisheries officials and politicians; and the continued support of the North Shore branch of Forest and Bird.

## South Island kokako: from the impossible to the probable?

SCOFFERS CITE the longstanding view that the South Island kokako is extinct and that the last confirmed sighting was in 1961. Yet persistent reports of sightings and calls from Stewart Island, Nelson Lakes, North West Nelson, Wakatipu Forest and Fiordland have kept the hope alive for many conservationists that the bird might still survive in some dense remote forests.

Perhaps the best evidence of the bird's recent survival is a feather, found on Stewart Island in 1987, and confirmed as coming from a recently living kokako.

Abundant throughout the South Island a hundred years ago, the distinctive orange-wattled cousin of the North Island kokako declined rapidly in numbers this century in response to the same pressures of predation and habitat modification faced by the northern subspecies.

One of those who believes strongly in the continued survival of the bird is John Kendrick, former Wildlife Service officer and recorder of the bird calls heard on National Radio (see profile in *Forest & Bird* February 1996).

In a search for the South Island kokako in Nelson Lakes National Park in June, Kendrick is certain that he heard the bird's haunting call.

"On this occasion we were out for a four-day trip. We weren't expecting much because the weather was filthy. Then we heard the bird, the first day out. It was a distinctive song – three groups of three notes. In response all the bellbirds and tui went into song; they just went berserk."

"For me, it was the culmination of searches in the area over the last ten years. I'd been alerted by earth grubbings – very different to what you get from weka or blackbirds. I always investigate these areas of rucked-up moss. You find them in deep beech forest with the very close, rich understorey. The bird is pretty cryptic


MARY GARDNER

*The tiles tell the story of Cheltenham and its tuangi using the actual data collected by locals. Each "chapter" describes how big the shellfish became by showing both the changes in size as well as the proportion of creatures sampled who got to these sizes.*

BULLER'S BIRDS OF NEW ZEALAND, 1873

– with a reputation for being very difficult to see, and lying doggo near these earthworks."

Kendrick explained that the response of bellbirds and tui to the call was identical to the characteristic reaction he has observed to the call of the North Island kokako.

Ornithologist and kokako devotee Rhys Buckingham recalls an occasion in the summer of 1976-77, when he was captivated by a kokako's song while tramping on the west side of Lake Monowai.

"It was like a cathedral bell ringing, it was crystal clear and out of this world. When the kokako are calling, you are smitten. Their song is a drug you can't get away from. The whole forest is transformed."

DoC's West Coast conservancy has now made a tape using the best-available North Island kokako recordings to try and attract responses from the southern birds. Surveying will take place in five areas in the Buller and eastern Paparoa region and any responses will be recorded.

While the department has no plans for a more extensive search until more evidence is available, this could happen soon. A feather collected during a wildlife survey by Timberlands West Coast last year is undergoing DNA testing. The testing is complex and delicate, however, and there are possible problems with contamination by other materials which might lead to an indeterminate result.

"The big worry is that they're probably old males," John Kendrick cautions. "That's why it's so important to try and save them now."

North Island Kokako Recovery Group leader Ian Flux agrees that any birds are likely to be lone males. "Females are more vulnerable to predation while nesting, and we know that remnant populations of North Island kokako often have a huge sex imbalance."

If DoC does find one or more birds, one possibility is that they will be used in a captive breeding programme (with North Island females if there are none from the South Island) at Mount Bruce Wildlife Centre and a population established on a southern offshore island.

Meanwhile the favoured location of those enticing earth and moss grubbings in deep West Coast beech forests shows how little we still know about these forests and why they need to be protected from logging.

## TV as a conservation tool?

TELEVISION IS A very effective source of information for many people. But what role do natural history television programmes, such as *Our World,* play in enhancing environmental knowledge and positive attitudes towards conservation?

Researcher Davina Hunt from the Zoology Department at the University of Otago set out to find out.

In one experiment, she tested the knowledge of school children before and after viewing a natural history video about New Zealand's animals. It was clear that the children learned a great deal from just one showing of the video.

In another study, Davina found that knowledge about species and the environment was significantly correlated with support for conservation, and respondents who watched natural history programmes also displayed a higher level of conservation knowledge and support for conservation than those who did not watch these programmes.

But correlation does not prove causation. These results simply might indicate that conservationists are more likely to watch natural history television.

Nevertheless, this study and others show television to be one of the top sources for information on the environment. Children also listed television as a fun way to learn about the environment, second only to seeing nature first hand – with most of them watching natural history television at least once a week – so it is possible that this is a potential key source of information and a potential tool for raising conservation awareness.

Sometimes, television is the only practicable and safe way that New Zealanders can see and experience some of the rarer and more inaccessible animals and wild places. Rod Morris's documentary on the black robin, for instance, beamed into thousands of New Zealand homes and gave us all a chance to watch a tale of hope without going near the bird's windswept rock haven.

If television really is that important, what then is the quality of information being given by natural history programming? This has so far received little study. In order to sell well, programmes tend to be entertaining first and informative second with the result that conservation messages may not even make an appearance, or may be distorted.

*Rachel Keedwell and Henrik Moller, University of Otago*

ROD MORRIS

*A worthwhile investment? More money was available to make the television programme on the black robin than was available to transfer the birds to other habitats.*

## China syndrome

ALTHOUGH inhabited by less than five percent of the world's population, the United States consumes some third or more of the world's resources. But China, with its booming economy and huge population, is fast catching up.

China already accounts for more grain and red meat, uses more fertiliser, produces more steel and burns more coal than the United States, and its emissions of carbon dioxide – already a tenth of the world total – are growing far more rapidly.

China's economy has grown by 10 to 14 percent a year for the last four years, and is likely to overtake that of the United States as the world's largest by 2010 if the growth rate continues.

Since China has nearly five times as many people as the US, its per capita demands are still far less. But even on a per capita basis, China is closing the gap in many products such as pork consumption. If each Chinese were to consume as much beef as the 45 kilograms a year eaten by Americans, it would take 343 million tonnes of grain – the entire US harvest – to feed the cattle to make up the difference.

As its population of 1.2 billion moves into modern houses, buys cars, refrigerators and televisions, and shifts to a more meat-based diet, the entire world will feel the effects.

The bottom line is that, with its vast population, China will not be able to follow for long any of the development paths taken to date by other countries.

*Source: Worldwatch Institute*

## Success in the Seychelles

ENDEMIC ISLAND species do not provide many success stories, but in the Seychelles, east of Tanzania in the Indian Ocean, at least one endangered bird – the magpie-robin – has recovered to record high numbers.

In 1965 only 14 magpie-robins remained – all on the small island of Fregate. Despite increased trapping of feral cats, there was still only a precarious population of 17 birds in 1990.

RICHARD CUTHBERT

*Like all Seychelles landbirds, the endangered magpie-robin* Copsychus seychellarum *is not found anywhere else. The birds mainly seek their food in open leaf litter, but regenerating natural vegetation on their Fregate Island home was found to be depriving them of foraging sites. The provision of suitable areas for foraging has been important in helping magpie-robin numbers to recover.*

▲

Working with New Zealand's Don Merton, of black robin fame, wildlife managers started a programme of supplementary feeding and habitat management to provide suitable foraging sites for the magpie-robins. Breeding success improved immediately and numbers rose to over 40 (see *Forest & Bird* May 1994).

Being restricted to just one island, however, the species was extremely vulnerable. After two unsuccessful re-introduction attempts, small populations have now been established on Cousin – owned and managed as a nature reserve by BirdLife International – and Cousine Islands.

With three separate populations and a total of 60 birds, the future is more encouraging. However the magpie-robin is not yet out of trouble, as a population of Norway rats has very recently been discovered on Fregate Island – a timely reminder of the importance of ensuring more than one population of any endangered species.

Another interesting New Zealand connection with the Seychelles has recently come to light. A sooty tern with a New Zealand band was discovered earlier this year breeding on Aride Island.

Most seabirds return to their colony of birth to breed, so this was unusual. The tern had originally been banded in 1961 in the Kermadecs, over 13,000 kilometres from Aride. Whilst the distance is impressive, it would only be a small fraction of the total kilometres the bird has travelled in its 35 years – in itself a remarkably long life and the maximum recorded for any tern species.

*Richard Cuthbert*

## Alien travels

THE WORLD'S largest non-government conservation gathering has been warned that the global movement of invasive species into new habitats is a multi-billion dollar problem that is not being directly or adequately addressed by international agreement.

A report from the Species Survival Commission of the Swiss-based World Conservation Union (IUCN) to the IUCN's congress in October called on governments and trade organisations to put numbers on the benefits and costs of species moving into new habitats as a result of human activity. The report argued that the spread of such species is on a par with habitat loss as the main reason for the decline of biological diversity.

"If we don't get a handle on this problem soon we will lose huge tracts of biodiversity," said the commission's Wendy Strahm. "Only the top competitive species in each area will survive. There is no sense in saving areas for conservation if we then allow them to be invaded by alien species."

Among the exotic invasions listed by the commission were:

- zebra mussels carried in ballast water from the Baltic Sea a few years ago which have invaded the Great Lakes bordering the United States and Canada. They are now spreading into inland lake systems where they kill clams, reduce food available for fish, and clog electric turbines and water pipes. No control is known.
- an exotic virus introduced into Australia through the thriving international trade in ornamental fish that is causing a rapid decline in frog populations in Queensland.
- water hyacinth introduced to China from South America and encouraged as an ornamental plant, livestock feed and an absorbent of heavy metal pollution. As a weed of lake systems it has caused local extinctions of several native plant and

animal species. It is also a huge problem in parts of West Africa where it clogs waterways.

The problem has grown tremendously, said IUCN director general, New Zealander David McDowell, as the world economy has reached into virtually every corner of the earth. Estimates of the direct costs (without environmental, human health and regulatory costs) in the US alone of invasive weeds is over $5 billion a year.

"What's needed is some leadership from international organisations and governments before the environment pays the full costs of the invasive species trade," said Strahm.

"If we are shifting to a policy of user pays in other areas, then we should do the same in the area of trade. Certainly those who benefit should pay their expenses."

## Protecting the Arctic

COUNTRIES bordering the Arctic Ocean have set up a joint council to provide more coordinated protection of the region's fragile environment.

The vast Arctic region is sparsely populated but suffers disproportionately from pollution and other human activities. With more striking climatic changes taking place in the polar regions than elsewhere, the Arctic is an important environmental early warning system for the globe.

The council, formed in September, links Canada, Denmark (responsible for Greenland), Finland, Iceland, Norway, Russia, Sweden and the United States. While it aims to provide a permanent forum for governments to work to protect the environment in the face of development pressures, the question is whether it will have enough teeth to combat many of the increasing problems of the region and its wildlife.

Scientists are worried, for example, that polar bears might be facing sterility from high accumulations of the toxic pollutants polychlorinated biphenyls. In the North Atlantic, the bowhead whale population remains critical at only 200 or 300.

One challenge is to encourage stronger environmental protection in Russia, which circles half the Arctic but whose increasingly deregulated economic development provides a growing threat.

## Paper income

THEY MAY NEVER be millionaires, but the people of the Balai village in the Solomon Islands do not measure the success of their enterprise in dollars.

What their novel paper-making business has done is provide them with some of the necessities of life – a water supply, medicine and payment of school fees.

Like many developing communities in the tropical world, the Balai of Malaita Island have been frequently targeted by loggers interested in their rainforests. But thanks largely to the efforts of one farsighted villager, Abraham Baeanisia, the loggers have so far been kept at bay.

A man with strong environmental principles and concerned by the increasing drift of young villagers to unemployment and homelessness in the capital Honiara, Baeanisia reasoned that it was better to create jobs closer to home.

The Solomons has a pressing need for creative solutions to its problems. Ranked second to last on the United Nations Human Development Index for Pacific island nations, its population growth rate is among the highest in the world and expected to double by the year 2013.

In 1994, with the help of New Zealander Chris Delany and New Zealand Official Development Assistance, Baeanisia started a project in Balai to make paper from plants and trees.

"We made the paper out of anything: banana leaf, sugar cane, all sorts of different tree fibres, and we are still discovering new ones," says Delany. "Balai was an ideal village because it has a strong, well organised community, and is well educated in forest conservation and community development programmes. For the past six years they had been actively resisting overtures from loggers."

Producing the paper was all very well. But Delany saw there was also a need to add value to it using wood block printing. The carving is done on custom wood first, then the only things that have to be imported are the inks.

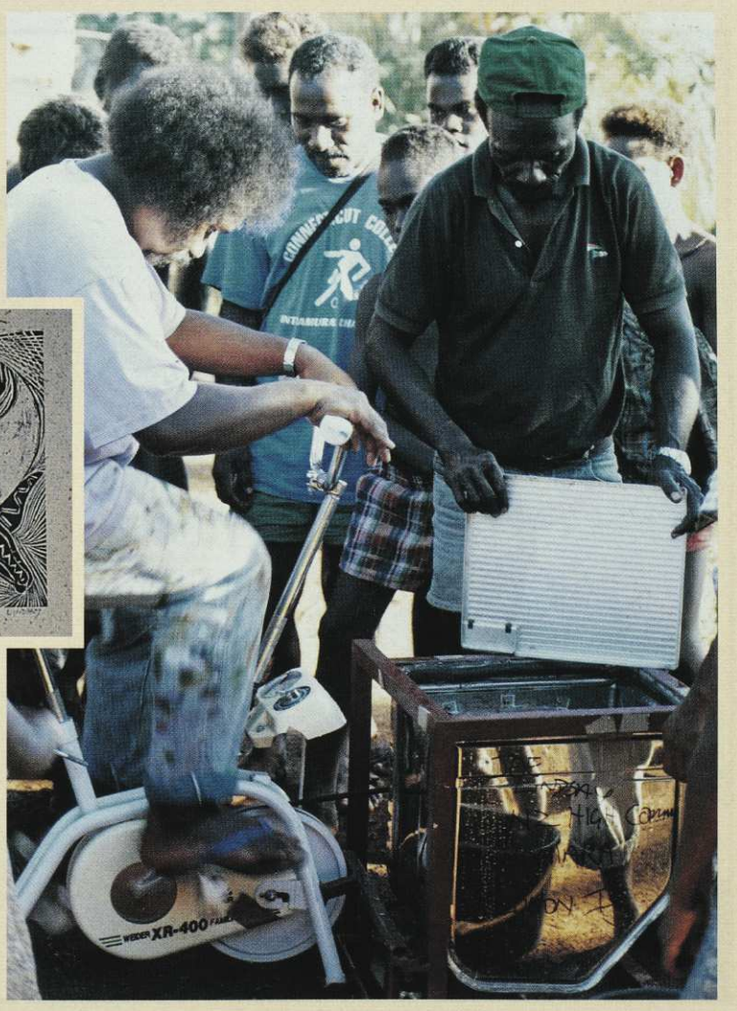
Quickly the islanders caught on to wood blocking techniques. Instead of a printing press, a spoon is used to transfer the wood block image on to the paper.

"Two years down the track the project is growing and expanding," says Delany. "A third of the profits go to the workers, a third to the community and a third is invested back into the business.

An early indication of the long term success of the project was demonstrated at an exhibition at the New Zealand High Commission in Honiara. Around $8,000 worth of prints were snapped up and orders came in from Honiara retailers. Since then orders have arrived from New Caledonia, Australia, Fiji and New Zealand for the paper and prints.

Not only are the villagers generating an income without damaging or destroying their forests, they now have a new medium for recording their custom art and designs, and young people are being offered an alternative to drifting to the urban centres in search of money and employment.

*Gerard Hutching*




*Paper-making Solomons style, using novel low-tech tools. After the fibre is cooked and rinsed, pedal-power – an exercycle hitched to a converted twin tub washing machine – does the beating. This innovation means the project can be taken to any village without the need for electricity. The paper is finally dried on screens in the sun. Above: the final product, with wood-blocked image by Joe Lindsay.*

## Reports on campaigns and projects by Forest and Bird branches and field officers

IAN CLOSE

*The Green Group at Naenae College. Leaders Geraldine Weston and Wendy Booth are in the centre at the front, and teacher Cath Brabin from the staff environment committee is on the right.*

▲

### Green group teams up with Forest and Bird

AN INVITATION to talk to a school group has led to a fruitful long-term alliance for the Lower Hutt branch of Forest and Bird. Three years ago committee member Bob Connal gave a talk to students at Naenae College about some of the society's work.

Around the same time, students from the school formed a Green Group and the link with Lower Hutt Forest and Bird began. Today the group has some 30 to 40 members who raise money for conservation projects, promote recycling and organise meetings to hear speakers on environmental topics.

This year the group organised a Green Week at the school with mufti days and a Green Dance (even the hall was decorated in green) to raise funds for Forest and Bird. A cheque for $847 for the Lower Hutt branch was the much-appreciated outcome.

In return, the branch has taken members of the Green Group for a tour of the branch's restoration work on Somes Island and organised special plantings at the school using surplus seedlings from the Somes project.

### Battle over Tasman plan

MEMBERS OF THE Tasman and Golden Bay sections are angry at the decision by the Tasman District Council to gut the district's proposed Resource Management Plan of its natural

heritage provisions.

The plan identified 200 important natural areas such as native forest, wetlands and estuaries, and required a resource consent for clearance, earthworks and other modification.

However, the list of natural heritage areas and the associated policies and rules were controversial with farming and commercial interests who wanted the entire plan withdrawn or key sections deleted.

Forest and Bird members lobbied hard to retain the protections and processes contained in the plan. At a meeting in late October, councillors caved into the opposition, ignoring the requirements of the Resource Management Act to protect significant indigenous vegetation and habitats.

The council's hasty move, while public submissions on the plan were still being received, means the wider community has been denied a chance to comment on what were progressive natural heritage provisions.

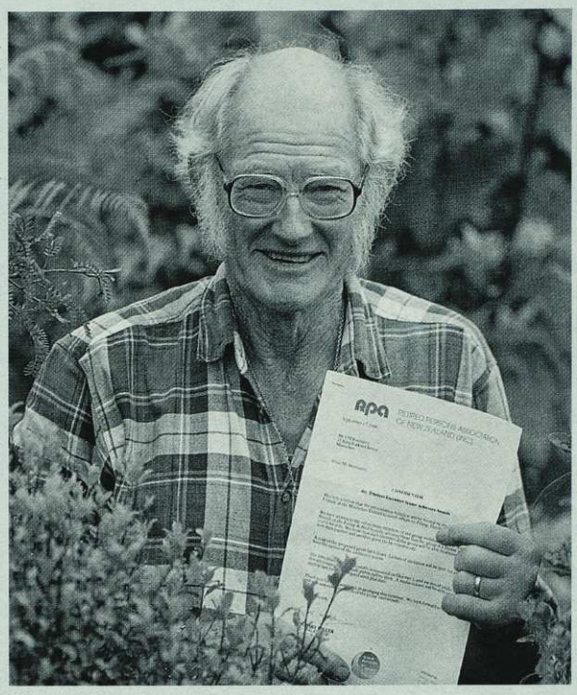
The decision is a real step backwards for nature conservation in the huge Tasman district. What remains of the plan is still open for submissions until late February.

## Reserve work earns award for Wairarapa members

FOR MASTERTON'S Eddie Bannister, raising seedlings at home to help revegetate a local reserve has been a labour of love.

Eddie is one of four members of the Wairarapa branch to receive the Senior Achievers Certificate of Excellence from the Retired Persons Association for their restoration work at Forest and Bird's Fensham Reserve.

The 38-hectare reserve, outside Carterton, was given to the society by dairy farmer John Fensham in 1962 and is one of the few remnants of the great tract of native forest and wetland that once covered most of the Wairarapa Plains. Initially the aim of the restoration was to eradicate a heavy infestation of old man's beard to help restore the reserve's ecological integrity. This work grew into construction of a walking track around the reserve that now provides a one-and-a-half hour excursion full of variety and magic.




WAIRARAPA TIMES-AGE

*Eddie Bannister pictured with the certificate celebrating his work at Fensham Reserve.*

Eddie Bannister explained the division of labour between himself and the other three award recipients – David Gawith, Percy Braggins and Frank Cody. "David is in charge of the weed control programme, Percy the track programme, I do the planting and Frank does bits of everything."

Forest and Bird's policy analyst, Duane Burtt, is working with the local group to develop a management plan for this important forest and wetland remnant.

**Names and faces**

## Keeping the records

BASED IN Forest and Bird's central office in Wellington Jenny James has one of those unsung but vital backroom jobs that help to keep Forest and Bird ticking over. Jenny processes all the subscriptions and ensures the society's membership system is properly maintained and up to date.

Originally a South African, Jenny came to New Zealand with her husband and two children nine years ago and soon became a member of Forest and Bird. "I was concerned about the natural environment being degraded," she says. "Coming from another country, I really appreciated how special and unique the animals and plants and wild places are in this country."

IAN CLOSE

*Jenny James answers one of the many inquiries from members that she receives each day. Queries range from questions about Forest and Bird's lodges and reserves, what walks their local branch might be running, even to the occasional question about how to look after an injured bird.*

Jenny worked as a computer programmer for a number of years before joining the staff at Forest and Bird. It's a skill that has proved useful in keeping on top of the society's membership software and database.

"You'd think a membership system would be fairly straight forward to run," says Jenny. "But with 46,000 members in ten different categories, plus all the KCC members, making sure that each member gets their magazine, and handling queries from members who are not sure if they have renewed – it can all get pretty complicated."

With the help of receptionist Danni Ogilvie, Jenny also looks after membership requests for the society's 55 branches, giving them updated lists of members and labels for their local newsletters. Then of course there is dealing with misdirected magazines, processing all the new members and keeping track of the donations from appeals.

From now until after Christmas, Jenny's work will be focused on handling the membership renewals that are being sent out with this issue of *Forest & Bird*. With a large number of loyal members, Forest and Bird has always had a high membership retention rate.

Once the renewals start to return it'll be more than a full-time job processing them, banking the money and updating names and addresses. "We handle about 40 or 50 address changes every week, even during the quiet times," says Jenny. "I'm always surprised by how many Forest and Bird members are on the move."

# NORTH

**Ten years ago, the ancient kokako, perhaps the most haunting of our endemic forest birds, was barely surviving in its North Island forest sanctuaries. Today, as SUE MOORE and JOHN INNES describe, much more is known about the kokako, and innovative research and new management techniques have made the bird's future on the mainland considerably brighter.**

*Now less common in many North Island forests: a kokako nest in 1992 after being attacked by a ship rat in Rotoehu Forest. The feathers suggest a scuffle between the sitting female and the rat. Video cameras often filmed female kokako refusing to leave their nests during harassment by ship rats. The rats usually remove enough egg shell to get access to the insides of each egg, leaving rough and jagged shell margins. They are phenomenal climbers and can reach any nest.*

EARLY MORNING in the King Country, conservation officer Phil Bradfield leads a sleepy group up a winding clay track through the bush. The party stops at Bradfield's request, its members happy to catch their breath. A pause and a tape starts, sending the organ-like notes of a kokako out across the misty valley. The group listens, hearing only the call of the bellbird, then the real star of the show responds. Hesitantly, hopping through the branches of a tall tawa tree, calling softly, is Barley Magrew, one of Mapara's 100-plus kokako. Close behind him his mate Mohawk.

How is it that these beautiful birds survive and are increasing in this mainland reserve, while the kokako's two close relatives, the huia and tieke (saddlebacks), have either disappeared for ever or are restricted to offshore islands?

The story starts here, in the King Country.

In the 1970s, public concern about the logging of ancient podocarp forests and its effect on the endangered North Island kokako was increasing. Fundraising by Forest and Bird members paid the salary for a young scientist, Rod Hay, to study the behaviour and ecology of kokako in

JOHN INNES

IAN FLUX

# ISLAND KOKAKO

## *the cutting edge*

King Country and Bay of Plenty forests. Hay's three-year study, and that of his Forest Bird Research Group colleagues, found that kokako populations were declining due to loss of habitat, and perhaps competition and predation from introduced mammals. Eventually public protest stopped logging in most of the North Island's indigenous forests – but still the kokako populations declined. The bird's habitat seemed safe but some other agent or agents in their forest homes was affecting its survival.

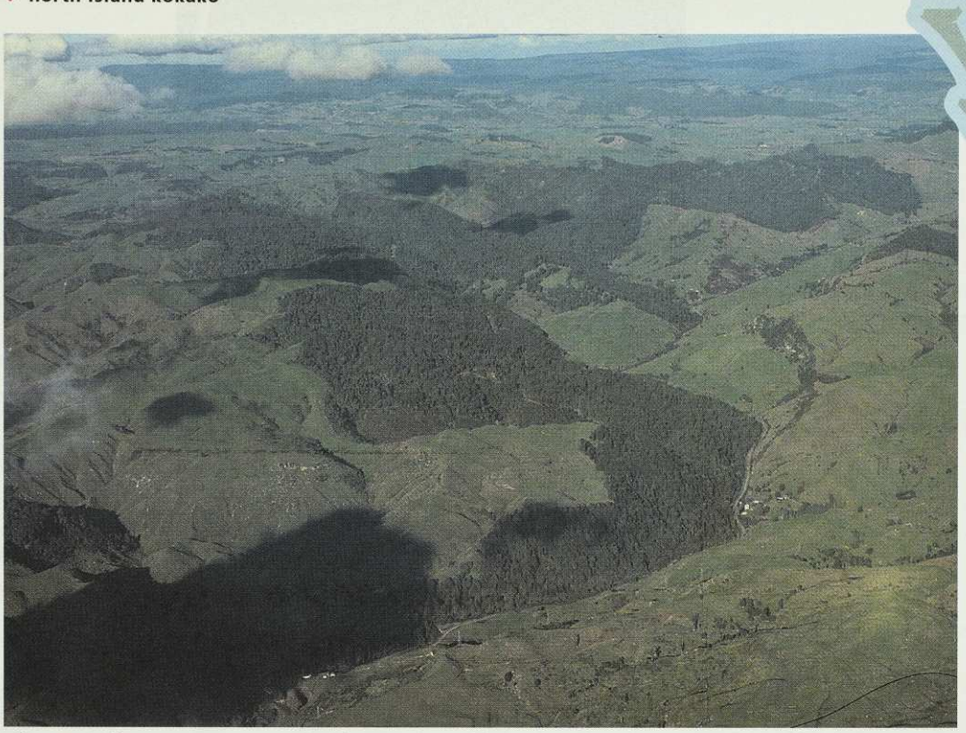
A kokako workshop in 1988, convened by the newly formed Department of Conservation, looked at ways to reverse the decline. It was at this key meeting that the now famous Research by Management concept was first discussed and agreed upon (see box page 15). A recovery plan involving a "recovery group" of key people with specialist knowledge of kokako was also developed. Completed in 1991, the plan became the first in New Zealand for a threatened species (see article by Gretchen Rasch in *Forest & Bird* May 1992).

TO SAVE THE kokako, managers first needed to know what was causing the decline. Why were kokako populations continuing to decrease in large unlogged forests such as national parks? Predation seemed likely, but who were the predators? Were the birds too old and just not trying to breed? The work of Rod Hay and others provided another suggestion. An extensive dietary overlap was discovered between possums and kokako and it seemed that kokako populations had decreased in forests as possum populations increased. Perhaps competition with introduced browsers was causing food shortages for kokako?

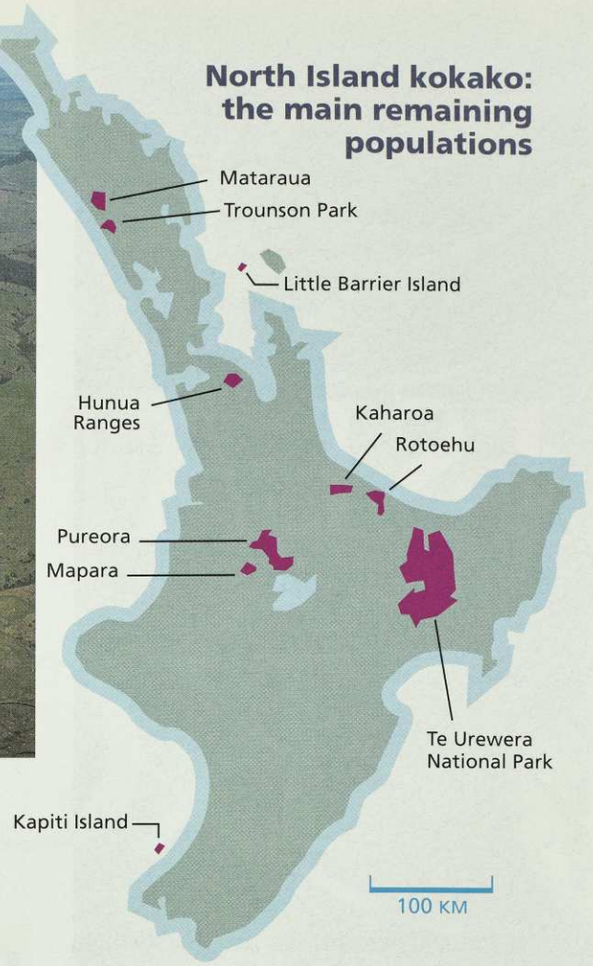
Guided by the 1988 workshop, Landcare Research and DoC quickly embarked on two ambitious research programmes. In one, kokako breeding attempts and their outcomes were closely monitored for four years at Rotoehu in the Bay of Plenty where mammal pests were abundant. The second, the Research by Management programme, compared the breeding success and adult density of kokako in Rotoehu with that in two other forests – Mapara and Kaharoa – where introduced pest mammals were controlled.

At Rotoehu, most pairs (60 to 70 percent) attempted to nest each year with the same pairs trying each year. While researchers were checking to see if there was a difference in weight between breeding

PHIL BRADFIELD



*The 1,400-hectare Mapara Wildlife Reserve is often described as an "island of forest in a sea of pasture". Managing isolated forest pockets has some advantages over managing larger forest blocks – ship rats and possums probably reinvade at lower rates than when the block is surrounded by forest. Pests at Mapara have been intensively managed since 1989. In this time kokako numbers have more than doubled, from fewer than 50 to more than 100.*




and non-breeding pairs (which might have indicated food shortages) they got an unexpected surprise. There was no weight difference, but in non-breeding pairs it appeared (from leg measurements) that both birds were males. Little wonder that these pairs weren't attempting to breed.

Sadly 83 percent of the Rotoehu nesting attempts failed, mostly due to predation at nests. The innovative use of video cameras revealed the culprits as ship rats, possums and harriers (see box page 17). This explained the low success of breeding attempts and probably the male-male pairings – loss of females on nests was causing an excess of males.

The identification of possums as nest predators was startling. Additional evidence came from the distinctive feather pellets that possums spat out after being fed road-killed birds. These pellets matched others found after predation of kokako adults and chicks.

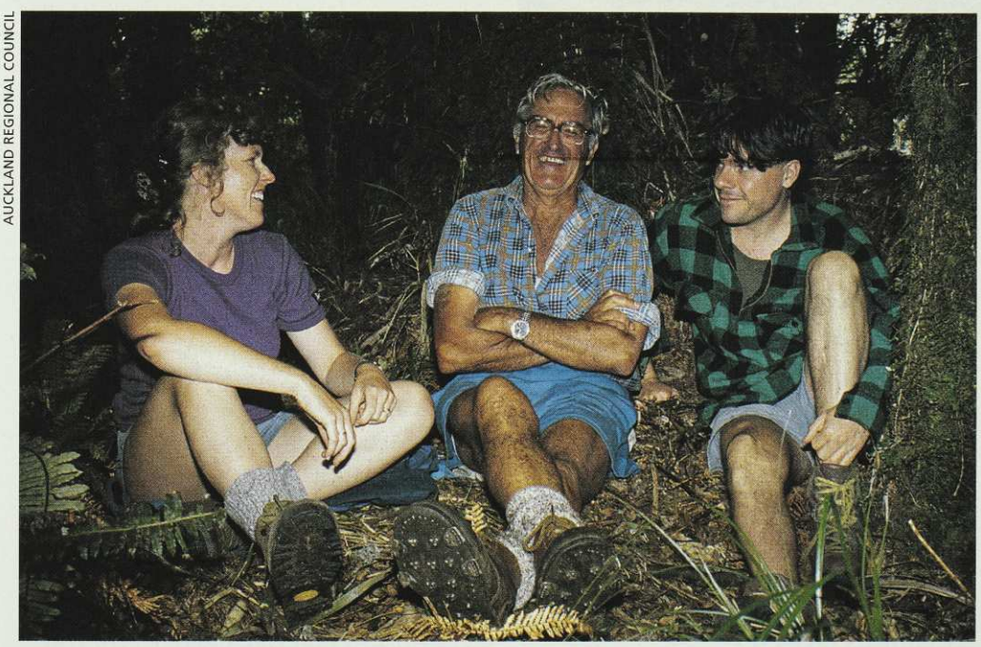
This was exciting news for all involved – possums were kokako predators as well as competitors. Possums and ship rats were part of the suite of introduced mammals being controlled in two of the Research by Management blocks. Would their control halt the kokako's decline in the managed blocks?

The answer was yes, but it didn't come straight away. After three years of management the kokako population at Kaharoa

## Kokako facts

- North Island kokako *Callaeas cinerea wilsoni* is one of three members of the ancient New Zealand wattlebird family. Of the other members, the huia is extinct and the saddleback is confined to offshore islands.
- bird of unmodified lowland forests, particularly mixed hardwood, podocarp and kauri forests.
- 38 cm long; a weak flyer with a rich flute-like song.
- mainly vegetarian: a wide range of foliage, flowers and fruits, and sometimes small insects.
- total numbers around 1,000 in scattered populations; as an inhabitant of dense forest interiors, its decline was not widely noticed until the 1970s.
- South Island subspecies *Callaeas cinerea cinerea* (distinguished by orange rather than blue wattles) not been sighted for many years and is presumed to be near extinction (see page 6).

AUCKLAND REGIONAL COUNCIL



*Brenda Greene (Auckland Regional Council), Brian McClure (Watercare; centre) and David Rodda (DoC) celebrate the arrival of three kokako chicks in the Hunua Ranges in 1995, after intensive pest management. These are the first since Brian saw chicks in the Hunua in 1985.*

(also in the Bay of Plenty) had the same high chick output as Little Barrier Island's and in 1992 it was the only mainland kokako population known to be increasing. The proportion of the population in pairs increased from 64 percent in 1990 when management started, to 100 percent in 1993, and the number of pairs more than doubled. In 1993, management at Kaharoa was switched off to see if chick output would decline as rat and possum numbers increased. It did, and last season (1995-96) no chicks fledged at all.

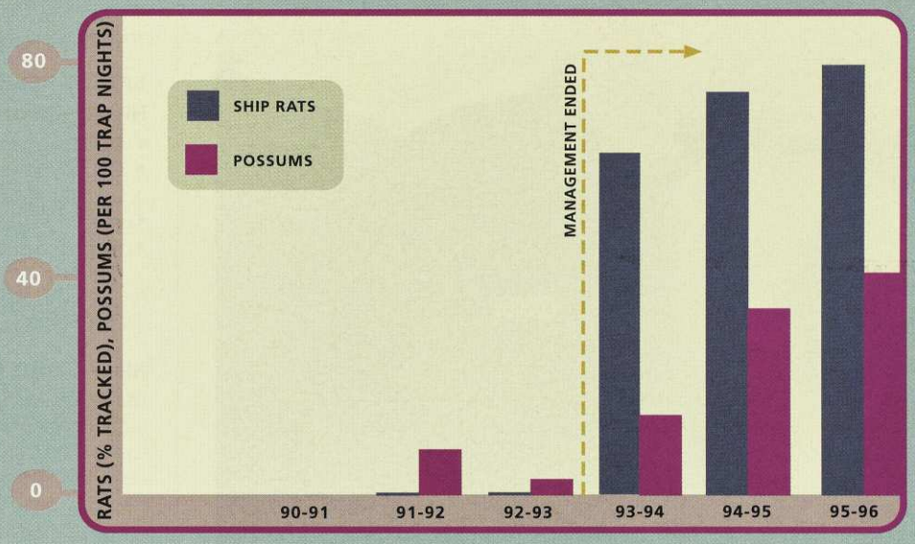
In the other managed forest of Mapara, in the King Country, there was little obvious success at first. Kokako numbers actually fell in the first two years of management and it seemed that only a handful of pairs were actually trying to breed. On the surface things were grim but DoC's Te Kuiti Field Centre staff persevered, encouraged by the success of a few successful pairs. Slowly the investment began to show returns. In 1990-91, five birds fledged, then seven the following year, then 15 more . . . Fledgling survival, at 80 to 90 percent, was remarkably high,

## Research by management – the way of the future

UNDER "Research by Management" (RbM), management procedures are used experimentally to test an idea. All it takes to combine management with research is to use standard, reliable methods to monitor the outcome of the management action.

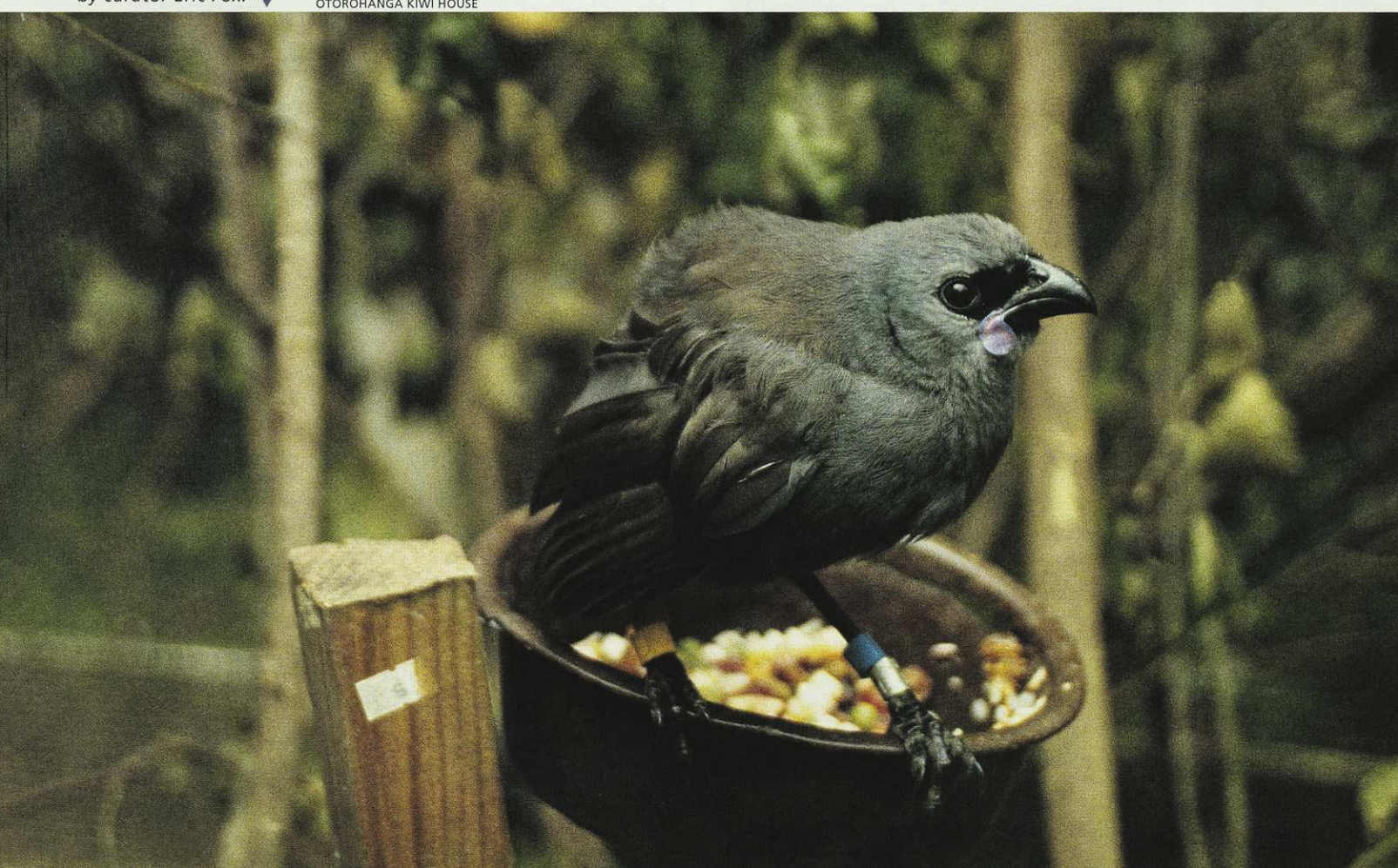
With North Island kokako, two treatment blocks – Mapara and Kaharoa – were subject to "maximum practicable" control of pest mammals (goats, pigs, ship rats, possums, mustelids and feral cats). In another, non-treatment, block – Rotoehu – pests were not killed. The kokako and pest populations were monitored in the same way in all three blocks.

RbM is special because it allows us to get on with managing systems while studying and learning more about them. It also combines the strengths of conservation managers and scientists to produce reliable scientific knowledge about the causes of kokako decline, while at the same time protecting kokako populations.




*Ship rat and possum abundance at Kaharoa, during management and once management had ceased. During the period of management, both ship rats and possums were kept to low numbers. Once management ceased, rat numbers increased immediately and significantly; possum numbers also increased, but more gradually.*

*"Freefall" was recovered from Mapara Wildlife Reserve after falling 32 metres from her nest. In this photo she shows the lilac wattles and brown-tinged plumage characteristic of teenage kokako. She is now fully adult, and still in residence at the Otorohanga Kiwi House after hand rearing by curator Eric Fox.* ▼ OTOROHANGA KIWI HOUSE



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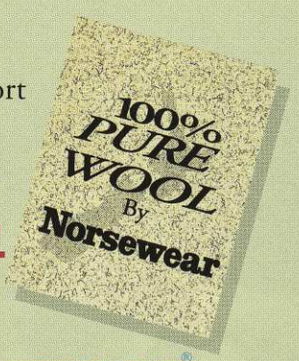


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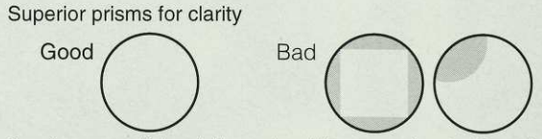


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## Who dunnit?

IN THE UNMANAGED forest of Rotoehu, 60 to 70 percent of kokako pairs were nesting each year, but most attempts were unsuccessful. To find out what was happening at the nests, researchers put 19 nests under 24-hour infrared video surveillance.

The cameras revealed the eating of eggs by ship rats, and of eggs and chicks by possums and harriers. Occasionally ship rats and possums were beaten off nests by protective females, or did not attack chicks when they had the chance. Nests often received visits from more than one predator, leaving a confusing trail of evidence behind.

One month of video surveillance at a single nest revealed this sequence of events:

- seven rat visits (all fought off by the female),
- a possum visit (it didn't eat the chicks for unknown reasons),
- two more rat visits,
- a harrier attack – one chick was eaten, the other jumped out of the nest and later died on the ground,
- two scavenging visits by rats that night, and finally
- a second scavenging visit by a harrier the next day.

JOHN INNES

*Time-lapse video provides an unmistakable identification of night time predators at forest nests. The extraordinary discovery that possums eat kokako eggs, chicks, and probably adults has caused a re-examination of historical correlations between the spread of possums and the decline of kokako. Here, at a kokako nest in Rotoehu Forest, is the first filmed possum predation sequence on a forest bird nest in New Zealand.*

Even in areas such as Mapara with intensive pest mammal management, a few kokako eggs and young disappear without trace. It is hoped that video surveillance of nests will continue to help solve these mysteries.


SUE MOORE

*Since 1990, Jeff Hudson (left) and Grant Jones – possumers turned kokako addicts – have surveyed large areas of Te Urewera National Park and located more than 600 kokako. The sprawling forests of Te Urewera contain more kokako than all other sites combined, but the numbers are in decline. The large area creates special problems for kokako managers trying to limit pest impacts.*

the new recruits were soon forming new breeding pairs, and after three years the population decline was reversed.

By the 1994-95 summer, 18 breeding pairs were established and it seems that the copious forest fruit production of the preceding spring triggered an overwhelming breeding response. That season for the first time on record, all kokako pairs that attempted to breed were successful, half of these went on to fledge two broods of chicks, and one even fledged three. A stunning 54 fledglings nearly doubled the population and a community of birds in decline had now been truly rejuvenated.

Careful research on banded birds by Ian Flux (the current recovery group leader), Phil Bradfield and others suggests that the slow start at Mapara was, as at Rotoehu, due to a shortage of females and that 75 percent of pairs were male-male. The number of male-female pairs has increased sixfold to 29 since management started in 1989, thus hugely increasing the reproductive potential of the Mapara population.

In 1994-95, as a treatment switch in the Research by Management experiment, pest control was initiated at Rotoehu. That season 40 percent of monitored pairs fledged young, the highest recorded in the five years of study there. This soared to 66 percent the following (1995-96) season, when pest control was more effective, and

## Island transfers

ALAN JONES

*The last Great Barrier Island kokako before its transfer to Little Barrier Island. The bird was farewelled by Ngati Wai kaumatua Arthur Toki. Sid Marsh, who is holding the bird here, described the ceremony: "As the Maori words flowed from Arthur's mouth, talking directly to the kokako opposite him, the surf boomed in the background and small flocks of kaka flew and 'kraaked' inland. A waiata was sung, and in this sacred atmosphere I could feel the goose-pimples on the back of my neck."*

THE SUCCESS OF kokako management on the mainland is good tonic for New Zealand conservation. However island strongholds still have a key part to play in the kokako story. With present technology, mainland areas will always require management to keep pest numbers low. On offshore islands, once pests have been eradicated, it is far less likely they will reinvade.

In the 1980s, the first new island population of kokako was established on Little Barrier. The first Little Barrier Island kokako were rescued from central North Island forests that were being felled. The birds have done well in their new home, and have a high chick output.

In 1994 the last Great Barrier Island kokako were transferred to Little Barrier. It is hoped that the two birds will find mates and perpetuate their ancient and possibly unique bloodline.

Another island population is being developed on Kapiti Island. Initial attempts at populating the island used single birds – remnants of old populations. After years of isolation, these birds didn't respond well to taped calls and were difficult to catch. Besides they are apparently mainly old males – not an ideal start for a new population. More recently, kokako from Little Barrier Island and captive-bred birds from Mt Bruce Wildlife Centre have been released on Kapiti. At present there are still few breeding females on the island. DoC now plans to transfer some of Mapara's "teenage" females to get the Kapiti population firmly established.

The next island in the queue is the recently revegetated Tiritiri Matangi. It is likely that birds from Mapara's growing kokako population will also be used to establish this new population. It will be interesting to see how kokako react to the dense young plantings here.

hopes are high for even better success in the coming season.

The success of kokako research and management is a tribute to the effectiveness of the Kokako Recovery Group.

"The group's success is really due to two things," says Paul Jansen who led the group from 1992 to 1995 and who now heads the Kakapo Recovery team. "First, the whole programme has a very sound scientific basis with realistic objectives. Second, we made a real effort to be inclusive and involve all the field people who are directly involved with the birds. This pays huge dividends since everyone knows what is going on and is more enthused about the recovery process."

MOST REMAINING kokako forests are now being intensively managed to protect their precious inhabitants. The Research by Management experiment isn't over yet but the preliminary results have already helped wildlife managers. We now know what is causing the decline (mainly ship rats and possums) and how to reverse it (control them to very low levels). Management techniques are constantly being refined.

The survival of kokako in the North Island to the present day indicates that annual pest control is unnecessary to maintain populations of such a long-lived bird. At Mapara, formal Research by Management will finish after one more season but management will continue. DoC will now turn off much of the pest control for a few years. This "pulsing" will give the Mapara forest a rest from the heavy poison use of the last six years and allow DoC staff to work on other high priority projects.

Intensive management has now started in Northland. In the swamp maire and damp ridge forests of Mataraua, bait stations and leg-hold traps are being used to reduce ship rat and possum numbers. Three pairs of kokako nested last summer, successfully raising four to six chicks.

At Trounson Kauri Park a new kokako area is being created. DoC staff hope to "mop up" isolated Northland kokako and move them here to a new safer home. So far two kokako have been transferred and are being monitored; more transfers are planned. Other threatened native species such as kiwi and kauri snails will also benefit from the intensive mammal control underway in the park.

In Auckland, DoC and the regional council are working together to protect kokako in the Hunua Ranges. Council resource scientist Brenda Greene says that in recent seasons only one of the five pairs that are currently being protected has been

recorded breeding. It may be that only one female remains in the population.

"DoC's now got funding to band the birds this season; that'll be a really significant step," commented Greene. "In five years we've gone from having no management in the Hunua Ranges to one of the most intense management regimes you can have."

In the early 1990s, Whakatane DoC contractors Jeff Hudson and Grant Jones surveyed most of the northern half of Te Urewera National Park for kokako. They covered around 60,000 hectares, mapping the birds and developing a new kokako survey method as they went. Their work revealed that Te Urewera, with at least 600 birds, is home to more kokako than the rest of the North Island in total.

But even here, in the largest remaining chunk of North Island kokako habitat, numbers are declining. A survey of Te Ikawhenua Ranges in 1993 counted 187 kokako; a return trip in 1995 found less than 50.

Pete Shaw, manager of the new Te Urewera mainland island project, says the kokako decline mirrors the arrival of possums in the area. Shaw, Hudson and Jones have instigated predator control to protect the remaining birds in key areas, and they are hopeful that kokako productivity and survival will increase this coming season.

Back in the King Country, local members of the New Zealand Native Forest Restoration Trust and the Otorohanga Zoological Society are protecting 650 hectares of Mangatutu forest (in north Pureora) and last season witnessed the successful fledging at least ten kokako chicks.

Nearby, in the Waipapa Ecological Area of Pureora, DoC has set up another protected area. Monitoring and protection here are being specifically designed not just for kokako, but for a range of threatened species, including *Dactylanthus* and kaka.

FROM THE EARLY days, the kokako work has been relatively well funded, due to high public interest, support from the top levels of DoC and generous corporate sponsors. Tasman Forestry funded pest management and monitoring at Kaharoa during 1990-1994 and, now, State Insurance and Norwich Union Ltd actively funds many aspects of kokako management through the DoC/Forest and Bird Threatened Species Trust.

This sponsorship provides funding for the recovery programme including video surveillance at nests, the reintroduction of kokako to Trounson Kauri Park and monitoring of Kapiti Island kokako. "It's a win-win situation," says the general manager of State Insurance, Malcolm Hill. "Our sponsorship helps the kokako, helps New Zealand's environmental future, and hopefully gives us some positive publicity."

Unfortunately for some North Island kokako populations, the management has come too late. Kokako populations in Taranaki, Whanganui, western Waikato, the Coromandel and Great Barrier Island have already dwindled to extinction or a handful of single birds. Some of these birds have been transferred to offshore islands (see box page 18). Others remain, alone in their ancient territories, sad vestiges of what were once thriving populations.

SUE MOORE

*Improvements to bait station design have been a crucial part of increasing the effectiveness of ship rat and possum control in kokako recovery programmes. This "Philproof" bait station was developed by Phil Thomson and is about to be checked by Dale Williams at Rotoehu in the Bay of Plenty.*

JOHN INNES

*Contract field worker Rachel Shorten ascends seven climbing ladders to see why a kokako nest failed at Rotoehu. Not everyone can cope with the heights. Even with skilled climbers not all nests can be reached because the climbs are too dangerous.*

*Suzanne Clegg and Phil Bradfield with one of more than 150 kokako banded at Mapara Wildlife Reserve in the past seven years.*

IAN FLUX

DEPARTMENT OF CONSERVATION

*Suzanne Clegg (DoC Te Kuiti) uses point height intercept equipment to determine how the forest vegetation is recovering in response to animal control at Mapara. Pest control undoubtedly benefits the entire forest community, even though in this case it primarily targeted kokako.*

WHAT LIES AHEAD for the North Island kokako? We've won some of the battles, but what about the war?

Over the next year a revised recovery plan will be written. Managers are now confident that they can protect kokako in medium-sized (1,000 to 3,000-hectare) blocks. The recovery group is looking towards sustainable management for much larger areas and longer time periods. Future research and management will look at sustaining kokako over tens of thousands of hectares in the few remaining very large forests, especially Te Urewera. Eventually places such as Whanganui, from where kokako have disappeared, may again be home to this charismatic songster.

Whatever happens, the commitment and enthusiasm of the many people involved in kokako recovery has always remained high. Many early workers of ten to fifteen years ago like Rod Hay, Hazel Speed, Phil Bradfield, Gretchen Rasch, Rhys Buckingham, Dave King, Dale Williams and Alan Saunders are still involved. Forest and Bird remains actively supportive and currently administers the kokako Threatened Species Trust. Finally a huge debt is owed to the many dedicated field staff who have painstakingly undertaken pest control in these mainland restoration projects.

The future is looking brighter for Barley Magrew, Mohawk and other North Island kokako. ◆

SUE MOORE *is completing a post-graduate Diploma in Wildlife Management, on study leave from DoC's Te Kuiti Field Centre.* JOHN INNES *is a scientist at Landcare Research, Hamilton. He is scientific coordinator of the kokako Research by Management programme, and was a founding member of the recovery group.*

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# what's wrong with our fisheries

**New Zealand's fisheries are still being exploited for short-term gain and not long-term sustainability. MARK FELDMAN looks at the disaster of the Canadian cod fishery and how we can avoid continuing down the same road.**

# short sight

FIVE HUNDRED years ago John Cabot discovered the world's richest fishery – the Grand Banks off the eastern coast of Canada.

For the next four centuries, communities devoted to cod fishing sprung up all along the coast of Newfoundland, Nova Scotia and New England as the Grand Banks were fished from small boats using handlines and pots. Humanity made little impact on the cod populations over that time: the Banks provided regular and seemingly permanent food and income for hundreds of thousands of people. There were occasional bad years, and the North Atlantic was always treacherous, but the communities and the cod continued to prosper.

Then technology upset the balance of life along the Banks. Diesel engines, nylon fishing nets, power haulers and sonar changed everything. Cod were no longer able to escape or spawn freely, and their populations began to drop. As the cod declined, technology continued to improve and fishers were able to catch more fish even though there were fewer in the water.

Finally the fishers developed the ultimate weapon – the pair-trawler. These two diesel-powered 20-metre trawlers were able to drag a huge nylon net between them and vacuum up every living thing in their path. By 1992 the cod were gone, the world's richest fishery was closed and remains so. It is doubtful the cod will return in our lifetime.

As well as being an environmental disaster, 50,000 Canadians are out of work, millions of dollars invested in boats, processing plants and distribution systems have been lost, and the social fabric of hundreds of communities has been destroyed.

In this age of environmental awareness, how could an advanced nation like Canada manage a valuable resource so badly? Its cod fishery was controlled through a quota system like ours, it had plenty of fisheries scientists, and management systems in place that were as good, if not better, than our own. Despite all this, the Canadians destroyed their most valuable fishery. If we examine some of the blunders of the Grand Banks it will be easy to see how close we are to following the same path.

WHEN FISH ARE managed under a quota system like New Zealand's, a Total Allowable Commercial Catch (TACC) is set by the government each year. The TACC is the total weight of fish that commercial boats are allowed to catch. But, in practice, no one measures how many fish are actually

MALCOLM FRANCIS

caught unless Ministry of Fisheries observers are on board. What is measured is the number of fish that are brought into port. The difference between what's caught and what's landed at the dock is waste, and there's lots of it.

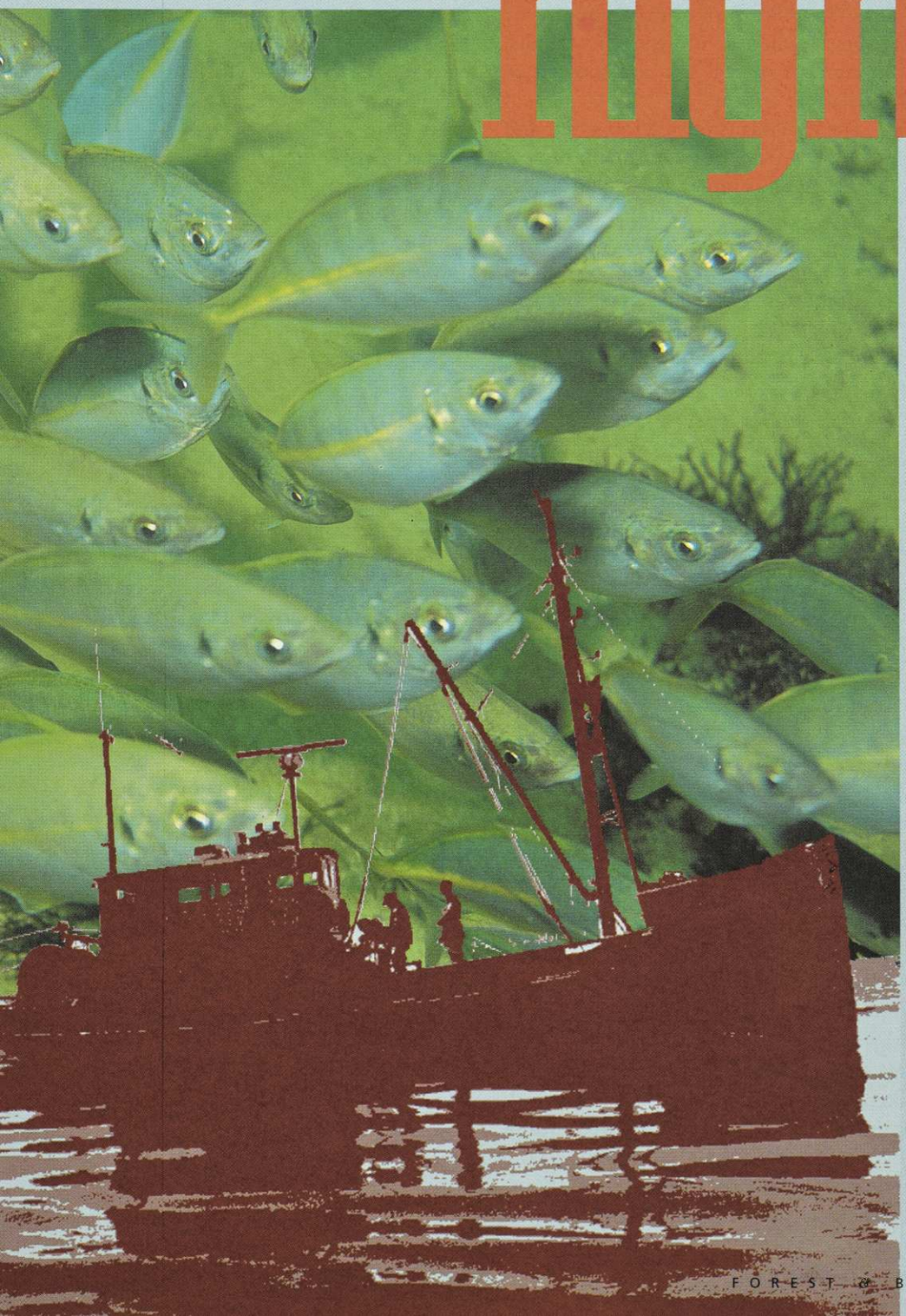
No one paid much attention to how the Canadian cod were caught. Methods that are extraordinarily wasteful, like pair-trawling and gill-netting, were poorly regulated. The result was that tonnes of undersized cod and other, unwanted, species were shovelled overboard after each tow of the net. When the catch was weighed in at port the dead, rejected fish were, of course, not counted in the quota.

The same thing is happening in New Zealand. Trawlers can capture huge numbers of fish with each tow. The fish that are caught first are jammed against the net and subjected to tremendous pressure as more fish build up within the net. These fish are damaged and have reduced market value. In addition, many young, undersized fish are trapped later in the tow because the bigger fish have clogged up the holes in the netting. Estimates of waste are around 20-30 percent – for every ten tonnes of snapper landed from a trawler another two to three tonnes of damaged and undersized fish are thrown overboard. Fishers can't take the undersized fish into port and don't want the damaged fish.

The Ministry of Fisheries has attempted to reduce the waste by regulating the mesh size and design of the trawl nets, and banning the trawlers from areas where juvenile snapper are known to live in large numbers. But the fishing industry has fiercely resisted.

Another problem is a practice known as "high-grading" where high-quality, high-value fish are selected out. A snapper that weighs between 1.2 to 3.3 kilograms will fetch more money per kilo than a fish that's bigger or smaller. When fishers have fixed quotas they want to get the maximum money for their limited catch, so they are tempted to only land the fish that are within the ideal size range and throw back the less desirable fish.

# high risk

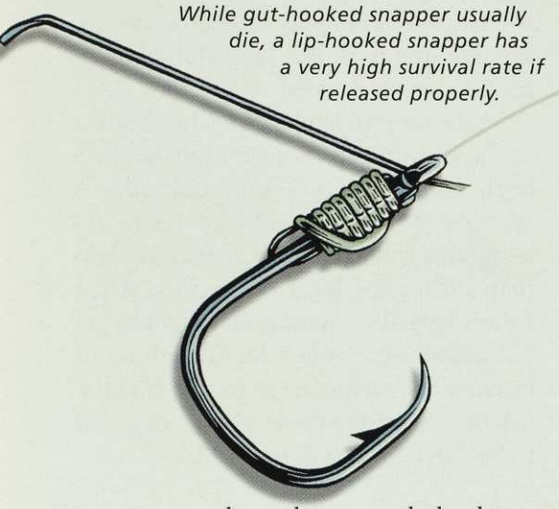


A study by the Ministry of Fisheries has shown that high-grading is common in the snapper fishery – particularly with longline fishers. Some of the rejected fish do survive because being hooked on a longline is less traumatic than being crushed in a trawl net, but the death rate is still high.

Solutions to the high-grading problem are possible. One easy one in longline fisheries is a hook designed by Paul Barnes of Auckland. Paul's hook would prevent gut-hooking (which usually kills the fish) and increase the survival rate dramatically. Earlier this year Doug Kidd indicated his support by funding research into the hook's effectiveness.

Another possible solution is to force longliners to use larger hooks so small fish cannot be caught. This would mean higher bait costs and a lower catch rate but it would save wasting hordes of small snapper. Since small snapper tend to live in shallow water, the catch of small fish could be reduced by closing all shallow areas of the inshore fishery to longliners.

Of course, if rules on hook size or style were introduced, their use would also apply to all amateur fishers. The recreational sector takes about a third of the



*Paul Barnes' anti-gut hooking appendage fitted to a standard commercial longline hook would save millions of rejected snapper from being killed. The wire projection prevents small fish from swallowing the hook. While gut-hooked snapper usually die, a lip-hooked snapper has a very high survival rate if released properly.*

snapper caught each year and also has a considerable waste problem, killing many thousands of small snapper each year because they're gut-hooked by inexperienced fishers using small hooks.

LET'S RETURN TO the story of the Canadian fisheries disaster and see how much the scientific errors they made are like the ones we are making right now. To understand how fisheries scientists got things so wrong we need to know a little about how they do their job.

Fisheries science is not easy. You can't just go out and count fish the way you can count sheep. Even if you survey part of the ocean there's no guarantee the area you survey will be typical. Fish tend to concentrate in pockets to spawn, feed or rest; the areas and times they choose to do these things can vary from year to year. Making things even more difficult is the fact that baby fish, the ones that will keep the fishery going in future years, usually live separate lives from the adults, eating other things in other places.

The survival of the young (called recruitment) is a critical issue. Without knowing how the young fish are doing it's impossible to decide how to manage the adult fish that are available now. In a healthy fishery many millions of eggs are laid; so many that the number of fry that survive has more to do with the right water temperature and food supply than the number of eggs laid. But in a damaged fishery – like our orange roughy or snapper – where there are very few adults, the number of eggs that are laid can be much more critical.

The Canadians missed this point and didn't keep track of recruitment. Instead they relied on complex mathematical formulas that predicted future stocks based on trawl surveys. The formulas that fisheries scientists use are based upon a series of assumptions (like constant recruitment and constant mortality) which are now known to be unreliable. The Canadians relied on the formulas and lost a fishery.

Unfortunately the same thing is happening here. We depend on these complex formulas to make our fisheries decisions because it's much cheaper to do the maths than get out and survey the fish. To understand just how bad it is you need to know a little more fisheries science. The state of a fishery is measured by the biomass – the tonnes of a species in the water. The biomass is expressed as a percentage of the tonnes of fish that were in the water before humans started catching them in a big way and disturbed the natural balance.

An undisturbed fishery has a biomass of 100 percent. A fishery that's well managed and has good recruitment would have a biomass between 25 percent and 50 percent. The orange roughy fishery off the Chatham Rise has been reduced after less than two decades' exploitation to a biomass of 13 percent; the snapper fisheries in the Hauraki Gulf and Bay of Plenty only have a biomass of 12 percent – just half of what they need to sustain themselves over the long term. These fisheries are perilously close to being unable to produce enough young to sustain themselves. A few years of bad weather, continued killing of young fish though wasteful fishing, disease and/or continued poaching could easily lead to a crash and the loss of these resources for many years.

## A new fisheries law

AFTER FIVE YEARS of debate, including 18 months in front of a select committee, the new 428-page Fisheries Act came into force on 1 October. While the principles in the new legislation are an improvement over the old fisheries laws it replaces, they are still much weaker than the sustainability provisions in the Resource Management Act.

The purpose of the legislation still focuses on "sustainable utilisation" rather than sustainable management of fisheries. This means that the interests of those such as divers and tourists, who in the narrow sense don't "use" fisheries, are generally excluded from consideration.

While the Resource Management Act can deal with many non-use issues up to 12 nautical miles from shore, the focus in the rest of the EEZ will be on extraction and use.

When making decisions under the new Act, the Minister of Fisheries must consider:

- "the reasonably foreseeable needs of future generations";
- "avoiding, remedying, or mitigating any adverse effect of fishing on the aquatic environment";
- maintenance of associated and dependent species;
- maintenance of biological diversity; and
- protection of habitat of particular significance for fisheries management.

The new legislation also requires the minister to set catch limits at a level which will ensure that fish populations or stocks are maintained at or above the level that would support the maximum sustainable yield (MSY).

Depleted stocks – for example northern snapper, Chatham Rise orange roughy or oreos – are required to be restored to the MSY stock level. There is no maximum time period, however, as is required in Antarctic fisheries, within which a stock can be rebuilt. Instead, the rebuilding period is within that "appropriate to the stock and any environmental conditions affecting the stock". In the case of snapper the minister has indicated this is 10 to 15 years.

A major weakness in the new legislation is its public participation procedures. The Act only allows groups selected by the minister to be involved in fisheries management processes. Already the minister has excluded the Marine Sciences Society – the specialist group of experts on marine sciences – from forums where the questions of funding and priorities for marine science research are discussed.

Important changes have also been made to the Marine Mammals Protection Act and the Wildlife Act. The Minister of Conservation, with the agreement of the Minister of Fisheries, is now able to set limits on the number of protected species such as marine mammals and seabirds that can be killed as bycatch during fishing operations. Disappointingly, however, the new Act contains no requirements to move bycatch towards zero.

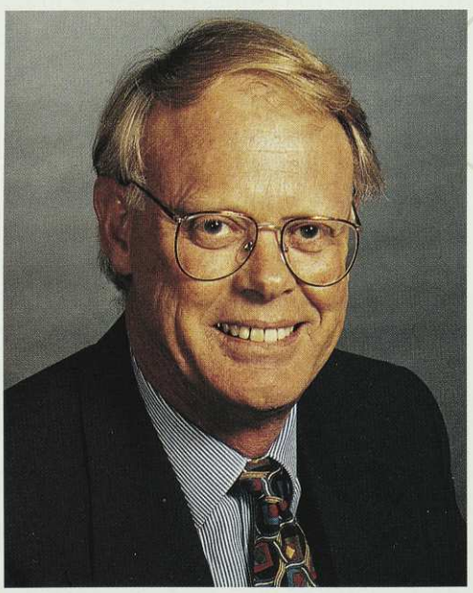
*Barry Weeber*

MALCOLM FRANCIS

*Snapper. In October last year, the Minister of Fisheries tried to close part of the Hauraki Gulf to commercial snapper fishing for half the year because too many baby snapper were being killed. The industry responded with a lawsuit to block the closure and has successfully used legal devices to keep the case before the courts (and the fishery open) ever since.*

Another critical mistake made in Canada was to depend on commercial trawl catches as the basis for research. After using a trawler to gather fish in a net, scientists then count, measure and age the fish. Then they use their formulas to predict the state of the fishery. The trawl surveys by the Canadian scientists revealed very few fish. The fishers argued that the scientists didn't know where to look and should be using the commercial trawl results instead. This was the road to doom.

Commercial fishers are good at one thing – catching fish. As fisheries decline, the fishers always know where the last strongholds will be. Canadian scientists made the error of assuming that the trawl surveys in areas where the fish were concentrated represented the whole ocean. It was a fateful move and one that has also been made here.



*Doug Kidd, a Minister of Fisheries who, despite an aggressive style and an initial antagonism towards conservationists, grew into his job. "The fish come first," he told the author. "A fundamental but so often absent concept around the world."*

For years, commercial fishing lobbyists in New Zealand have been telling us that aerial surveys of kahawai showed that there were heaps in the water. The government scientists at first went along with this line. But, in response to arguments from recreational fishers, scientists began to realise that the aerial surveys only revealed kahawai in a few small areas, probably those where the fish found the best food supply. Even if there were only a few kahawai left, they would still be found in these particular areas.

A similar downhill road is being followed in other fisheries where the total commercial catch or "Catch per Unit Effort" (CPUE) – how many fish the fishers catch per hours of trawling, number of fish hooks, lengths of gill-net etc – is used to determine the health of the fishery. The assumption behind CPUE is simple: if the CPUE is going up the fishery must be healthy, if it's going down something must be wrong.

But there are two serious problems with CPUE. One is that it depends on the industry's own figures. These tend to be unreliable due to bias and sloppy record keeping. But there's a more ominous problem: every year as commercial fishers get better tools, they get better at finding fish. Colour video sounders, massive nylon nets, powerful diesel engines and GPS plotters have made it easier for them to locate and catch their prey. This increases their CPUE even though there are fewer fish in the water.

There are some simple ways to avoid a Grand Banks-style disaster. One is to keep the biomass of fish in the water well above what the formulas suggest, always remembering that only a fool doesn't insure his business. The other is not to rely on statistics from those who have a direct interest in exploiting the resource. The government – the public guardian of the resource – needs to gather its own. This requires money for research (see box page 26) – money the industry would prefer not to part with. This brings us to the last, and most important, cause of the collapse of the Canadian fisheries – the political influence of commercial fishing companies and its effect on scientific research.

TO UNDERSTAND the politics of fisheries management you need to know how a fishery develops. When a new fishery is discovered – like our orange roughy – commercial boats converge on it quickly; they know the easy money is made before the fish are overexploited. By the time scientists begin to study the fishery they are already years behind the fishers.

It takes several seasons to get information on the true state of a fishery; by then the fish are already hurting. It takes more time before officials and politicians act. All the time there is resistance from fishing companies as their lobbyists hammer at the scientists and politicians, pushing for higher quotas. By the time limits are being set on the fishery, the public process is years behind (and seldom catches up). This is the evolution of the "too-little, too-late" style of fisheries management that pushes the fish populations down a descending staircase of sustainability.

This classic pattern was followed with the Canadian cod fishery. Although the fishery wasn't new, the explosive growth and power of the trawlers created the same


ALAN TENNYSON

*Japanese longliner in Wellington Harbour. Increasing technological sophistication has allowed fishers to continue to exploit ever-declining stocks of fish.*

descending staircase as happened in New Zealand waters when trawlers attacked the orange roughy on the Chatham Rise or the snapper in the Bay of Plenty.

In order to try and combat the financial power of the fishing industry, the Ministry of Fisheries has established a well-ordered consultation process. This process brings together the groups interested in the fishery (commercial fishers, recreational and tourist sectors, conservation groups, Maori interests) with ministry officials. The idea is to exchange ideas on how the various species should be managed that year and hopefully come to a consensus. When the process is complete the minister finally makes a decision on the next year's quotas.

The fishing companies can afford to hire their own lobbyists and scientists. Because of all the difficulties in assessing the populations of fish in the sea these "hired guns" are able to argue endlessly with government scientists about their research results, putting tremendous pressure on them. The government scientists are no different from anybody else; they don't like being harassed and hassled about every conclusion they come to. More often than not, the net result of the process is an unbalanced "scientific" conclusion that makes the fishery look better off than it really is.

The consultative process is also corrupted by the financial power of the industry. Their representatives pack the meetings; it's not unusual for there to be a 5:1, or even 10:1, ratio of commercial representatives to those from the other sectors. The industry lobbyists are paid well and are making money while they prepare and sit through those meetings. Everyone else is losing money through having to take time off work. Airfares, motel bills and meals add to the burden.

The fishing industry has had no hesitation about using the courts to achieve its goals. When studies by the Ministry of Fisheries revealed the degree of fish waste from trawlers, the industry tried to block the release of the data by going to court. The industry tried to similarly delay publication of the (unpalatable) results of a ministry study on the frequency of high-grading. When other studies revealed how many baby snapper the trawlers and longlines killed, the industry again used litigation to try to block the release of the information.

Right now the industry is using its lawyers to prevent the Minister of Fisheries from reducing the snapper quota off the East Coast of the North Island. Over a year ago the minister reduced the commercial snapper quota by 40 percent

## We eat them but how much do we know about them?

COST RECOVERY is a major feature of the new fisheries regime. In other words the expense of managing fisheries should be borne as much as possible by those who are making money from them.

An essential part of this management is research into the state of fish populations. It is impossible to make sound decisions about the size of the allowable catch without understanding something about population size, life histories and recruitment rates of each species. Most of this research is funded by the government through levies on the industry. Yet while export receipts from fishing have increased by 30 percent since 1991 to $1,237 million, funding for fisheries research has *decreased* by 37 percent to $14.45 million in the same period.

The effects of the cuts means that many scientists who have left the old Ministry of Agriculture and Fisheries or NIWA – the Crown Research Institute that has taken over the research – have not been replaced, and NIWA has had to lay off a third of the crew from its research vessels.

Despite this massive decline in research funding, the fishing industry has argued over the past two years for further substantial cuts. The effect of more cuts would be to undermine genuinely independent fisheries research and ensure that only the work that the industry finds directly useful would get done. Studies focusing on the environmental impacts of fishing or research into critical stocks such as orange roughy, oreos or snapper would be downgraded.

There are still huge gaps in our understanding of New Zealand's fish populations. Of the 151 stocks at present in the quota management system, there are current biomass estimates for only 12. Of the 91 stocks for which there are sustainable yield estimates, less than 30 are based on scientific analysis with the remainder dependent only on catch-averaging formulas.

There is also insufficient information on many of the key biological parameters needed to assess fish stocks. For example, fish size and rates of growth are known for only half the 51 species covered by the quota system and the age of fish is known for only 19. Yet catch limits are still set for these species.

The fishing industry needs to remember that there are other interests in the marine environment other than those associated with commercial exploitation. The new Fisheries Act brings the environmental effects of fishing onto centre stage and the introduction of more species into the quota system will inevitably require further research.

*Barry Weeber*

in an attempt to save the fishery. The industry sued, the legal process was dragged out and the older (higher) quota remained. This September Doug Kidd set the same lower quota for the 1996-97 season as he'd unsuccessfully attemped to set a year before. Again the industry rushed to court and obtained an interim order setting aside the decision. The industry's case arguing against the merits of the new quota will now not be heard until next March. In the meantime the snapper continue to be overfished.

IF WE WANT TO retain the wealth of our fisheries then changes must be made in how we manage them: a quota system in itself is not enough. Waste must be eliminated through the use of what's called "input controls". Changing the size and style of fish hooks, altering present trawling methods, protecting areas where baby fish live, and eliminating wasteful gill-nets are all input controls.

The scientific process must be modified to improve safety margins. Managing a fishery at or below a biomass of 25 percent is risky. We need more insurance against the danger of error when we have too little research and hard data, and too much dependence on abstract formulas.

The consultative process could be repaired by requiring the industry to contribute to the bills of other sectors. After all, the industry wants to profit from a public resource and it should also have to pay to protect the resource.

But most of all, the core of the problem lies with the boards of our big fishing companies. As long as these "captains of industry" use their financial power to push for maximal catches now, instead of sustainability, the management process will fail.

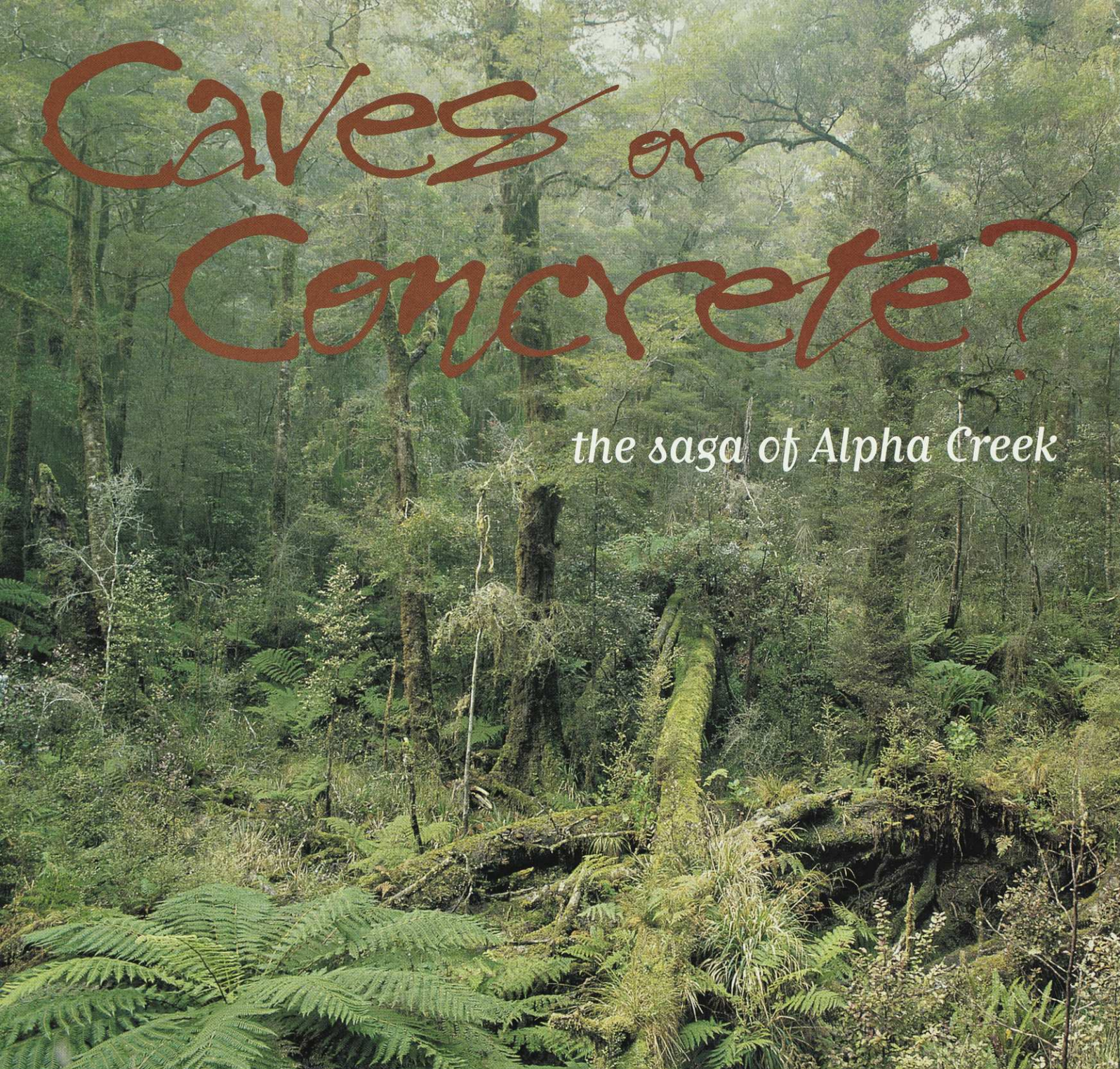
The quota system was introduced with the hope that commercial fishers would care for the resource they had a vested interest in; it didn't work. The industry is still looking backwards, trying to relive the days of big catches and outlandish profits. What we need now is people that look ahead, people who can think and act for the long-term health of the only fishery we will ever have. Brian Rhodes, the former Chief Executive at Sealords, said it best when he left the business in 1994:

"Far too large a proportion of New Zealand's economic community still expends its efforts on finding ways to take value, rather than create value in an organisation. In periods of high inflation and high interest rates, a short-term view of business is understandable, but it's time our financial community accepts that we are now operating in a new business environment which will provide an immense reward for those who are in for the long haul."

MARK FELDMAN *is a doctor and amateur fisherman who writes regularly on fishing and fisheries conservation.*

# Caves or Concrete?

## the saga of Alpha Creek

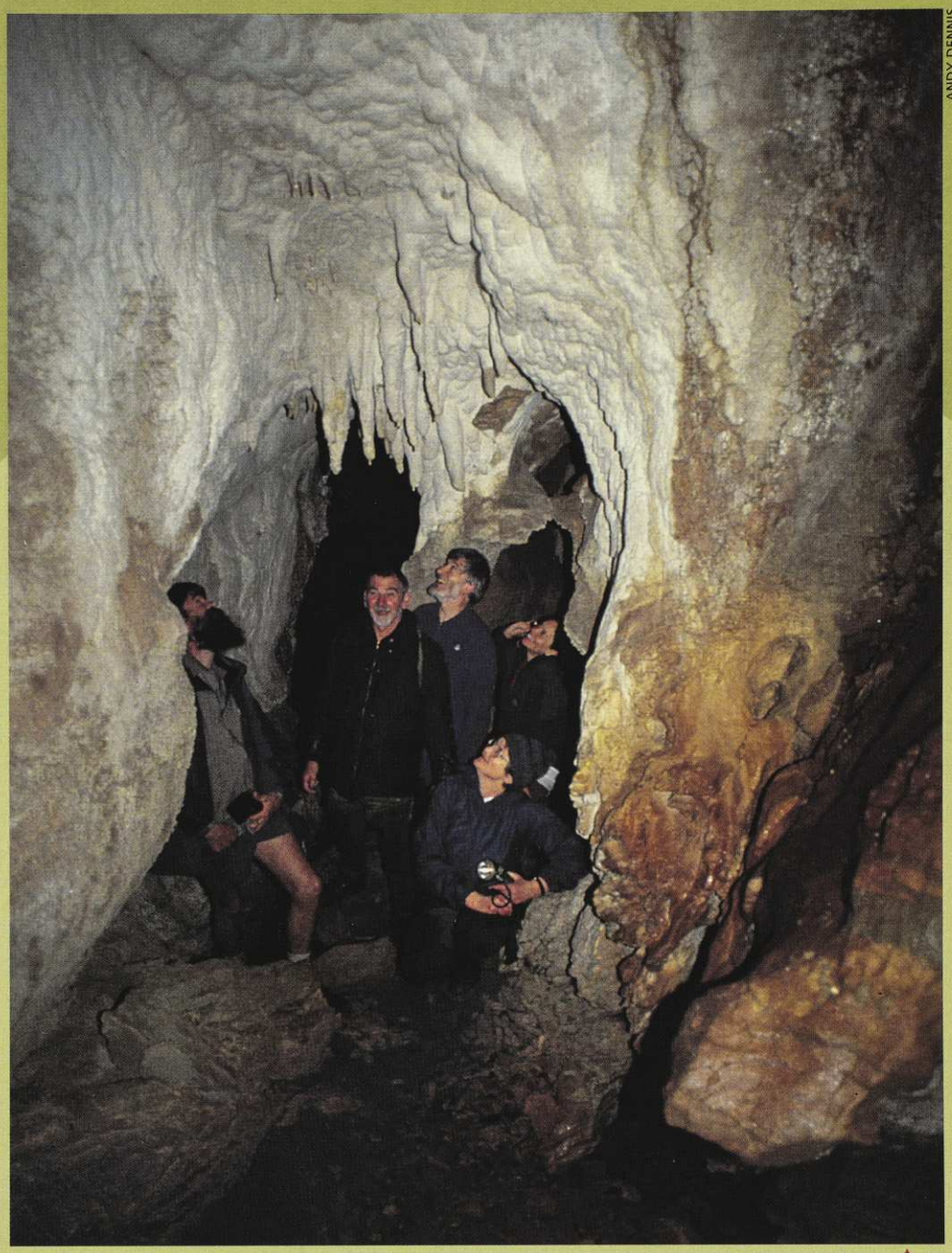


*A canopy of silver beech, treeferns, shrubs and tangles of fallen mossy trunks mask much of the underlying karst surface of the western Paparoa limestone landscape including the entrances to many caves. The rugged and uneven terrain and dense vegetation make exploration difficult and new discoveries an ever-present possibility.*

**The distinctive limestone landscapes of the western Paparoa Range were not fully protected when the Paparoa National Park was created in 1987. Lobbying by cement manufacturer Milburn New Zealand meant that key areas containing sculpted creekbeds, bold limestone bluffs and numerous caves were excluded from the park. The area's future is again controversial as Milburn now seeks planning consent to bulldoze a road for a limestone quarry in Alpha Creek. ANDY DENNIS revisits this intriguing part of the Paparoa – a special area that should finally be given proper protection.**

AMONG THE more exquisite features of the densely forested limestone region west of the Paparoa Range are the small creeks that weave their deeply-carved courses across the tilted plateau which dips inland from the high grey-white ramparts that loom above the Punakaiki coastline. Most

CRAIG POTTON



ANDY DENNIS

*Just inside the upper entrance to Bamboo Cave in Alpha Creek. Bamboo Cave contains two fossilised whale skeletons over 30 million years old and is in the heart of the area which Milburn would have the right to quarry if granted the mining licence and other resource consents which it is now seeking. Left to right are Graham (Chippy) Wood, conservation officer, Punakaiki; Bill Winstanley, former chairman of the Nelson Conservation Board; Phil Wood, guru of caving and cave exploration in the Buller; Chris Winstanley (front), deputy principal of Buller High School; and Deborah Carden, DoC field centre manager at Punakaiki.*

of these creeks once flowed underground and they provide, in both their present form and their habit of frequently disappearing and reappearing, constant reminders of their subterranean origins.

As surface streams, their sculpted beds and banks are now softened by rich coverings of mosses, liverworts, ferns and overhanging forest. It is this combination of lush vegetation and the sculptural effects of patient etching by acidic water on limey rock that makes them the most enchanting of the western Paparoa region's more intimate karst (or limestone) landscapes.

One of the best places to get access to these smaller limestone streams is from the Tiropahi Track, an old bush tramway that follows the Tiropahi River through the coastal limestone hills five kilometres south of Charleston. The track wends its easy mossy way through regenerating beech/rimu forest, with lovely interludes of dark river, colourful granite boulders and high limestone bluffs.

Near the inland end of the track (about an hour from the Greymouth/Westport highway) a number of limestone streams join the Tiropahi's tannin-stained waters – Alpha Creek from the north, and Waggon and Doubtful Creeks from the south. All three contain a superb range of surface karst landforms and, in the case of Alpha and Waggon Creeks, probably more caves within a relatively confined area than anywhere else in the Paparoa limestone country.

IN THE CAMPAIGN to create the Paparoa National Park in the 1980s, conservationists made a strong case for including all of the western limestone region as far north as Ananui Creek (the stream that flows through the Ananui or Nile River caves) inland from Charleston. However pressure from local industrial interests resulted in most of the limestone country between the Nile and Tiropahi rivers being excluded from the park. Despite its containing numerous caves, spectacular gorges and the huge "Hole-in-the-Wall" natural arch, and being generally unsuitable for production forestry, the area was allocated to the state-owned enterprise Timberlands West Coast.

A sizeable enclave was also excluded south of the Tiropahi River in Waggon

ANDY DENNIS

*A section of the Tiropahi (or Four Mile) Track. Following the line of an old bush tramway between a high limestone escarpment and the tea-coloured waters of the Tiropahi River, this track provides easy access through the limestone hills south of Charleston to the Alpha Creek/ Waggon Creek area. The proposed mine access road would run virtually on top of the track for almost half its length and, with around 140 heavy vehicle movements a day, would destroy the general peace and serenity of an exquisite part of the Paparoa limestone country.*

## The chemistry of lime-rich rocks

IN THE ENDLESS cycles of sedimentation, uplift and erosion through which new rocks are created and then worn down as they are exposed to the elements, limestones have come up with a special twist of their own.

Besides being subject to the normal destructive processes of weathering and mechanical erosion, limestones also slowly dissolve in contact with water. This means that the sculptural forces at work on lime-rich rocks have a greater range of tools at their disposal than is the case with other types of rock. Limestone landscapes, as a result, often feature eccentric and extravagant architectural forms both on the surface and beneath the ground.

Limestones are sedimentary rocks in which calcium carbonate (or lime) derived from shells and skeletons of marine organisms provides more than half of the sedimentary ingredients. In contact with rainwater made even slightly acidic by the atmosphere or, far more effectively, by leaf-litter and humus from the forest floor, this calcium carbonate slowly dissolves. Over aeons, water slowly etches its way into joints and other weaknesses in lime-rich rocks creating a range of highly distinctive landforms often reminiscent of the way meltwater carves its way through the heart of glacial ice.

As the process advances, underground channels take over from surface streams; sinkholes and slots become common landscape features; deep gorges and canyons develop with natural arches, overhangs and alcoves; and all manner of weird and wonderful runnels and flutings are etched into exposed surfaces. Much the same kind of thing occurs beneath the ground where shafts, passages and caverns evolve as a result of the combined efforts of dissolution and erosion.

It is here that some of nature's more delicate sculptural talents are manifested in stalactites, stalagmites, shawls, flowstones and other works of natural artistry. These are created as slowly dripping water patiently deposits minute quantities of calcium carbonate that it has picked up earlier in its subterranean journey.

In the western Paparoa region the limestone nearer the coast usually averages less than 70 percent calcium carbonate. Inland, however, these beds dip downward and are overlain by younger strata in which the calcium carbonate component regularly exceeds 90 percent. Alpha and Waggon Creeks both drain through zones of this younger, purer limestone. Which is why they contain such a density of caves and surface karst features. And also why a cement manufacturer like Milburn happens to find them so attractive.

ANDY DENNIS

*Delicate straws and stalactites coated with soft "moon milk" decorate many of the galleries in Name Later cave, a 600-metre network of subterranean stream passages near the western boundary of the Alpha Creek area. While this cave is not likely to be within the immediate mine zone, blasting in the mine could still cause considerable damage to the delicate formations as well as increased sedimentation of the underground waterways.*

Creek where Milburn had identified enough high-quality limestone to keep its Cape Foulwind works supplied for over 100 years at current rates of production.

Notwithstanding its exclusion from the park, the then Minister of Conservation, Helen Clark, indicated to Milburn that she was unlikely to grant mining access to mine Waggon Creek because of its outstanding natural values and status as part of a gazetted ecological area.

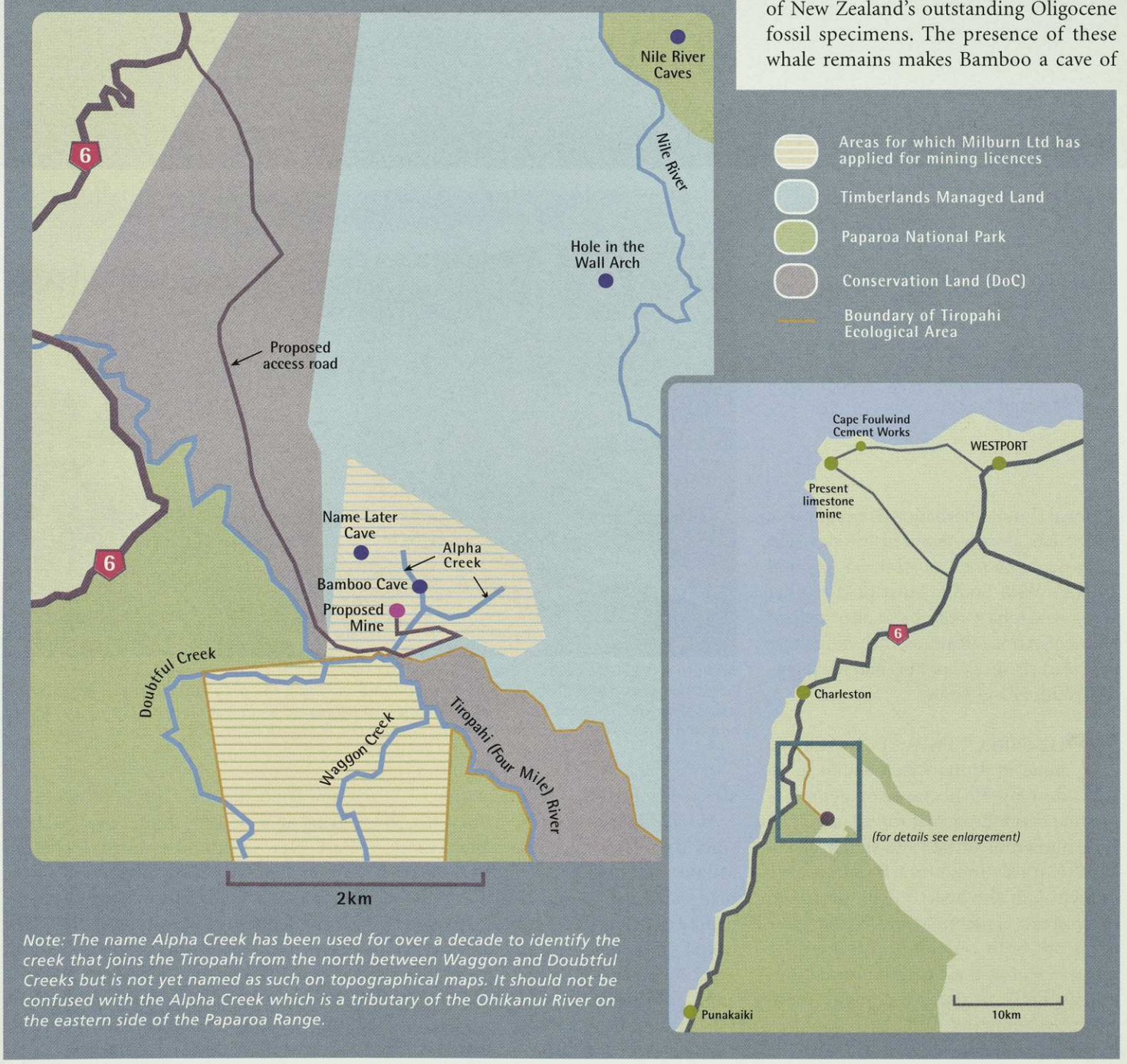
As a result, Milburn turned its attention to the adjacent area managed by Timberlands and, in particular, to Alpha Creek which had been partially logged by the Forest Service. Its natural values were not generally thought to be as significant as those in Waggon Creek, although it was known to contain an interesting range of karst landforms including a number of caves.

Milburn's subsequent prospecting of Alpha Creek revealed enough cement-grade limestone to supply the Cape Foulwind works for about 30 years. With ministerial opinion still favouring protection of Waggon Creek, the company applied for a mining licence over the Alpha Creek deposits in 1990.

At the same time as Milburn was investigating the commercial potential of Alpha Creek, the Buller Caving Group was also devoting more attention to the area. Led by long-time Westport caving guru Phil Wood (see box page 33) a small but dedicated group of local cavers located and explored over 30 separate caves within an area of little more than one square kilometre – many previously unknown. They included one two-kilometre cave system known as Golfcourse and two others, Bamboo and Name Later, that each exceeded 600 metres – the latter containing many passages decorated with stalactites, stalagmites, shawls, delicate straws and large areas of roof and walls coated with gleaming soft white "moon milk".

While Bamboo is less lavishly decorated than Name Later, it contains two fossilised whale skeletons that are at least 30 million years old, the most complete of which includes 14 vertebrae forming a low bridge across a narrow passage. The skull of this skeleton has not yet been located (and is probably still embedded in the adjacent limestone) but even without a skull, the skeleton is one of New Zealand's outstanding Oligocene fossil specimens. The presence of these whale remains makes Bamboo a cave of

**Northern Paparoa National Park and the Alpha Creek and Waggon Creek mining licence applications**




*Note: The name Alpha Creek has been used for over a decade to identify the creek that joins the Tiropahi from the north between Waggon and Doubtful Creeks but is not yet named as such on topographical maps. It should not be confused with the Alpha Creek which is a tributary of the Ohikanui River on the eastern side of the Paparoa Range.*

*Part of the exquisitely sculpted creek-bed of Waggon Creek in the area excluded from Paparoa National Park. Milburn opposes any suggestion that Waggon Creek be added to the park and clearly still has a major interest in its extensive deposits of very high-grade limestone. However, Waggon Creek is part of a gazetted ecological area which means that the consent of the Minister of Conservation would be required before any mining licence could be issued.*

CRAIG POTTON

ANDY DENNIS

*Milburn's limestone mine at Cape Foulwind has supplied the nearby cement works with limestone since 1953. Over 40 years of continuous mining have left a vast open-cast pit covering more than 100 hectares. Some years ago Milburn expressed an intention of returning this mine site to native forest but to date there has been little evidence of on-site restoration work.*

national (if not international) significance and it has already featured in television films made by the Cousteau Society and TVNZ's Wild South. Most of the other caves in Alpha Creek have also yielded bones of extinct creatures, including those of at least six species of moa and the flightless South Island goose.

THE DIRECT IMPACT of a Milburn mine in Alpha Creek would be to destroy 35 hectares of generally pristine beech/broadleaf forest and obliterate numerous surface and subterranean karst features including Bamboo cave (which is in the heart of the proposed mine area). Golfcourse and Name Later caves are both outside the immediate mine zone, but their delicate formations are unlikely to escape damage from sustained blasting and their complex hydrological patterns would also be affected by increased sedimentation.

In addition to the destruction that 30 years of mining would cause to Alpha Creek, Milburn's preferred option for an access road would also have major impacts on the natural character of the area. The road itself would run virtually on top of the Tiropahi Track for about 1.5 kilometres at its inland end, and carry an estimated 140 heavy vehicle movements a day.

At present Milburn's cement works at Cape Foulwind are capable of manufacturing up to 450,000 tonnes a year – about half New Zealand's annual cement production. The works were built in the early 1950s to take advantage of deposits of high-quality limestone in the Cape Foulwind area. Distance to the current mine is less than four kilometres and rock is transported by huge dump trucks along a private road. Transporting limestone from Alpha Creek, by contrast, would

involve a 40-kilometre journey on public roads, including about 20 kilometres of the main Greymouth-Westport highway.

The company is a major employer in the Westport region with 140 of its own staff and at least as many again owing their jobs to the company's presence in the district. Originally a New Zealand company, Milburn is now more than 70 percent owned by one of the world's largest cement manufacturers, the Swiss-based multinational Holderbank. The Cape Foulwind works is the only cement plant Milburn still operates in New Zealand (having closed former works in both Otago and Southland) although the company has substantial offshore interests including a recent $50-million investment in a cement manufacturing company in China.

Milburn's 1990 application for a mining licence for Alpha Creek was lodged just in time to be considered under the old Mining Act rather than the much stricter requirements of the 1991 Resource Management Act. It attracted substantial objections from conservationists. The weight of these objections appeared to have stalled the application at the Planning Tribunal, but Milburn's determination to proceed with the venture was confirmed last year when it applied for resource consents to construct 3.5 kilometres of new road to the proposed Alpha Creek mine site. Since such a road would cross conservation land, Milburn has also applied for an easement from the Minister of Conservation under the provisions of the Conservation Act (see box page 34).

In addition to the significant damage a mine would cause to the scenic, scientific, recreational and historical features of Alpha Creek, there are also serious shortcomings in Milburn's applications for a mining licence and access road consents. Prominent among these is the poor quality of the company's required environmental impact reporting.

No real attempt has been made to investigate the possible presence of rare plants in the area; bird surveys were conducted on only three days in the cold April of a cold wet year; and freshwater research was confined to sampling two sites in the main Tiropahi River on a single day in June, although these were enough to indicate very high freshwater values for a river system in this part of the West Coast.

Bat and lizard surveys were also grossly inadequate – for example no bat detector was used despite the Tiropahi being almost a stronghold for threatened short-tailed bats. And reports on native

## A passion for caves

WHEN YOU GO into Phil Wood's menswear shop in Westport and edge your way through the crowded racks of trousers and jackets to the cavern-like office at the back, you find yourself not in the room where the proprietor does his accounts, but in an archive of limestone and caving information perhaps without parallel in the country.

Phil's fascination with the karst landscapes of the Buller region began almost 50 years ago when, as a teenager, he visited caves in the Fenian area near Karamea and had some of his photographs published in the widely-read Auckland *Weekly News*.

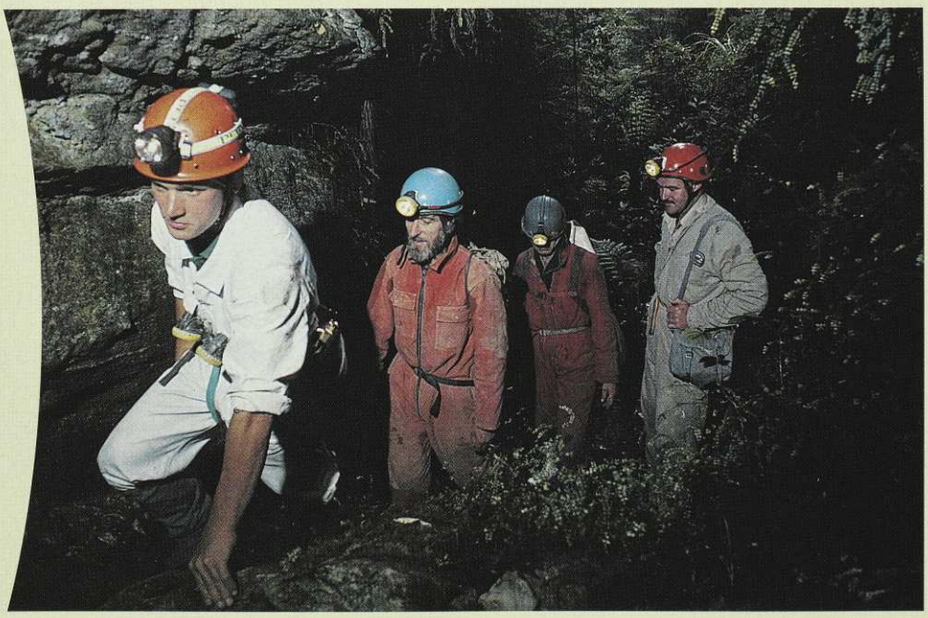
The interest evolved into a dominant passion during the 1970s when, with the Westport venturer scouts, he began systematically exploring the Charleston limestone district. Exciting new discoveries were always a possibility on these journeys and as local interest in caving grew, Phil helped to found the Buller Caving Group in 1979.

Since the early 1970s, in between running his clothing shop and helping to bring up seven children, Phil has discovered, by himself or with others, about 150 new caves in the Buller region. Sixty of these are in the Oparara district near Karamea, with most of the rest at the Charleston end of the western Paparoa limestone belt.

Many of these caves are small and are only of local interest. But others have proved of major importance. Foremost among the latter is the Honeycomb Hill network in the Oparara which contains 14 kilometres of passages and 70 entrances and has yielded subfossil bones of 52 species of birds – 27 of them now extinct and three of them new to science. This collection of bones is the most significant ever recovered from a single New Zealand cave.

In addition to discovering, describing and mapping numerous caves, Phil has tirelessly campaigned to protect what he sees as a highly vulnerable (and non-renewable) part of our natural heritage. He fought for seven years to secure protection for the Ananui (Nile River) caves and catchment near Charleston, and also played a major part in protecting the Honeycomb Hill complex. His 12 years on the West Coast Conservation Board coincided with the long campaign to create the Paparoa National Park, and for the past decade or so he has been battling to protect the caves and karst features of Alpha and Waggon creeks.

It is not easy standing up for conservation on the West Coast, but Phil Wood has been doing it for most of his adult life. As far as caves are concerned, his reasons are simple. "The area is too important as a caving and karst resource to be destroyed by mining," he wrote in one of several submissions on Milburn's Alpha Creek proposals. "Such areas, important for future generations for tourism and enjoyment, and possibly for yet unforecast scientific value, are irreplaceable. These values need to be recognised when evaluating land for mining, against land which may require a little more effort to mine, but does not have the same long-term ecological value."



THE COUSTEAU SOCIETY/PHIL WOOD

*Phil Wood (second from left) with other Buller cavers and one of the Cousteau film team in Alpha Creek during the filming of "Cousteau in New Zealand".*

## Alpha Creek – the legal labyrinth

SEVERAL MINISTERS, local councils and the courts have a say in the future of Alpha Creek's subterranean landscapes.

The proposed mine is on land managed by Timberlands West Coast so any decision on access for mining lies with the Minister of State Owned Enterprises using the commercially focused provisions of the SOE Act, rather than conservation legislation. Publicly, Timberlands has not opposed the mine and has concerned itself only with the way in which forest cleared from the site would be disposed of.

Milburn's proposed road to the mine crosses conservation land. After considering public submissions (yet to be called for) the Minister of Conservation will have to decide whether to grant an easement for the new road. The department is seeking further information from Milburn on the road's likely impacts on vegetation, wildlife and karst systems. DoC's decision on the easement application is important because of the other decisions which are stacked like dominoes behind it.

These include Milburn's 1995 applications under the Resource Management Act to the Buller District Council and the West Coast Regional Council for land-use and related resource consents for the access road. At the company's request the councils have put these applications "on hold" until the easement issue is decided. The Environment Court (formerly Planning Tribunal) may be the final arbiter of the resource consent applications given the strong opposition they attracted from Forest and Bird, Buller cavers, the West Coast Conservation Board and others.

The Environment Court also has to consider the objections to Milburn's 1990 mining licence application under the supposedly defunct Mining Act 1971. The excessively liberal transitional provisions in the Crown Minerals Act mean that applications made under the 1971 Act will continue to be considered under that Act well into the next century, as if the Resource Management Act did not exist. So Milburn escapes either having to apply for land-use and related resource consents for the mine itself, or having the mine's effects on vegetation, wildlife habitat and karst systems considered in terms of sustainable management.

Recommendations from the Court go to the Minister of Energy who makes the final decision.

A DoC "no" to the access easement is far from guaranteed. Departmental reports indicate a schizophrenic attitude to the mine. Some suggest the department considers itself bound by the recommendations of former staff in the late 1980s that the company direct its attention to Alpha Creek rather than Waggon Creek. Other reports show that DoC is well aware of the area's natural values and the irreparable damage that both the road and the mine would cause Alpha Creek's caves, streams, fossils and forests.

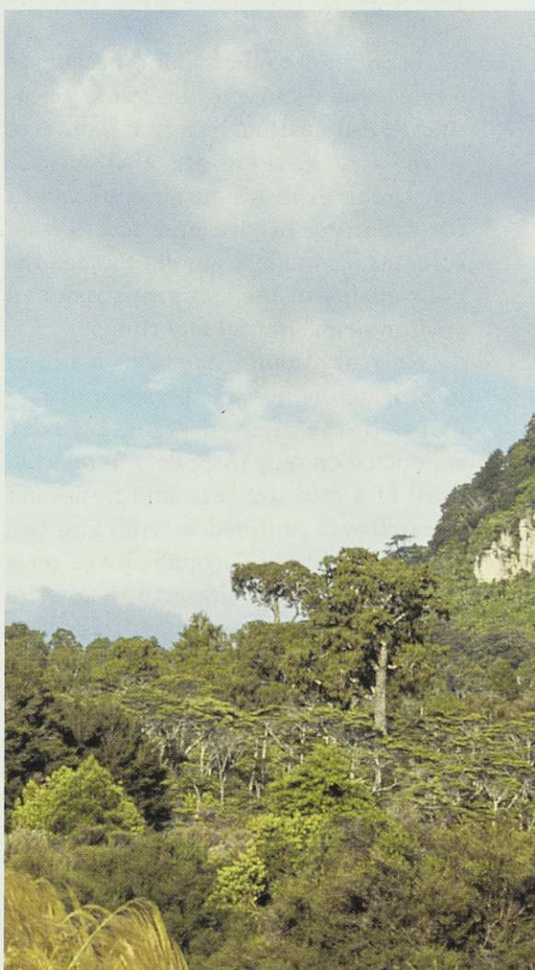
*Eugenie Sage*

land-snails and cave fauna were made without any field investigation despite the area providing a type and quality of habitat that is likely to contain significant representatives of these often-neglected groups of smaller animals.

Consultation with appropriate iwi has also been poor. Despite a claim that the area had no history of Maori occupation or use, it is clear that it is of considerable cultural importance to Poutini Ngai Tahu as are many locations in the western Paparoa limestone region. Numerous waahi tapu, urupa and other sites of cultural significance are present in the area and indications are that tangata whenua are likely to be as strongly opposed as conservationists to the prospect of a mine and access road.

Other sources of limestone exist that could meet the company's long-term needs. There are extensive tracts of lowland limestone elsewhere in the Buller region some of which are in areas that have been extensively logged or cleared for farmland – such as north of Charleston or near Inangahua.

Milburn is adamant that none of these areas are suitable to meet its long-term needs (on account of the quality and extent of the deposits or problems with access and the costs of overburden



*These limestone bluffs provide an impressive backdrop along part of the Greymouth-Westport highway. Milburn's proposed access road to the mine would cut an intrusive visual scar through conservation land around the base of the bluffs.*

THE COUSTEAU SOCIETY/PHIL WOOD

*One of the Cousteau film team and Phil Wood (right) reconstruct a moa skeleton in Equinox Cave in Waggon Creek during filming for "Cousteau in New Zealand".*

removal). But prospecting so far has been carried out only by the company's own agents and no independent assessment of these alternative areas has been made. Moreover, the company's continuing doubts about the extent and quality of the limestone in the Cape Foulwind mine that it has worked on a daily basis for over 40 years must lead one to question its ability to be definitive about these other limestone areas, given both the intermittent nature of prospecting and the rugged country and dense vegetation involved.

EVEN IF MILBURN could provide a satisfactory response to all of the above objections, this is not the time to issue consents for a mine and access road that are unlikely to be needed for several decades at least. One of the pillars of the Resource Management Act is the onus on safeguarding options for future generations. It is difficult to think of an action that would be more at odds with this philosophy than handing over the fate of an important natural area presently owned by all New Zealanders to a foreign-owned company whose use of the resource would result in large-scale modification.

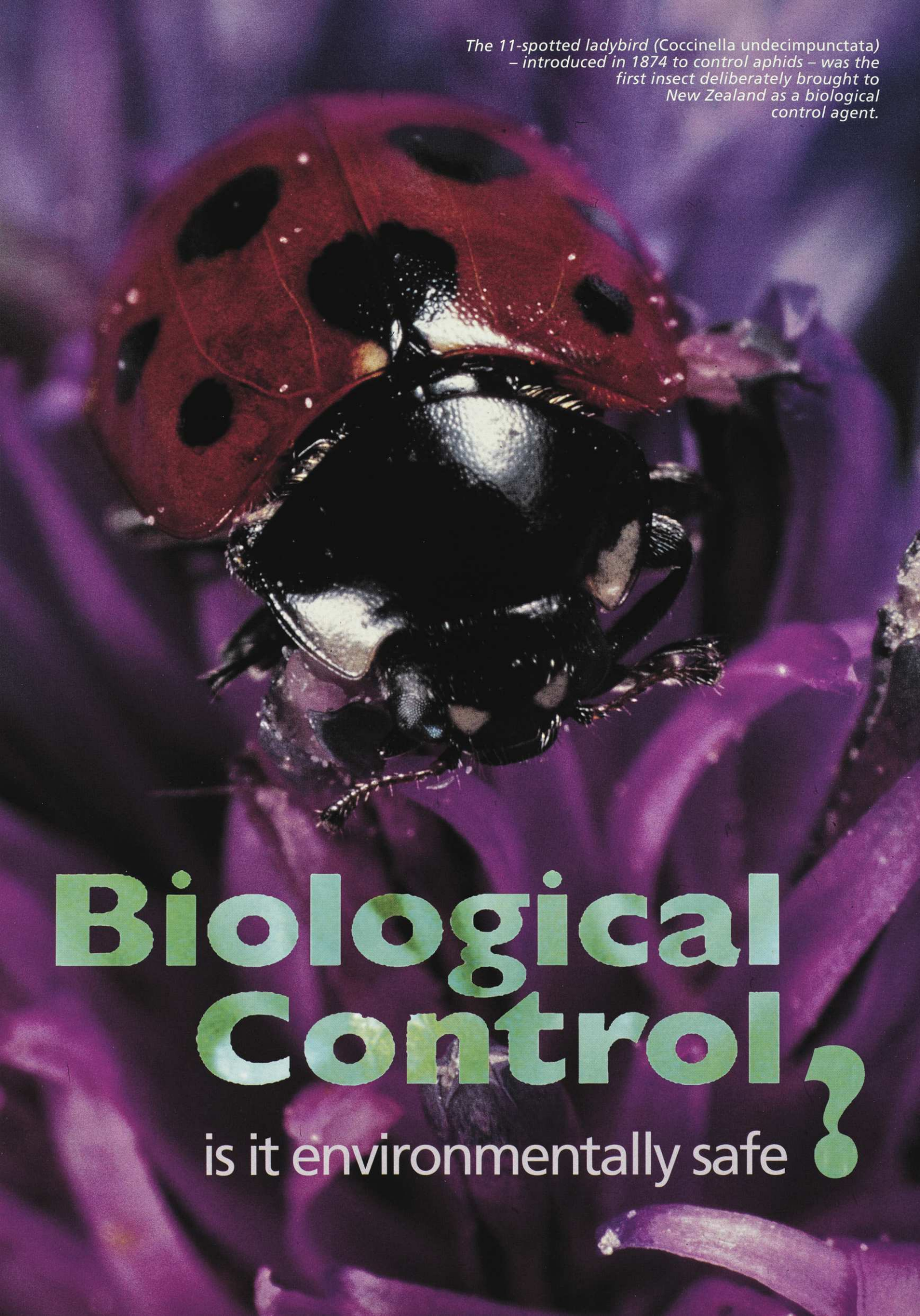
Not only should any decision on the mine be left to those who are more likely to be affected by its consequences, a better base of information is needed before that decision can be made. At the very least, more work needs to be done on the biology and hydrology of this part of the Paparoa limestone landscape, and an independent assessment made of alternative sources of limestone elsewhere in the Buller.

And who really knows what is likely to happen over the next few decades to the New Zealand cement industry generally, the processes of cement manufacture, the state of the Buller bar and West Coast rail link, or the ownership of Milburn?

More fundamentally, should 30 million years of natural evolution be sacrificed for 30 years of manufacture of a substance which, whatever its utilitarian qualities, so often seems out of harmony with the rhythms that nature imposes on landscape and environment? Or should a major industrial operation be allowed in an area of exquisite natural beauty and tranquillity; especially one whose intrinsic and cultural values are still only gradually being discovered, and whose opportunities for public escape, inspiration and quiet enjoyment can only increase in value in a world that continues to get faster, greedier, and more covered in concrete? ◆

ANDY DENNIS *is a freelance writer, editor and conservation consultant. He is a member of the Nelson Conservation Board.*

EUGENIE SAGE



*The 11-spotted ladybird (*Coccinella undecimpunctata*) – introduced in 1874 to control aphids – was the first insect deliberately brought to New Zealand as a biological control agent.*

# Biological Control

## is it environmentally safe?

**Every year a number of alien organisms are deliberately introduced into New Zealand to control agricultural insect pests. But the assurances regarding the environmental safety of biological control are now being questioned. BARBARA BARRATT looks at some potential problems for our native insect fauna.**

IMPORTING ANIMALS to control other animals has a long tradition in New Zealand – a country of many exotic introductions. One of the most infamous early attempts at biological control was the introduction of weasels, ferrets and stoats in the 1880s to reduce rabbit numbers. The attempt failed when these generalist European predators turned their attention to easier prey such as native birds.

Today biological control is more refined and is a widely accepted method of controlling the pests of economic crops to improve yields. It is also being examined as a way of reducing rabbit numbers (rabbit calicivirus disease) and for the control of possums (viral immunocontraception).

The first deliberate introduction of a biological control agent into New Zealand was thought to be the 11-spotted ladybird in 1874, for control of aphids. Since then a large number of organisms have been brought to this country to control insect pests and weeds. Up to 1992, 242 biological control agents – mostly from Australia, Europe and North America – had been released to control 70 target pest species.

Most of the introductions have failed to establish here. Of the 75 that have established, most have failed to control their specified pest target. In fact, only 22 introduced biological control agents – less than ten percent of those released – are reported to have had some impact on the specified target species, although the success rate in New Zealand is better than the international average.

Some of these introductions were aimed at native species which have become pests, such as grass grub (which increased in numbers with the development of pastures), but most have targeted the pests of horticulture, crops, pasture and forestry that have become established in New Zealand from overseas.

When a new pest arrives in New Zealand, it usually comes without the suite of natural enemies that keep it in check in its country of origin.

Modern biological control is an attempt to redress the balance, by importing a natural enemy – a predator, a parasite or a disease-causing pathogen – from the area of origin of the pest. This is known as "classical biological control". Once released into the environment, these new organisms are usually left to maintain themselves and spread, reaching a balance with the pest species they are intended to control, hopefully keeping them below damaging population densities.

Finding a potential biological control agent for a new pest usually requires exploration and study in the pest's area of origin, but sometimes a control agent can be imported from another country where the same pest has established, and a suitable biological control agent has already been found.

Another type of biological control is known as "inundative control", which is used, for example, in glasshouse crops in New Zealand for whitefly and mites. Growers can purchase mass-produced biological control agents for these pests which they liberate into the glasshouse to give control for a season, or for the growing period of the crop. This needs to be repeated in subsequent years.

BIOLOGICAL CONTROL is one of many tools used in weed and pest management. After the 1962 publication of Rachel Carson's *Silent Spring* attacking the widespread use of pesticides, the public became increasingly aware of the potential dangers to the environment, to wildlife and to themselves from large-scale pesticide use. The effect was to force the hand of regulatory bodies around the world to review their pest control strategies, which until then relied heavily on the use of chemical herbicides and insecticides.

Reductions in pesticide use can be achieved by implementing a system which combines methods of weed and pest control known as "integrated pest management". Chemical pesticides still have a role in integrated systems, but the emphasis has steadily shifted towards combinations of improved husbandry, and biological control.

Amongst the strong environmental arguments raised against the use of pesticides are the lasting residual effects (the time it takes chemicals to break down in the environment) and the effects on non-target wildlife which occur during the passage of these materials through the food chain. Many of the worst offenders, such as DDT and dieldrin (organochlorines), have generally been banned from use, although they still remain a problem in the environment.

Biological control, by comparison, has been enthusiastically promoted as a safe and natural alternative to pesticides, and

## The approval process

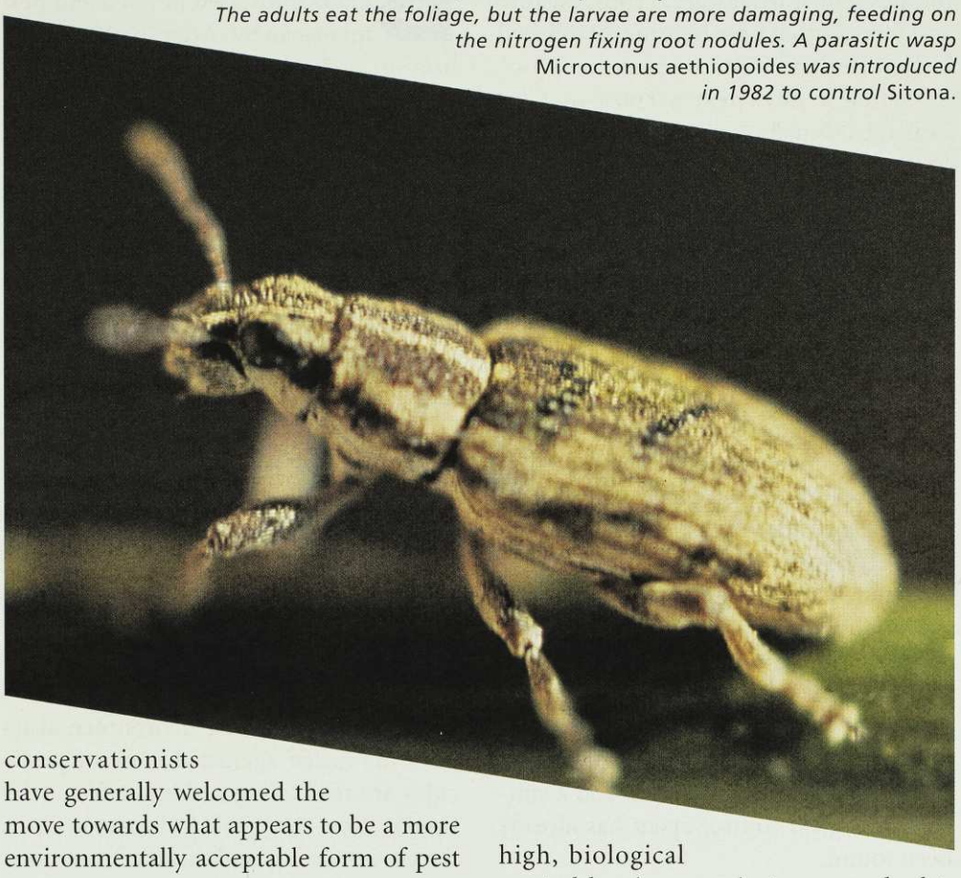
UNDER THE HAZARDOUS Substances And New Organisms Act passed earlier this year, an Environmental Risk Management Authority (ERMA) will be established to review applications to import new organisms including biological control agents.

This will replace the current arrangement where applications are received by the Ministry of Agriculture's Regulatory Authority, and vetted (including a public review process) before an import permit is issued by the Chief Veterinary Officer.

At this stage it is expected that a similar process will be followed by ERMA. The public, as well as major stakeholders such as DoC and Crown Research Institutes will be invited to make submissions on applications. Minimum standards will have to be met and applications will be declined if the new organism is likely to significantly displace native species, cause deterioration of natural habitats, or harm New Zealand's inherent genetic diversity.

Any new organisms imported will also require biosecurity and import health clearance from MAF under the 1993 Biosecurity Act before release. One of the short-comings of this process is that there are currently no guidelines for testing to ensure that biological control agents will only attack the targeted pest, or protocols which can be implemented to ascertain that the minimum standards are met. There is also no requirement for post-release monitoring of new organisms released into the environment.

ROD MORRIS



Sitona discoideus *(about 4-5mm long), originally from the Mediterranean, is a pest of lucerne. First recorded in New Zealand in 1974, the weevil probably arrived here from Australia. The adults eat the foliage, but the larvae are more damaging, feeding on the nitrogen fixing root nodules. A parasitic wasp* Microctonus aethiopoides *was introduced in 1982 to control* Sitona.

MINISTRY OF AGRICULTURE

conservationists have generally welcomed the move towards what appears to be a more environmentally acceptable form of pest management.

There have been some well-publicised and spectacular successes in biological control. One example is the control of prickly pear cactus in Australia after the introduction from Argentina of the *Cactoblastis* moth. Another success was the release of the predatory ladybird *Rodolia cardinalis* from Australia into California to control cottony cushion scale on citrus crops. Although the failure rate is high, biological control has in many instances undoubtedly proved to be a highly effective form of agricultural pest management.

In comparison with chemical control, biological control is characterised by being irreversible, self-perpetuating and self-dispersing. In other words, when a biological control agent is released into the environment, it is done so with the expectation that it will be a permanent addition to the biota, it will reproduce and increase in numbers from the original numbers released, and that it will spread from where it was released.

These attributes are, of course, some of the very features that are seen as advantages for biological control as part of cost-effective, sustainable, pest management programmes. However, they are also factors that are beginning to alert researchers to the potential environmental implications of such introductions.

In recent years the assurances regarding the environmental safety of biological control have been increasingly questioned. Information and examples have come forward on "non-target" effects, where the biological control agent is attacking species other than the one it was intended to control. In a few extreme cases in other countries, extinctions of non-target species are thought to have occurred, sometimes as a result of "host-switching" by the agent after it has reduced numbers of the intended host to low levels. Information on these environmental impacts is scant, probably because very little research has been carried out to look for these effects.

The great majority of control agents introduced to this country have been insects and other invertebrates. Thus any non-target impacts are likely to be on native (and other established) invertebrates, or possibly on native vegetation. Although no known extinctions have resulted from biological control introductions in New Zealand, some are considered to have adversely affected the native fauna.

In the 1960s the parasitic tachinid fly

BARBARA BARRATT

*A native broad-nosed weevil,* Nicaeana cinerea *(3-4mm long). The flightless adult weevils feed on a wide range of native plants, and the larvae feed below ground on the roots. Very little is known about the ecology of these species, and there are several undescribed species in this genus.*

## Native broad-nosed weevils

ADULT WEEVILS are characterised by the presence of a rostrum, or an elongation of the front of the head which bears the mouthparts. In broad-nosed weevils this is short and blunt. There are some 1,500 endemic species of weevils in New Zealand, and the broad-nosed weevils (Brachycerinae) are a large sub-group of these.

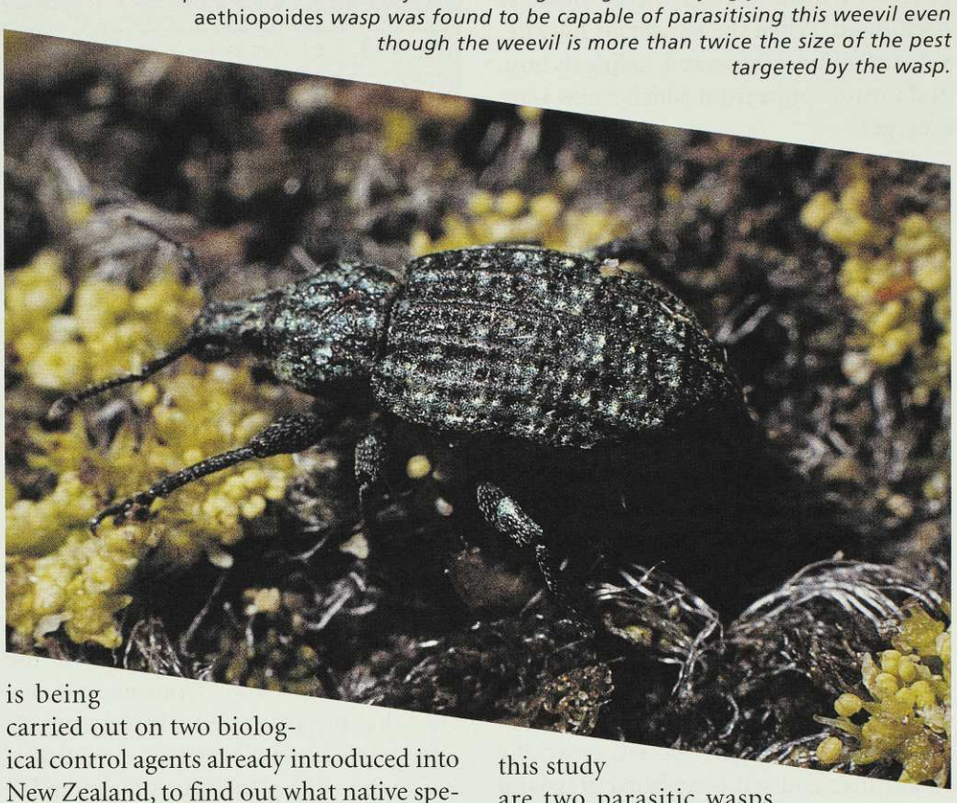
The native brachycerine weevil fauna is very poorly known, and the current research programme at Invermay into the possible impacts of two introduced weevils has brought a number of new species to light.

In particular, little is known about the biology and ecology of these native weevils. The adults feed on seedling plants and mature plant foliage of a broad range of plants. Field observations suggest that they also feed on pollen of flowering plants, and adult survival studies in the laboratory have indicated that pollen may represent an important source of protein for egg production. Larvae are soil dwelling and feed on plant roots. The adults are generally flightless, and some species have very limited distributions. However, little is known of their conservation needs.

*Trigonospila brevifacies* was released for control of light brown apple moth, a pest in orchards. It is now found parasitising a number of other moth species, with anecdotal evidence to suggest an associated decline in the numbers of some native leafrollers. A research programme has recently begun to attempt to quantify this impact.

Vanessa Munro working with the Horticultural Research Institute has found that native moths are parasitised in some native habitats, but the range and susceptibility of species are yet to be determined. Also, numbers of the native red admiral butterfly are thought by some entomologists to have been reduced since the introduction of parasites to control the cabbage white butterfly.

Zenagraphus metallescens *(10-12mm long) in the Remarkables Range. This striking native weevil is quite common on many Central Otago ranges. Worryingly, the introduced* M. aethiopoides *wasp was found to be capable of parasitising this weevil even though the weevil is more than twice the size of the pest targeted by the wasp.*

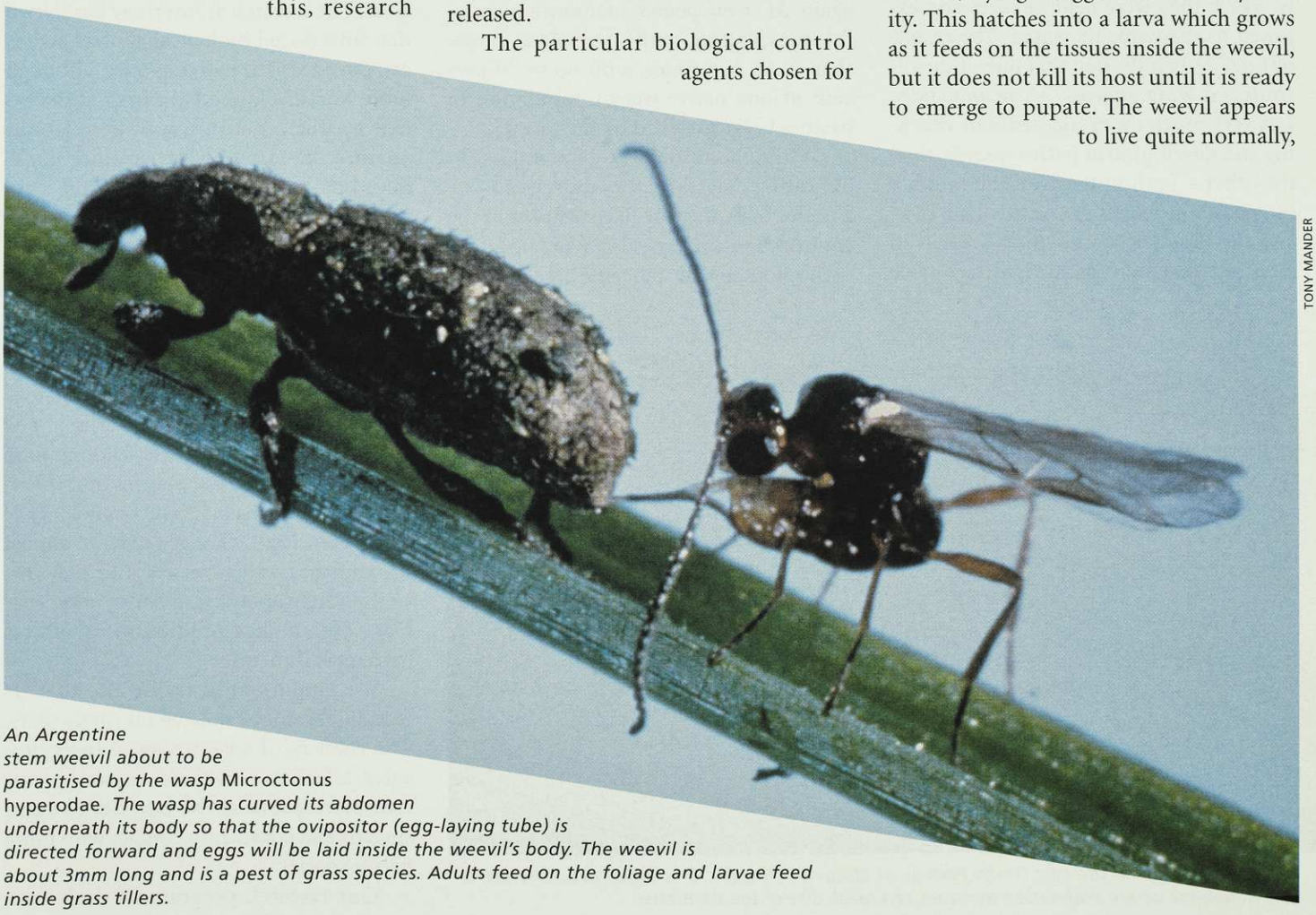


BRIAN PATRICK

AT THE INVERMAY Agricultural Centre in Mosgiel, a Biological Control Group is conducting research aimed at improving the environmental safety of biological control agents introduced into New Zealand.

The plan is to develop guidelines and protocols to test for host specificity – that is to identify the likely host range so that informed decisions on the impact of releases can be made – while the new organisms are still in quarantine. To do this, research is being carried out on two biological control agents already introduced into New Zealand, to find out what native species they attack in the laboratory, and compare this with what is happening in the environment. The study is therefore mimicking what could be done in quarantine, while at the same time verifying the results by finding out what has actually happened in the field since they were released.

The particular biological control agents chosen for this study are two parasitic wasps. *Microctonus aethiopoides* was released in 1982 to control the exotic sitona weevil, a pest of lucerne, while *M. hyperodae* was introduced more recently, in 1991, to control the ryegrass pest, Argentine stem weevil. The wasps attack the adult stage of the weevils, laying an egg inside the body cavity. This hatches into a larva which grows as it feeds on the tissues inside the weevil, but it does not kill its host until it is ready to emerge to pupate. The weevil appears to live quite normally,



TONY MANDER

*An Argentine stem weevil about to be parasitised by the wasp* Microctonus hyperodae. *The wasp has curved its abdomen underneath its body so that the ovipositor (egg-laying tube) is directed forward and eggs will be laid inside the weevil's body. The weevil is about 3mm long and is a pest of grass species. Adults feed on the foliage and larvae feed inside grass tillers.*

except that females become sterile and unable to produce eggs once they are parasitised. When the parasite is fully developed it leaves the weevil, killing its host, and forms a pupa from which a new wasp emerges.

The first step in our research was to identify native species that could potentially be at risk from these introduced insects. These were considered most likely to be taxonomically related native weevils, and particularly those that live in environments similar to those of the intended hosts, and would therefore be recognised by the parasitic wasps as possible targets. Both target pests – sitona weevil and Argentine stem weevil – are members of the large broad-nosed weevil subfamily, Brachycerinae, a group that includes many native species in New Zealand.

Many of these native weevils are found in modified pastures as well as their natural tussock grassland and alpine environments. Their distribution therefore overlaps with the pest species, especially in pastures and semi-modified grassland areas, but both sitona weevil and the Argentine stem weevil can also be found occasionally in native grasslands, extending up to the alpine zone.

From a list of related native species collected during surveys of grassland, a number were selected for laboratory tests, in which they were held in cages and exposed to the parasitic wasps. The results of these tests indicated that one of the introduced wasp species, *M. aethiopoides*, was very much more successful in attacking and developing in native weevils, than the other – both in terms of the number of species in which the wasps laid eggs, and the number of individual weevils in each test that were parasitised (see table above). Most of the native species parasitised by *M. aethiopoides* are in the genera *Irenimus* and *Nicaeana*, but one was the subalpine to alpine species *Zenagraphus metallescens*, a weevil that is two to three times the size of the intended sitona host.

## Parasitism of native weevils

*Although it was reassuring to find the laboratory tests matching results in the field, it was worrying to discover what was thought to be a reasonably host-specific biological control agent attacking a number of native weevil species.*

| | Wasps introduced as biological control agents | |
|---|---|---|
| | *Microctonus aethiopoides* | *Microctonus hyperodae* |
| **Laboratory tests** | | |
| No. native species parasitised/no. tested | 7/7 | 5/7 |
| Average parasitism | 58% | 13% |
| **Field monitoring** | | |
| Number native species parasitised | 13 | 1 |
| Maximum parasitism recorded | 71% | 3% |
| Number of sites where parasitism was found in native species | 10 | 1 |

To see how well laboratory tests could "predict" what might happen in the field, surveys of native weevils have been carried out to ascertain whether they are being parasitised "naturally" in the environment. From these studies, we found that again, *M. aethiopoides* is far more successful in exploiting native weevils as hosts, than is *M. hyperodae*, with up to 70 percent of one native weevil population in pasture being attacked by the former.

While the result was encouraging in indicating that laboratory testing can give a useful indication of likely impact in the environment, it was also worrying that such a non-specific parasitic organism has been released. The studies will continue with regular monitoring of some of the native weevil species that are being parasitised, so that we can gain an understanding of longer-term effects of *M. aethiopoides* on the species concerned.

BIOLOGICAL CONTROL agents are usually released to combat an agricultural pest problem, but obviously once they are released, they spread by their own means into any suitable environment including conservation areas. The research at Invermay has shown that introduced biological control agents can pose a risk to native species, although more work is required to work out the extent to which native weevil populations are threatened, and whether other introduced biological control agents are having a similar impact.

The environmental implications of non-target effects of biological control agents are clearly complex, ranging from direct effects upon the survival of non-target hosts, to ecological ramifications which follow in food webs when there is a substantial change to the status of any species in an ecosystem. Depending upon the role of the "at risk" species in the ecosystem, and the balance and complexity of the system itself, changes may be almost insignificant, or conversely they may impact severely upon a number of other species. This makes prediction of effects extremely difficult.

It is important to realise also that effects might not be noticed for many years. The chances of an introduced biological agent affecting non-target organisms increases over time as the introduced agent spreads and comes into contact with more native species.

Our research programme deals with

BARBARA BARRATT

*Tussock grassland on the East Otago Plateau at about 900 metres. This is typical broad-nosed weevil habitat where population densities can reach 30 per square metre.*

BARBARA BARRATT

*A "Malaise" trap in position on Otago's Old Man Range is being used to survey introduced and native* Microctonus *wasps. Flying insects land on the central vertical partition of the trap and then instinctively work their way up towards the light where they become caught in a preservative. The researcher in the background is using a commercial leaf-sucking machine to collect native weevils.*

biological control agents introduced for insect control. Biological control of weeds presents a similar threat to the environment as there is always a danger of the new organism switching to native plants. However, there are significant differences.

In New Zealand we have approximately 2,000 species of native plants of which probably 95 percent have been described. This means that, given the resources, scientists can thoroughly test the new organism to see if it will attack related native plant species (and economically important plants), and thus be more confident in assessing the degree of risk involved in the release of the biological control agent.

For insects the situation is very different. There are an estimated 20,000 species of native insects, of which about half are described, and a large number yet to be discovered. This makes quarantine testing much more difficult, and emphasises the need for urgent taxonomic work to be carried out on the New Zealand insect fauna.

Biological control is a powerful pest management tool with both environmental and economic risks and benefits that need to be considered. It is often argued that the costs of carrying out detailed quarantine investigations to assess potential environmental impacts are not warranted. However, it can also be argued that the irreversible addition of a new organism to the environment at least justifies the cost of a minimum level of investigation so that a realistic analysis of the level of risk to the environment can be ascertained. The new procedures to be developed under the Hazardous Substances and New Organisms Act will hopefully make this mandatory.

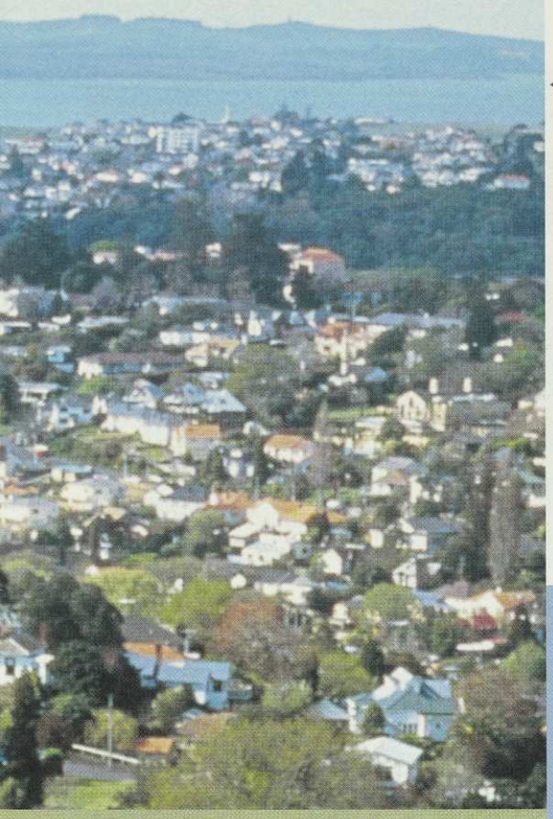
When *M. aethiopoides* was released in New Zealand, it was done so with very little quarantine testing. It has been reasonably successful in controlling its intended host, but time will tell as to whether the benefits will be outweighed by the environmental costs. As an interesting twist to the story, which makes the cost-benefit equation even more complex, *M. aethiopoides* has now been found parasitising a beneficial weed biological control agent, the nodding thistle receptacle weevil (*Rhinocyllus conicus*), and could therefore be compromising the benefits of another biological control programme.

The more recent introduction of this problematic wasp's cousin, *M. hyperodae,* did not occur until after about a year of careful investigation in quarantine of potential host range, and extensive peer review of the findings. It was known that some native species could be attacked in the laboratory, but the research indicated that only one native species was likely to be attacked in the field. Although it is only five years after its release, only one native species has been shown to be attacked in the field, and it is the one predicted from quarantine studies.

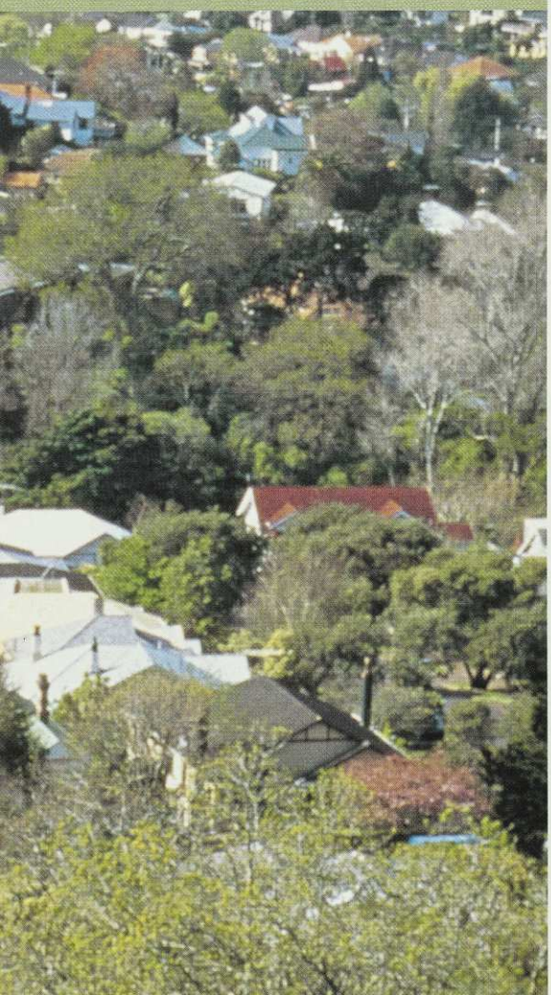
DR BARBARA BARRATT *is a scientist with AgResearch in the Biological Control Group based at Invermay Agricultural Centre, Mosgiel.*

# Forest Remnants and Urban Consolidation

Forest Remnants



*Left and below: view north from Auckland's Mt Hobson. This part of Remuera has not yet been heavily infilled, and trees and gardens are still prominent. The gully in the foreground, known as Nairn's Bush, contains a small but continuous strip of remnant forest extending through the back of a large number of sections. Infill housing has already encroached on the eastern end.*



# is infill housing the answer to urban sprawl?

**A patch of bush is cleared in the bottom of a secluded gully; 13 town houses are crammed into a long narrow section that was previously occupied by one house and a large bush garden; Forest and Bird is rung by an concerned resident saying that a neighbour is clearing the forest at the back of his section. DAVID RELPH looks at some of the effects of the new phenomenon of infill housing which is causing drastic changes to parts of Auckland City and to a lesser extent in other cities such as Christchurch.**

CONSERVATIONISTS tend to be largely occupied with issues which affect areas outside the city. Yet most of us live in urban areas, and it is the growth of cities that increasingly generate some of the most significant environmental issues.

For most of the past 150 years, New Zealand's cities have devoured the surrounding countryside as they expanded in an unplanned way. In the past five years our population has increased by 225,414 or 6.6 percent and that growth has been increasingly intensive and rapid round Auckland. Absorbing over half the national increase – 119,240 residents – Auckland has grown by almost twice the national average.

In a country that we have fondly imagined to be uncrowded and relatively lightly populated, New Zealanders have belatedly begun to realise that urban sprawl brings with it many problems. The provision of transport and services such as stormwater and sewage disposal becomes increasingly difficult and expensive, and low-density housing patterns encourage high levels of private car use with all their accompanying environmental costs.

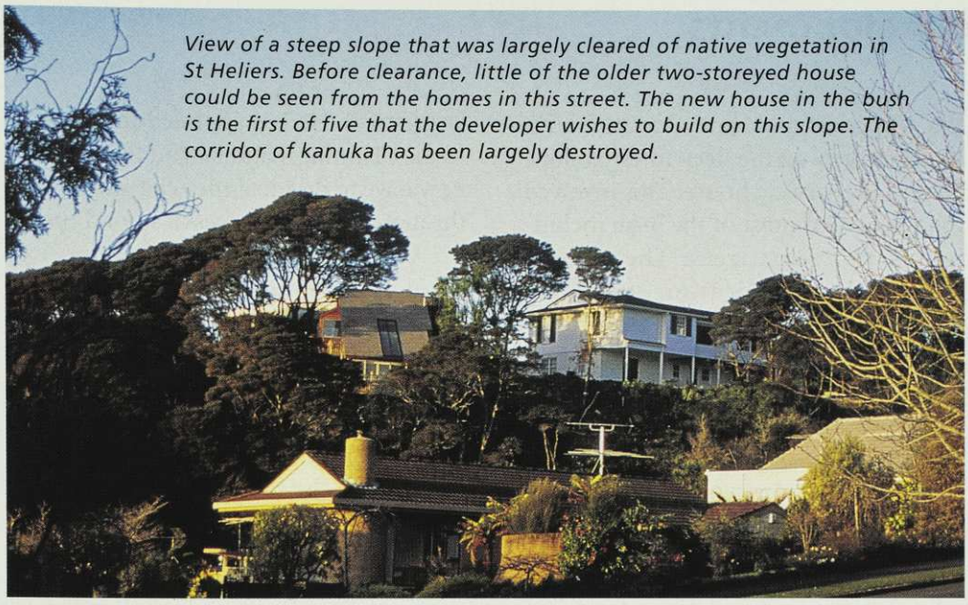
Few conservationists would be happy to see a continuation of the inexorable spread of new subdivisions that have been such a feature of New Zealand's cities in the past. But what are the alternatives?

Winding back population growth is an obvious longer-term option, but while this growth continues, the only real way to avoid the physical expansion of a city is to intensify the density of dwellings within built-up areas. This is infill housing. In itself it poses the dilemma of how to increase housing density without significantly reducing the quality of the environment in the affected suburb.

A CLOSER LOOK at what is happening in Auckland City reveals that the issue is not a simple one. Auckland Regional Council has attempted to halt suburban spread by zoning certain boundaries as green belts. This has led to bitter legal challenges from North Shore City, Rodney District and from developers who had bought the attractive rolling farmland on the northern boundary. The courts have upheld the ARC's urban limit and have declared that local councils can incorporate limits to urban development in their district plans.

It is within the confines of Auckland

DAVID RELPH



*View of a steep slope that was largely cleared of native vegetation in St Heliers. Before clearance, little of the older two-storeyed house could be seen from the homes in this street. The new house in the bush is the first of five that the developer wishes to build on this slope. The corridor of kanuka has been largely destroyed.*

City (an area covering the Auckland isthmus), that the most marked development of infill housing in New Zealand is taking place.

While the outer cities of the Auckland urban area are partly developing through new fringe housing developments, Auckland City's new growth is nearly all infill. The city council has a stated goal of 100,000 more residents on the isthmus (an increase of around 25 percent). The location of this increase has recently been refined through zoning, and it is planned that large proportions of it be absorbed in certain defined areas – particularly around the inner city and business centres.

ALTHOUGH INFILL housing is a solution to one environmental and social problem, it frequently provokes strong local protests over the marked effects on the urban natural environment. At its most intensive, larger trees disappear from the skyline and the vista becomes one of closely spaced two-storeyed houses, high walls of painted plaster and paving and the little space available for greenery tends to be mown grass or neat landscaped areas. In areas where the zoning permits, large blocks containing multiple dwelling units have become the norm. In some suburbs the intensity of new housing is extremely high. In St Heliers, for example, 14 percent – or roughly one house in eight – has been built in the past five years.

In the Eastern Suburbs of Auckland, concern centres particularly on a dozen small gullies that still retain strips of indigenous bush, which in most cases are on parts of rear sections in private ownership. Generally the bush is largely mature kanuka, often in good condition, though several sites are heavily infested with invasive weeds and rubbish.

The remnants represent the last vestiges of the original forest which covered most of the Auckland isthmus. This is borne out by analyses of pollen from swamp soils from sites such as the present Queen Street. Kanuka most often is the dominant tree, with other significant species including a variety of broadleafs; in some gullies there are fine groves of nikau or cabbage trees, and a few large totara and other podocarps.

In each valley the bush remnants are not only a notable landscape feature but, combined with adjoining gardens, they still provide diverse habitats that can supply the year-round food needed by nectar-sipping and fruit-eating native birds. These areas are the only parts of the city still able to support significant numbers of fantails, silvereyes, grey warblers, and the occasional tuis and moreporks.

One study of a small bush patch in Remuera identified nine species of native birds. Kereru still regularly visit bush sites in Parnell and on the slopes of Mt Eden. As the number of sections available for development decreases, pressure is increasing to subdivide those sections with bush on them.

Apart from the direct loss of these natural remnants, intensive infill housing puts stress on other services. Existing stormwater drains are under increasing pressure and at times of peak flow the sewerage system frequently overflows into the stormwater system.

While increased population densities should supposedly lead to more viable public transport and less reliance on cars, it doesn't always work that way. Increased traffic congestion created by infill developments is partly responsible for the revival of a controversial project to build a motorway through the Eastern Suburbs and across the wetlands of Hobson Bay. The city council has also noticed increased pressure on public spaces for recreation. This is a direct result of increased living densities and reduced private space.

IF WE ARE TO LIMIT urban sprawl, is the loss of remaining natural remnants inevitable? Not necessarily. There are ways of allowing considerable

*The present appearance of the hill behind St Heliers Bay. This whole slope has been intensively developed for housing. Compare the lack of trees and gardens with the photo on page 42-43.*

DAVID RELPH

# Two approaches to infill developments

THE PROBLEM OF saving urban forest and the contrasting extremes in development applications are no better illustrated than in a patch of bush on the border of Kohimarama and St. Heliers in Auckland's Eastern Suburbs.

This piece of remnant forest extends for about 400 metres up a steep gully between two fully built-up streets. Mature kanuka with a 10-metre canopy, the area is nowhere more than about 40 metres across. Apart from one section owned by the city council, the whole bush gully is on the rear sections of about ten privately owned properties and forms part of the view of at least 100 others. Most of the ten sections that abut the bush are quite large and under current zoning can be subdivided – in some cases for several new dwellings.

In 1993 a developer obtained one of the properties and applied to build five houses largely on the steep forested slope behind the existing house. This involved the removal of most of the bush including 14 protected trees. The council decided the application was non-notifiable and gave the developer approval to remove the trees and set up a building platform. The first notice the surrounding residents had was when they heard the chainsaws in action.

After months of angry communications with the council, the 30 surrounding residents obtained an interim injunction halting the developer from further clearance pending a High Court hearing in early 1995. At this hearing, the developer was refused consent to build more than one house or to remove any more trees although by this stage the slope had been denuded of most of its larger trees. He has appealed the decision to the Planning Tribunal and the residents now have to decide if they can afford to go through the court process a second time.

A year later the bush was under siege again but this time the result was different. Two owners at the eastern end of the gully combined their sections and applied to develop the upper end of the bush. This time the applicants spent a great deal of time and money developing a plan that will disturb the bush as little as possible, consulting council officers and all adjoining residents at some length, taking interested groups on lengthy visits to the site, and modifying the plans to take into account any objections.

The plan, however environmentally sensitive, still involves a compromise and the loss of about a quarter of the bush. What is left will be enhanced by the infill housing without severely reducing the quality of the urban environment. This will only happen when local councils ensure that developers retain natural vegetation and open spaces. Such council policies in turn will depend on the attitudes of residents – how much we value a pleasant urban environment, and how much we are prepared to pay for it.

Auckland City Council has gone some way towards protecting its forest remnants. The council's current tree protection ordinances require that in most areas resource consent is required to fell or prune indigenous trees of more than 600 mm diameter and six metres high, or most exotic trees of 800 mm diameter and eight metres high. This involves consultation with interested parties (neighbours etc), arborist reports and a hearing before a council committee.

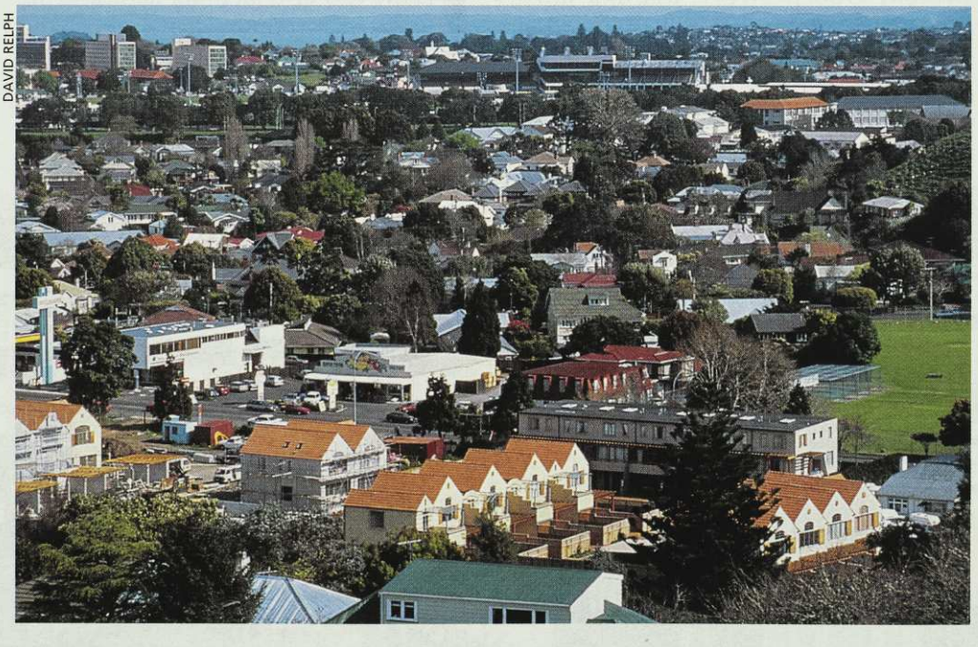
Hearings result in quite rigorous assessment of applications, and have seen a number of subdivision applications involving the removal of groupings of trees being turned down. Forest and Bird's Central Auckland branch has been involved in a number of these hearings and its impression is that more recent development applications have tended to be more carefully planned, with existing vegetation considered, and plans for replanting included.

But there is now a backlash to what are perceived by many developers as costly, time-consuming and rigid processes. In June this year a group of Auckland City councillors moved to alter the tree protection regulations – to increase the protected tree diameter to 800 mm and the height to eight metres for indigenous trees, with a similar increase for exotics. Estimates suggest that this would make perhaps 40 percent of currently protected trees vulnerable to development. While some rationalisation may be needed, this solution would be a disaster.

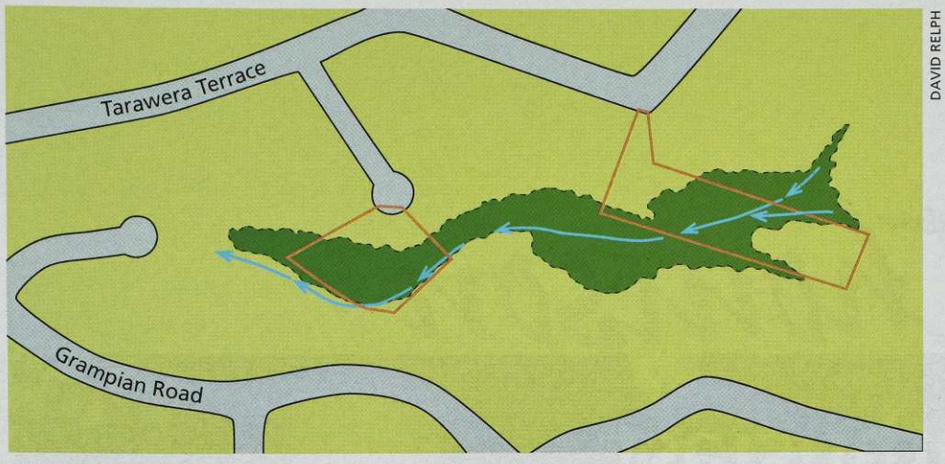
Apart from such tree protection regulations, it is important also that local citizens and interested pressure groups such as Forest and Bird keep pressure on local councils to continue to work on finding other ways of preserving significant vegetation and developing more open natural areas. It is important that most applications to remove areas of natural vegetation are publicly notified by the council.

The buying of back sections by council to aggregate bush patches and convert them to reserves should be considered in some instances despite the cost. Changes in zoning, and rate relief for bush owners as compensation for not developing a site, are other options. In the end it all comes down to how much we value remnant vegetation in the urban environment. Councils will only act if

DAVID RELPH



*Part of the suburb of Epsom looking west from Mt Hobson. The suburb's trees remain prominent. In the foreground is part of an intensive housing development along the Southern Motorway and railway. Auckland City is encouraging this type of development near major transport routes and commercial centres.*




DAVID RELPH

*The two development sites in Tarawera Bush on the border between Kohimarama and St Heliers. The development on the left of the map involved considerable environmental destruction, no consultation and ended in court. The other development provided more of a win-win result.*

removal of invasive exotic scrub and an extensive replanting programme. The developers were also happy to agree to Forest and Bird's condition that a covenant be put on the title preventing new owners removing further bush.

While ideally Forest and Bird would have liked the council to buy all the bush and manage it as a reserve, realistically it was felt that the application, in a privately owned site inaccessible to the public, was an acceptable compromise.

DAVID RELPH

*Looking into the bush gully owned by St. John's College in Meadowbank – probably the largest area of privately owned forest in urban Auckland. Developers are aware that well over 100 dwellings could be built on this site.*

sufficient pressure is imposed on them.

Urban trees and bush have enormous values – in their appearance, in softening and framing more distant views, as wildlife habitats, and for their heritage values. In addition of course, they have functional values in providing shade, shelter, privacy, noise screening and air purification.

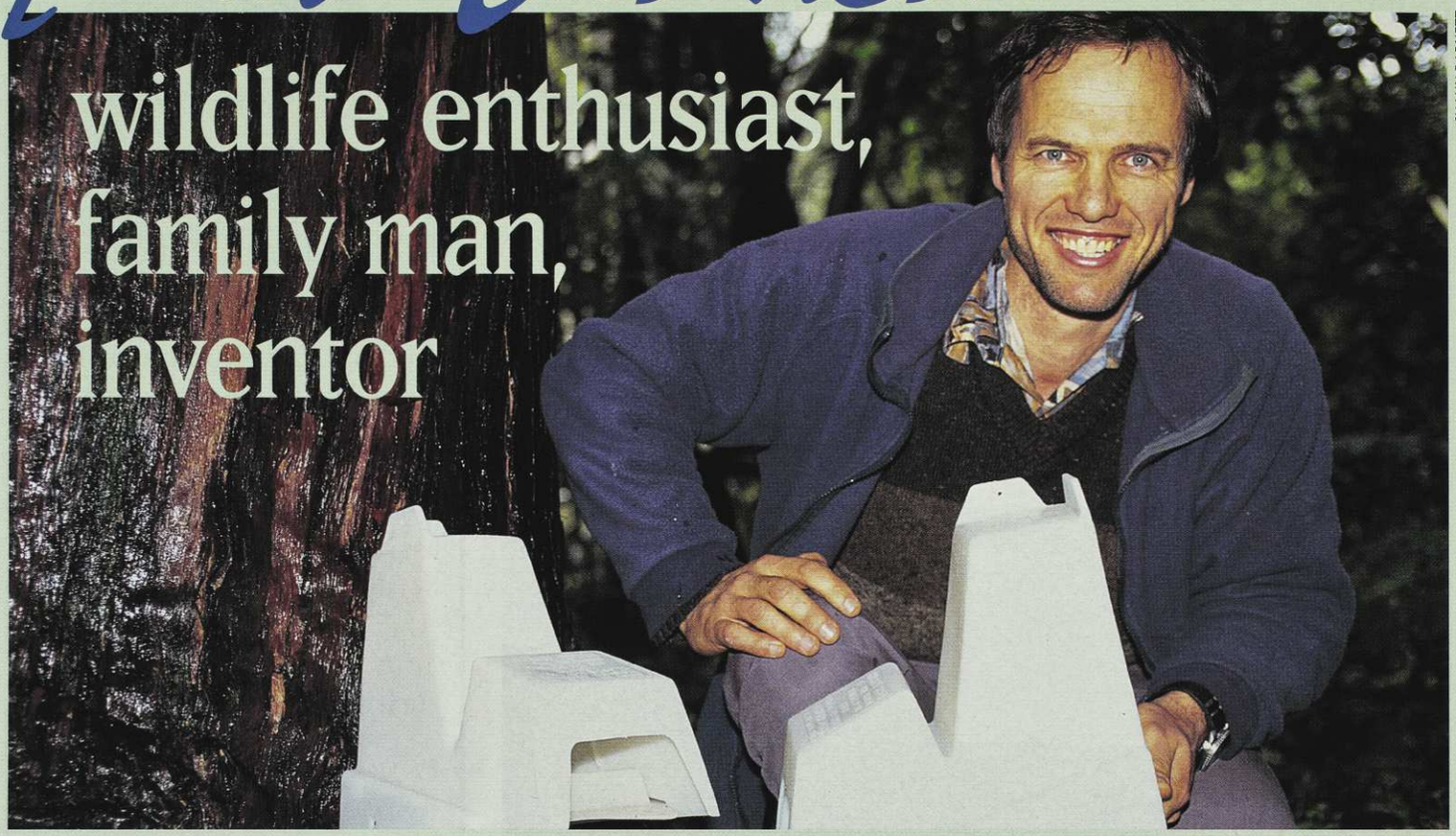
It is worth noting that in many overseas cities suburban trees are regarded as great community assets. The enormous value of diverse urban ecosystems of forest and gardens is emphasised by the comment of an ornithologist at a recent infill housing application hearing that if the current hunting of kereru in rural areas continues, urban habitats may be the only hope for the survival of this species in the future.

The real significance of these forest patches comes from their survival in the midst of a city, surrounded by development. This gives them great social, aesthetic and recreational importance.◆

DAVID RELPH *writes science text books for secondary schools. He is also a freelance natural history, conservation and travel writer.*

# Phil Thomson

## wildlife enthusiast, family man, inventor



SHAUN BARNETT

**FIONA EDWARDS talks to a conservation officer who is, by his own admission, mildly eccentric and totally absorbed with inventing killer contraptions to protect native wildlife.**

IT WAS THE KEA that captured his eye and his imagination during a school visit some 30 years ago by an officer from the Wildlife Service. From that moment, eight-year-old Phil Thomson became bird-crazy.

Phil still had that kea in mind when he left school at 17 to become a Wildlife Service cadet. "I spent the next four years working throughout New Zealand, at times based on Little Barrier Island, then managing takahe in the Murchison Mountains and following kakapo in Fiordland and Stewart Island," he says. "I was also involved in transferring Chatham Island parea [pigeon] from the main island to a predator-free island."

Phil rapidly discovered that protecting the native wildlife he loved meant being prepared to kill their introduced predators and competitors. Invariably he endured long hours of drudgery, cramped living quarters and unpleasant working conditions.

"I remember during a cat control project to protect kakapo on Stewart Island, Susan (his wife), another worker and I lived in a six by eight foot, unlined garden shed, in a south-facing gully at the lower end of the island. Every day we'd be up at first light – usually woken by rain falling on our tin shed. We'd pick up a load of fish and attempt, with our faces plastered with sandflies and our hands numb with cold, to inject the fish with 1080 solution. But the 'best' part was crawling across the island laying baits in strategic locations where we thought a cat might find them."

Before the poisoning operations began, Phil says almost half the remaining kakapo on Stewart Island had been killed by feral cats in a 12-month period.

Eleven years with the Wildlife Service eventually saw Phil move to the Waikato and initiate the new Department of Conservation's kokako management project at Mapara Wildlife Reserve, south of Te Kuiti. This highly successful project (see article page 12) controlling possums and rats to extremely low levels has allowed kokako numbers to increase – with more than 100 chicks born in the last five years. Less well known are the estimated increases in the numbers of other birds at Mapara. Tui numbers are five times greater; bellbirds, three and a half times greater; and kereru, two and a half times greater than in nearby unmanaged forests.

"It was during the work with kokako that I became interested in the development of bait stations for predator control," he says. "I saw lots of bait wasted due to poorly designed stations, where rain would turn baits into unusable green porridge. It seemed to me well worth putting some effort into improving bait stations and reducing that waste."

Once he'd decided there had to be a better way, the rookie inventor started thinking and constructing bait stations in his mind. They needed to be stackable, rain-proof, easy to fill and with a lid that possums couldn't remove.

Late one night, lying in bed he thought: "Why not turn the bait station upside down and have the opening at the bottom?"

Susan, and daughters Catherine and Sarah, woke up to find all the lights on in the house, with loud noises coming from downstairs. Fearing burglars, they instead found Phil working on his first bait station.

"He'd worked on it all night and by 7am he was ready to show me his new invention," Susan recalls. "I was speechless – it was an odd-looking, tin contraption held together with pop rivets."

The Philproof bait station had been born, but hundreds of hours were to pass before it reached maturity. "I always seemed to be sketching angles on paper, making prototypes (more than 70), field testing them and trying to choose the best models. The next stage was making a wooden mould, sanding it, painting it and sanding it again until I had something smooth enough to set a fibreglass mould over the top," Phil says.

It takes a long time to develop a good idea, he explains, because while you can picture it in your mind, you have to build it and test it in field conditions to see if it really works. While perfecting the design, Phil would wake up at least five times a night and scratch ideas onto a pad kept beside the bed. So that he wouldn't wake Susan, he slept with a headlamp strapped to his head.

"The only time I got to talk with him was in his sleep, and then all he would talk about was his inventions," Susan reveals.

For the family, it was a long 18 months as Phil, still working fulltime for DoC during the day, became absorbed by the inventing bug. "Once you start designing things you can't stop," he says. "I got so involved in the whole process I almost missed the birth of our third daughter." Baby Laura arrived while Phil was displaying and winning an award for his bait stations at the Mystery Creek Fieldays.

The inventions also took over the Thomson family's basement. "I can't get the car in the garage any more and the farm shed is pretty full too. And I have to use a three-metre pole to reach the light switch in the basement."

SHAUN BARNETT

*Family production line: Phil, Susan, Sarah and Catherine trim the edges of the Philproof bait stations.*

Turning the fibreglass moulds into aluminium moulds and then making plastic bait stations became the expensive part of the Philproof production line. Once the plastic bait stations came on stream, Phil and Susan's two eldest daughters became adept with potato peelers, tidying up the edges.

"Catherine and Sarah would charge me 10 cents a station and they can clean 100 stations in half a day. The kids have a mercenary streak which is eating into my profit margins!"

While Phil had all the family working hard, he had an option of selling out to a bigger firm capable of taking over all the production hassles and selling the stations at a higher price. But he wanted to make his bait station the best one available at the lowest possible price. A conservationist in theory and practice, Phil makes the injection-moulded bait stations with raw materials from recycled plastic milk bottles. He has now produced 40,000 stations – the equivalent of 1.2 million milk bottles and enough to protect 50,000 hectares of forest.

Phil hopes to make ground control of possums more practical and cost effective for farmers, regional councils and DoC. He says the bait stations are versatile and can use any type of bait from flour/cyanide mixes, to wax blocks or cereal baits. As well as possums, they can be used against rats, rabbits and wallabies.

Phil also hopes groups of keen conservationists will adopt local reserves and, using his "recipe for restoration", get rid of resident rats and possums. "The improvement in forest health is almost immediate and in a year or two, an increase in the numbers of native birds is also obvious."

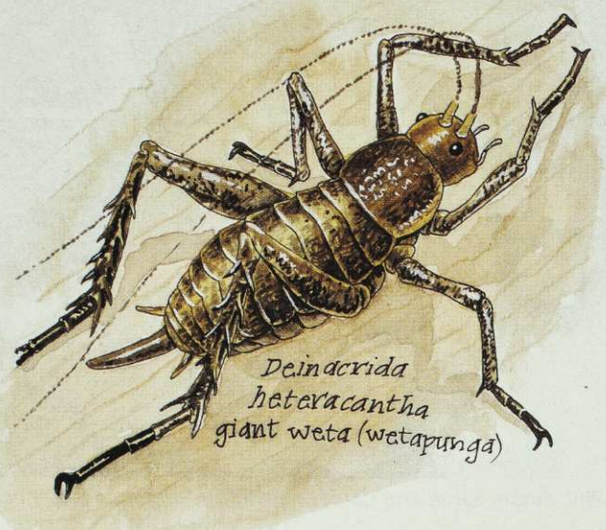
Phil says several conservation groups in the Waikato have combined with local farmers and deerstalkers to rid local reserves of rats and possums. "One group on Mt Kakepuku has achieved a 92 per cent reduction in possum numbers and fresh, new forest growth is everywhere."

Phil has sold several thousand stations and has had no complaints. He says people just keep coming back for more. "My most successful selling tactic is to jump on the bait station to show it is indestructible. I seem to have a well-known and deadly reputation for breaking equipment, so "Philproof" stations are well-named."

With the success of Phil's bait stations, has come the desire to continue inventing. All his inventions aim to protect native wildlife and on his drawing board lie ideas for possum trap sets (to prevent kiwi injuries), new rat-monitoring tunnels and stackable stoat tunnels – all aimed at reducing the number of wildlife predators. His enthusiasm is as strong now as it was years ago when he met his first kea.

And as he talks enthusiastically about his ideas, his hand reaches for a pen and another piece of paper. ◆

FIONA EDWARDS *is a former conservation officer with Forest and Bird. Today, when she isn't working part-time for DoC, writing or getting involved in local conservation issues, she can be found in a hammock beside Raglan beach.*




# Big

*The heaviest insect in the world is New Zealand's giant weta,* Deinacrida heteracantha. Deinacrida *lives in the treetops and Maori called it wetapunga, "the god of ugly things". Even wetapunga was no match for rats, and this giant insect now survives only on Little Barrier Island.*

WHY DID THE Kaimanawa horse issue excite such a frenzy of passion and a flood of letters to the papers overwhelming reason and common sense?

Perhaps it was because horses have so long been the friends and work animals of humans, perhaps because they are hairy mammals with attractive large eyes like our own, perhaps because for many people they symbolise the wild and the free. All these reasons perhaps but, most importantly, because horses are BIG. If horses were the size of rats far fewer people would care if they were removed from an area.

Humans are hooked on BIG because we are big. Of the 10 to 20 million species of animals estimated to exist in the world, only a few hundred are bigger than us, and, like us, most of those big species are at the top of their respective food chains. Think of the first animals a child learns to recognise in picture books. They are the giants of the animal kingdom – lions and tigers, elephants, hippopotamuses, even the extinct dinosaurs.

Why do we admire size? Even in human societies we fondly imagine to be sophisticated, big and male still means strength, and strength means power. It works in animal societies. We watch in awe the TV documentaries showing the enormous male "beach masters" of the elephant seal colonies – raging colossi fighting their mountainous rivals for the rights to the harem. For, although we dress it up a bit in human society, power means females and offspring, and the continuance of genes – Darwin's survival of the fittest.

Far from the hub of mammalian evolution, New Zealand missed out on lions and tigers, horses and elephants. But like other island ecosystems we had our giants too.

The moa family included the tallest birds the world has seen. The New Zealand eagle, *Harpagornis,* with its three-metre wingspan was the largest bird of prey to ever exist. And some giants still hang on in this country, some overlooked, others marooned for safety on islands free of introduced predators. They are not dinosaurs, but the giants of an even earlier world – animals without backbones.

## Local giant

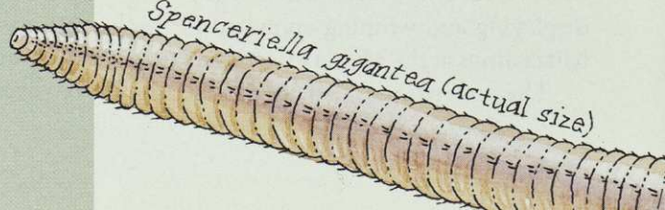
OUR NATIVE EARTHWORM fauna is diverse, big in number of species and sometimes big in size. The largest, *Spenceriella gigantea,* grows up to 1.4 metres long and can be as thick as your thumb. It lives in the subsoil of native forests of North Auckland and offshore islands like Great Barrier. This giant worm burrows as deep as three metres below the surface, extracting nourishment from the humus, fungi and invertebrates it swallows along with the dirt.

*Spenceriella* is big, but some Australian earthworms are bigger, up to four metres long. Length has its limitations – the drag factor for a start – but the major constraint is diameter. An earthworm breathes by taking in oxygen and releasing carbon dioxide by diffusion through the moist layer around its skin. (This explains why dry earthworms die.) This diffusion of gases is passive, and can only effectively reach cells fairly close to the skin.

So an earthworm can be long, but it can only be as stout as the limits of oxygen diffusion allow.

WHEN WE THINK of earthworms we think of the worms in our gardens and compost. These are all recent human introductions – about 19 species. But New Zealand also has its own suite of 173 native earthworms. All the native species belong to an ancient and primitive earthworm family called Megascolecidae whose members today are found in India, Australia, South Africa and South America. Ancestral members of this family burrowed their way through the forest soils of ancient New Zealand some 100 to 150 million years ago when this country was joined with these other areas as part of the ancient continent of Gondwana.

It is not too difficult to imagine Darwin's finches, arriving in the Galapagos archipelago and then flying to the various islands of the group, remaining geographically separated and evolving into different



species. But try and imagine the same dispersal of our native earthworm species. Earthworms are not carried by the wind or by birds (alive, that is) and they cannot survive in seawater. Time alone saw them burrow their way throughout New Zealand. Their slow spread and subsequent adaptation have resulted in 173 species, each with its distinct and sometimes highly specialised niche.

Native earthworms are mostly found in the leaf litter, topsoil and subsoil of native forest and tussockland. Others have developed lifestyles under the bark of trees or high in the forest canopy. Like all earthworms, each breaks down organic matter allowing it to be better utilised by smaller invertebrates and ultimately providing nutrients for plants.

Those earthworms that live in leaf litter don't make permanent burrows. They are small, relatively quick (to avoid the beaks of hungry birds), and darkly coloured to protect them from the damaging ultra-violet rays of the sun. Further down, earthworms of the topsoil are less vulnerable to predators, and are larger, less active and less pigmented than leaf-litter species. They make permanent burrows. Even further below the surface, subsoil earthworms like *Spenceriella* (see box) are very large and sluggish, reflecting their safe, albeit boring lives, far beyond the reach of predatory birds or the destructive rays of the sun.

Our specialised native earthworms began to disappear when forest clearance, fertiliser and stock trampling altered their soil homes and the more generalist introduced earthworms moved in. This latter group are members of the most recently evolved family, the Lumbricidae and are the worms of your lawns and gardens. They have followed the spread of human development around the world, dominating and excluding the local endemic worms, providing an important horticultural service but reducing biological diversity at the same time.

OUR PRESENT DAY giant weta, contemporaries of the dinosaurs, are little changed from their fossilised ancestors of 190 million years ago, when New Zealand and Australia were part of Gondwana. They have evolved in this country to become giants among insects.

Being big is energy efficient, and, with less likelihood of being eaten as is often the case in simpler island ecosystems with fewer predators, there are few countervailing disadvantages to being large and conspicuous. Animals therefore often evolve into larger forms on islands than they do elsewhere. Problems begin when a suite of predators such as rats are introduced and you suddenly find that being very big is being very vulnerable.

But why didn't weta become as big as elephants – or more modestly, as big as cats? The limit is imposed by the breathing system. In animals with backbones – fish, amphibians, reptiles, birds and mammals – oxygen and carbon dioxide are carried to and from the body cells by the blood vessels, powered by the beating heart.

In insects, the blood system is not involved in respiration. Air is piped through tubes opening from ten paired portholes along the thorax and abdomen – these openings can easily be seen in a weta or even a cricket. The air tubes branch again and again, and the very finest capillaries are filled with fluid. Oxygen in the air flows directly along the larger tubes, dissolves in the fluid of the small capillaries and then diffuses into the insect's tissues. Although some muscular pumping can be exerted, mostly the air travels slowly by passive diffusion. It could not reach the inside of a large animal fast enough to support rapid or strenuous activity.

So giant weta, the fattest insects alive, are not renowned for speed.

The other factor limiting insect size is the external skeleton. This armour, which has contributed to the enormous variety and success of the insect group, also curtails an insect's size.

It is humbling to remember, though we may unconsciously think that big is beautiful, that the mammals of the world today, which include most of the large land animals, number only about 4,100 species. By comparison, 400,000 different beetle species have been identified and many more await discovery.

A theologian once asked the famous biologist J.B.S. Haldane what inference could be drawn about the nature of god from a study of his works. Haldane replied: "An inordinate fondness for beetles."

*Ann Graeme*

# *is beautiful?*


*Growing up to 180 millimetres long, the giant red flatworm is one of about 30 native species of terrestrial flatworms. Unrelated to earthworms, flatworms are unsegmented, brightly coloured and feed on small animals such as slugs or snails. Once plentiful in the mountains of north-west Nelson, giant red flatworms are now much reduced due to habitat loss and introduced predators.*

ANN GRAEME *is the national coordinator of Forest and Bird's Kiwi Conservation Club.*

ILLUSTRATIONS BY TIM GALLOWAY

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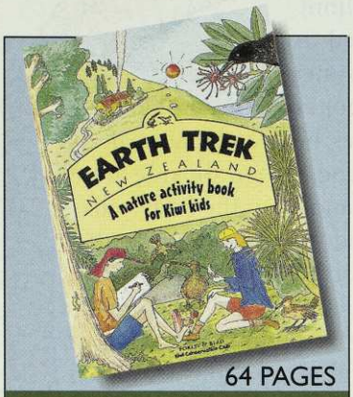


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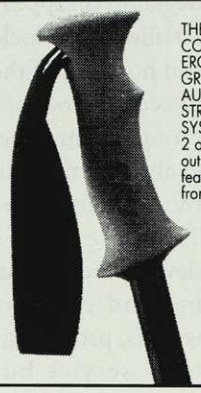

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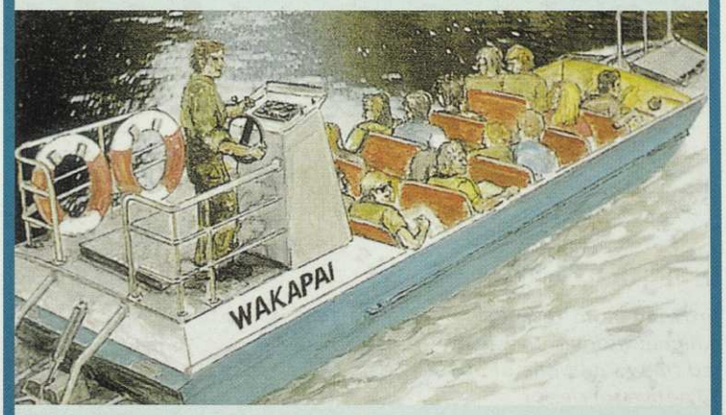


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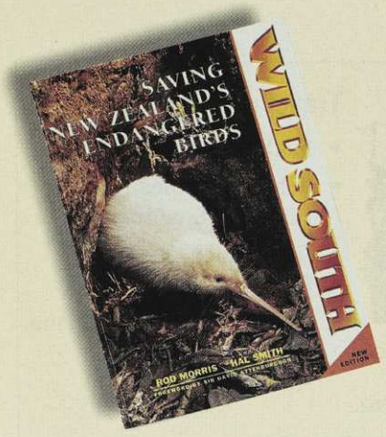



## Wild South: saving New Zealand's endangered birds

*by Rod Morris and Hal Smith (Random House) 1996, 248pp, $39.95*

It is a brave soul who ignores the advice of producers from the BBC Natural History Unit – acknowledged masters of the art of natural history film making. Nevertheless, to their eternal credit, their TVNZ counterparts in 1975 did ignore the Beeb's suggestion that it would be "simplest to begin with common animals such as rabbits and deer, to try to give audiences an intimate view of their private lives".

Instead the New Zealanders chose to focus on the endemic species – mostly birds, and mostly rare and endangered – that make this country unique. The gamble paid off as audiences avidly watched the *Wild South* series of programmes open the window on a world that many did not know existed.

*Saving New Zealand's endangered birds,* a new edition of a work first published in 1988, is all the book's title suggests – and more. Besides being a riveting narrative of the bird rescue work carried out by the Wildlife Service and the Department of Conservation, also describes the making of a number of the *Wild South* programmes.

Rather than merely reading a scientist's account, we are there with the camera crew as they attempt to film the sometimes elusive birds that are to be the subject of a programme, thereby offering us insights into animal behaviour we might never receive. And they are a star cast: the kiwi, black robin, takahe, kakapo, black stilt, saddleback, kea, yellow-eyed penguin and kokako.

In a sense the evolution of the Dunedin-based Natural History Unit of TVNZ over the last two decades has paralleled that of bird conservation efforts. This revised edition shows us that, given the resources and the will, New Zealanders can reverse the slide to extinction that face so many of native species: in 1996 the future of the kokako, yellow-eyed penguin, black robin and saddleback looks more rosy than in the late-1980s.

The strength of the book lies in the authors' abilities to interweave a number of different elements: the history of the birds, wildlife rescue work and the creation of the documentaries. The lively and informative text is complemented by wonderful photography, mostly by unit producer Rod Morris.

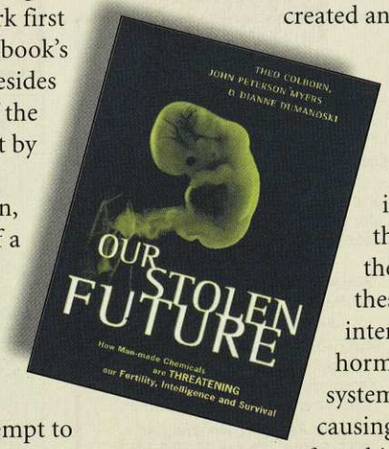
*Gerard Hutching*

## Our Stolen Future

*by Theo Colborn, John Myers, Dianne Dumanoski (Little Brown and Co UK) 1996, 308pp, $49.95*

In 1962, Rachel Carson published a book that was to change the way we thought about the environment for ever. In *Silent Spring* she graphically described the damage done by the wanton use of synthetic pesticides, notably DDT.

*Our Stolen Future* is the natural heir to Carson's legacy. In simple and direct prose, the authors – two leading US environmentalists and a noted journalist – set out the accumulated evidence of the presence and effects of persistent chemical contamination, over a huge geographical range and from the lowest to the highest animals in the food web.




The uninterrupted flood of chemicals created and released into the environment since the 1940s means that all human beings alive today have more than 250 synthetic chemicals in their bodies. Much of the evidence compiled by the authors suggests that these chemicals are now interfering with the delicate hormonal message-carrying systems in all vertebrates, causing symptoms that range from birth defects and cancer, to more subtle damage such as lowered fertility, parenting skills and intelligence.

Not all the issues dealt with in this book are beyond dispute; but then neither was the DDT debate, nor the discovery of the hole in the ozone layer in 1985.

Even for those who don't know the difference between a dioxin and a furan (and I certainly didn't), if you wish to be better informed on the issues relating to our environment and its future you should read this book.

*Chris Hobley*

## New president

JON JACKSON was appointed a judge of the new Environment Court (formerly the Planning Tribunal) in September and has resigned as president of the society. Jon was president for the past two years, deputy president for four years prior to that, and a member of the executive since 1986.

Our congratulations and best wishes go to Judge Jackson in his new role; we are sure that he will fill the position with dignity and sharp intelligence and that his judgments will reflect the best interests of the environment.

Deputy president Keith Chapple has been elected as president by the executive, and the deputy president's position will be filled by the executive at its November meeting.

Keith has been a member of the executive since 1990. He has been an active campaigner on energy issues, in particular against inappropriate hydro developments. He is perhaps best known for leading the campaign to wind back ECNZ's monopoly on the waters of the Whanganui system in the late 1980s and early 1990s. He is employed at Taumarunui Hospital and lives within earshot of the Whakapapa River near Kakahi in the King Country.

## Australasian parrots

A GROUP DEVOTED to the study of wild parrots in Australia, New Zealand and Oceania has been formed within the Royal Australasian Ornithologists Union. The BIRDS Australia Parrot Association will focus interest on some of the region's rarest native species, like the kakapo and orange-bellied parrot, as well as some of the most difficult-to-manage and the most abundant.

The association will discuss issues that threaten parrots throughout the region, such as clearance of habitat, changes in fire regime, loss of hollows etc. It will produce a newsletter, run expeditions and projects and prepare policies on parrot-related issues.

Membership costs $18 or less. Contact BIRDS Australia Parrot Association, c/- RAOU, 415 Riversdale Rd, Hawthorn East, Victoria 3123.

## Advertising inserts

THE REVENUE the society receives from advertising in *Forest & Bird* allows the costs of the magazine to be kept down and more of your subscription dollars to be spent on our direct conservation work. This applies also to loose advertising inserts.

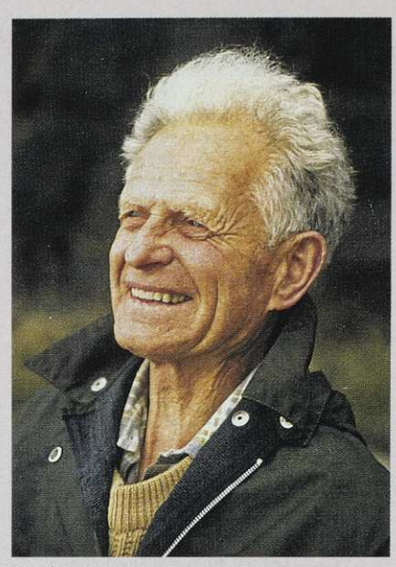
However, if you do not wish to receive loose, non-Forest-and-Bird advertising material, please write to: Jenny James, membership administrator, Box 631 Wellington, and the material will be excluded in future from your magazine package.

## Obituary: Paul Every

CONSERVATION LOST a staunch and practical advocate with the death in August of Paul Every at the age of 85.

Born in Gore, Paul developed an early love of the forests, rivers and backcountry of Otago and Southland which he travelled extensively on a one-speed bicycle.

A school teacher in Dunedin, then Taranaki dairy farmer, Paul and his wife Phyllis retired to a 20-hectare haven on the Otago Peninsula in the 1970s where Paul created a refuge for native plant and animal life, and grew native plants for restoration projects. He helped form a trust for the protection of yellow-eyed penguins and, with Phyllis, donated a block on their property as a small reserve for a colony of native green gecko.



*Paul Every*

Paul was also a driving force behind the replanting of Jacks Blowhole Reserve – a childhood haunt – and a founding committee member of Forest and Bird's 220-hectare Lenz Reserve on Tautuku Bay.

A life member of the society, Paul was awarded an Old Blue by Forest and Bird in 1989 for his long service to conservation.

## Calling conservation volunteers

WANT TO HELP survey little spotted kiwi, trap stoats, collect native seeds, pull pines, restore huts and tracks or capture giant weta?

These tasks and more are available to New Zealanders who want to do something practical for conservation. DoC has a detailed programme through to August next year of important projects that require volunteers. The projects are graded for varying fitness levels and required skills (such as painting, first aid, or just good eyesight and keen interest), and vary from one-day jobs to longer ongoing projects. A donation is sometimes requested to cover food and transport costs.

For details of projects in your area and registration forms, contact the volunteer coordinator in your local DoC conservancy office. A list of the full national programme can be obtained from Kellie Coombes on 04-471-0726.

# 1996 index

Key: BO = Branching Out
C = Comment
CB = Conservation Briefs
WW = World Watch

## AUTHORS



## SUBJECTS

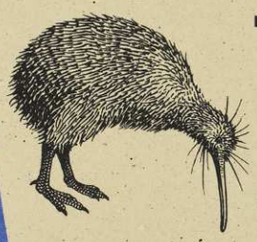
# join Forest and Bird

## and join a friend

*We need your support and the support of your friends to protect New Zealand's natural heritage*

**Membership of Forest and Bird gives you:**

- participation in New Zealand's largest and most active grass-roots conservation organisation.
- subscription to the country's most important magazine on environmental and conservation issues – four full-colour issues a year of *Forest & Bird*. Plus six issues of the topical *Conservation News*.
- membership of your local branch, which runs trips, walks and conservation projects.



- the right to stay at Forest and Bird's lodges around the country.
- a great gift idea for a friend or member of the family.

**YES** I want to join. Please enter a membership in the category ticked below.

Name (Mr/Mrs/Ms) _____

Address _____

_____ Telephone _____

☐ This is a new membership ☐ This is a renewal (membership no. _____)

**GIFT MEMBERSHIP** Join a friend by filling in their name above, and your name below. Gift memberships will be sent with a special gift card in your name.

☐ Please tick if you would like to be billed for renewal of this gift membership next year.

Gift from: (Mr/Mrs/Ms) _____

Address _____

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|---|---|---|
| ☐ Single ☐ Family ☐ Non-profit group | | $47.00 |
| ☐ Senior Citizen ☐ Senior family | | $35.00 |
| ☐ Student | ☐ Schools / Libraries | $30.00 |
| ☐ Overseas | | $NZ67.00 |
| ☐ Life (single only) | | $675.00 |
| ☐ Corporate | | $275.00 |

**KIWI CONSERVATION CLUB**
*(for children up to 13, see over):*

| | |
|---|---|
| ☐ Single | $12.00 |
| ☐ Family (no. of children) ____ | $20.00 |
| ☐ Schools / Groups / Overseas | $22.00 |
| Donation | $ _____ |

(all prices incl. GST)

☐ Enclosed cheque to Forest and Bird or:

Charge to my ☐ Visa ☐ Mastercard ☐ Amex ☐ Diners

Card No. ☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐

Expiry date _____ Cardholder's signature _____

***By mail:*** **FREEPOST No. 669, Forest and Bird, PO Box 631, Wellington.**
***By phone:*** **(04) 385-7374 with credit card details.** ***By fax:*** **(04) 385-7373.**
***E-mail enquiries to:*** **office@wn.forest-bird.org.nz**

96/97

MEMBERSHIP FORM

MEMBERSHIP FORM

**YES** I want to join. Please enter a membership in the category ticked below.

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96/97

# Gift nature to a child you know...

*For young New Zealanders: the*


The Kiwi Conservation Club is for children up to 13 years. It encourages an appreciation of the natural world, and promotes fun, conservation-based activities. KCC members receive:

- quarterly copies of the KCC magazine. This is full of interesting stories, games, jokes and projects to take part in.
- the local KCC newsletter about local trips, beach cleanups, or walks especially for kids.
- the KCC member's badge and sticker.
- the KCC membership certificate with the Kiwi Conservation Code.

***Give a gift of nature to a child with a membership to Kiwi Conservation Club on the attached form***

# FOREST and BIRD lodges

### RUAPEHU LODGE, TONGARIRO NATIONAL PARK

Set within the national park at Whakapapa Village, this lodge is available for MEMBERS ONLY, and is an ideal location for tramping, skiing, botanising and exploring.

The lodge holds 32 people in four bunk rooms, and provides all facilities except food and bedding. Private parties are restricted to 10 members.

Bookings and inquiries should be made to PO Box 631, Wellington (04) 385-7374. The lodge is very popular, and bookings may be made six months in advance, if secured with a 20% deposit. The rates are reasonable, and fluctuate seasonally.

Full payment is required four weeks prior to occupation, after which time there is no refund for cancellation.

### WILLIAM HARTREE MEMORIAL LODGE, HAWKE'S BAY

Situated 48 km from Napier, 8 km past Patoka on the Puketitiri Road (sealed). The lodge is set amid a 14 ha scenic reserve and close to many walks in the area, eg, Kaweka Range, Balls Clearing, hot springs and museum.

The lodge accommodates up to 15 people with 10 bunks and a further 5 mattresses. It has a fully equipped kitchen including stove, refrigerator and microwave plus tile fire, TV, hot showers and flush toilet. You will need to supply your own linen, sleeping bags etc.

For information and bookings please send a stamped addressed envelope to Margaret O'Rourke, 518 Kennedy Road, Greenmeadows, Napier, (06) 844-8301.

### ARETHUSA COTTAGE

An ideal base from which to explore the Far North. Near Pukenui in wetland reserve. Six bunks. Fully equipped kitchen. Separate bathroom outside. Inquiries and bookings to Pat Platt, Waterfront Rd, Pukenui, RD4, Kaitaia, (09) 409-8757, or Sue Beauchamp, 1 Heretaunga Cres, Cable Bay, RD3 Kaitaia, (09) 406-1525.

### TAUTUKU LODGE

State Highway 92, South East Otago. Situated on Forest and Bird's 550-ha Lenz Reserve 32 km south of Owaka. A bush setting, and many lovely beaches nearby provide a wonderful base for exploring the Catlins. The Lodge, the Coutts cabin and an A-frame sleep 10, 4 and 2 respectively. No animals.

For information and rates please send a stamped addressed envelope to the caretaker: Miss M. Roy, Papatowai, Owaka, RD2. Phone (03) 415-8024.

### TAI HARURU LODGE, PIHA, WEST AUCKAND

A seaside haven set in a large sheltered garden on the rugged West Coast, 38 km on sealed roads from central Auckland. Close to store, bush reserves, and tracks in the beautiful Waitakere Ranges.

Bedrooms include a double and 3 singles, plus large lounge with open fireplace, dining area and kitchen. The self contained unit has 4 single beds, a living room with kitchen facilities. Bring food, linen, and fuel for fire and BBQ.

For details and rates send stamped addressed envelope to Ethne Richards, 25 Aldersgate Road, Hillsborough, Auckland. (09) 625-8973.

### WAIHEKE ISLAND COTTAGE

The cottage at Onetangi has comfortable bunk accommodation for eight people and has a stove, refrigerator, and hot water. Adjacent to a 49-ha wildlife reserve, it is in easy walking distance from shops and beach. It is reached by ferry from Auckland City (six or seven returns daily) and by bus or taxi from the island ferry wharf. Everything is supplied except linen and food. No animals.

Different rates apply for winter and summer. For rates send an addressed envelope to the booking officer, Maya Spence, 16 Hobson Terrace, Onetangi, Waiheke Island, (09) 372-5647.

### BUSHY PARK LODGE

At Kai Iwi, 24 km northwest of Wanganui on sealed road off State Highway 3. Historic homestead, fine grounds and 89 ha of virgin bush with tracks and trees identified.

Bed and breakfast. Accommodation for 15 in six bedrooms, single and double beds, electric blankets, heaters and vanity units. Dinners available on request. Recreation room.

Open 7 days; reduced off-peak rates.

Separate self-catering accommodation for up to 13 is available outside the main house, including kitchen facilities, mattresses and pillows. Toilets and showers are in adjacent building.

Bookings and information leaflets: Manager, Bushy Park Lodge, Kai Iwi, RD 8 Wanganui, (06) 342-9879.

# Christmas Specials from Kathmandu

| | | |
|---|---|---|
| Hydrotex Walking Boots | *Save $100* | **$169.00** |
| Mini Maglite Torches | | **$19.95** |
| Espresso Maker (4 cup) | *50% off* | **$32.50** |
| (1 cup) | *50% off* | **$22.50** |
| Kathmandu Down Sleeping Bags | | **30% off** |
| Polypropylene L/S Top & L/Johns | *Save $9.55* | **$19.95** |
| Canvas Unisac | *25% off* | **$56.25** |
| Kathmandu T-shirts | | **$12.50** |
| Kids Capricornia Jumper | *Save $30* | **$49.50** |
| Leatherman Tools | | **25% off** |
| Silk Bag Liners | | **$39.50** |
| Karabiners | | *From* **$6.95** |

***(Sale starts Thursday 5 Dec)***


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