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GUEST EDITORIAL

Science and Research — New Directions

The Division has undergone what in former times was known as a "sea change"; a metaphor worth exploring, given the retirement of Dr Richard Sadleir, the Division's foundation director, in June 1995.

It was a rough passage from 1987. The Division and the Department owe Richard a considerable debt for the quality of his pilotage through nearly a decade of almost constant restructuring of New Zealand science, and regular questioning of the department's right to maintain a science and research capacity. Doubt about the validity, and indeed the necessity of the Division's role has not just expressed externally; there has been an almost continuous series of internal reviews of science since 1989-90. Yet the Division has not only weathered the storm and maintained its existence through this period of uncertainty and continually reducing budget, but it has emerged into the calmer seas of increasing acceptance of the need for science and even more importantly of increasing budgets with its Crew more or less intact, and its rigging in good order. For this I extend my thanks to Richard, on behalf of all members of the Division and wish him a long, happy and scientifically satisfying retirement.

My appointment as Science & Research's second director coincided with the Department's senior management giving the Division a clearer mandate, and adopting a science planning system which will enable the Division to join the Departmental mainstream, and provide a better science service to front line managers. One cannot join the mainstream without creating eddies — and these eddies might cause some temporary discomfort, but they will be worth it. My intention is that the Division will be recognised in a way not previously achieved, as the scientific foundation upon which the grand adaptive management experiment (which is the practice of conservation management in New Zealand) is based. It will achieve this by accepting accountability for the standard of science based information available to managers; and by extracting from the national expenditure on conservation related science the maximum possible benefit for conservation management.

There will be changes, but these will be evolutionary. The Division has a huge capacity and its products are in high demand. The seas are calmer, the horizon is clear, the future looks great for conservation, and therefore for conservation science.

John Holloway
Director, S&R

Department of Conservation
Te Papa Atawhai

REPORTING BACK

Bats? Totally inspiring!!

The 10th International Bat Research Conference was held on the campus of Boston University from 6-11 August 1995. Over 390 delegates from 38 countries attended. The conference included 30 symposia papers on Phylogeny and Evolution, Conservation Biology, Functional Morphology and Echolocation.

In August 1995 Colin O'Donnell (Science and Research Division, Christchurch) attended the 10th International Bat Research Conference in Boston Mass. Here are some of his comments.

An additional 130 oral papers and 120 poster papers were also presented. Because of the large number of papers, two sessions ran concurrently. The evenings were busy with two evenings for presentations of poster papers and one evening devoted to a major workshop on conservation education. Additional meetings on bat conservation were organised by IUCN and the American Zoo Association. Several commercial displays demonstrated bat detection, radio-tracking and capture equipment. There were three representatives from New Zealand, myself, Jane Sedgeley and Stuart Parsons. The proceedings of the conference symposia, entitled "Bats: Phylogeny, Morphology, Echolocation and Conservation Biology" will be edited by T.H. Kunz and P.A. Racey, and published by the Smithsonian Institution Press. Abstracts from the conference will be published in the journal *Bat Research News* (to which the DoC Library subscribes) early in 1996.

I was totally inspired by this conference! We were subjected to a huge array of well presented papers on all aspects of bat biology and conservation, learnt a considerable amount about study techniques, and made many useful contacts with overseas bat workers. I found the discussions that went on between sessions extremely helpful. What was also inspiring was that despite our relative "youth" in the bat world, the research we are undertaking in New Zealand is at least as good as that done elsewhere.

It was interesting to hear three papers by overseas workers on the opening day which dealt with the New Zealand short-tailed bats (work that I was unaware of) and to see the excitement that overseas bat workers felt towards our special bat fauna, despite never having seen them!! The family Mystacinidae doesn't seem to fit well into accepted bat phylogenies, and several alternative analyses were presented by speakers. Whatever the answer it seems likely that our bats split off very early, perhaps in the Eocene, before the evolution of many standard bat characteristics. A possible short-tail fossil from Australia was also reported.

Advice on issues of current importance in New Zealand

Tissue sampling for genetics studies

Work is now beginning in New Zealand on the genetics of our bat populations. Tissue sampling using wing punches is required. I met many people that are now using this technique overseas with no adverse effects. In fact I had a try at it myself and to view a wild population of horseshoe bats of which 50 or so had been punched within the last month, and all tissue had healed completely. However, its best to do tissue sampling in spring and summer when tissue re-growth is more rapid (especially in young bats).

Sensitivity of bats to handling

We have been very careful about handling of bats and obtaining the proper ethics approvals for all research done so far in New Zealand. It was reassur-

ing to see many examples of how amendable bats were to regular handling with no problems, as long as careful precautions were taken. One example, was of a worker catching all bats (including young) in a colony once every 3 days over the summer. Growth curves of young were measured and young were banded (with very specific bands). All young grew normally and the bats returned each day to the roost. The oldest bats in the colony were 26 years old and had been handled many times!

Surveying bats from their echolocation calls

There were two messages that were drummed in: Firstly, on one hand, we're incredibly lucky in New Zealand to have only two species of bat, with relatively distinct calls, to try and identify, not 10 or 20 or 60 or 135 (Brazil)! Our discussions in New Zealand about the best way to differentiate between our species are healthy though, because, on the other hand, echolocation calls within species can vary a great deal according to habitat, food type, age, feeding method, amount of clutter and so on. Calls can vary depending on how high the bat is flying (1-2 m differences in height can even make a difference). Call structures can change with age and juvenile calls are often related to their mother's. Bats can even adjust their calls very subtly (e.g., inter-pulse interval) depending on what they're doing. Call structure, pulse rate and peak frequency are the simplest ways of identifying species but we also heard about complex multivariate discriminant analyses being used just to identify species.

Care of captive bats

I was surprised at how widespread the use of captive microbats for research programmes was. Many studies involved holding groups of bats temporarily. There is a wealth of experience and many manuals on captive care which should be consulted if such programmes are being proposed here. Captive studies are used because so many aspects of bat biology are so difficult to study in the field. Likewise I was surprised at the confidence people I spoke with had in re-introduction of bats to the wild. Bats seem to be pretty resilient animals IF THEY ARE CARED FOR CORRECTLY, and one example was given of reintroduced bats now breeding in the wild. Contact me if you want references.

Restricting access to bat colonies

Disturbance of bats in caves was identified as a major concern by many workers. Both casual cave visitors and recreational cavers are causing problems. Several groups have developed guidelines (especially Bat Conservation International). There are many standard designs for grills and gates over caves in use.

Use of forearm wing bands

We have gone through quite a lot of agony about how to permanently mark our bats for long term studies of survival, without causing damage to wing membranes. It was reassuring to see that people overseas are generally happy to use the British bat bands that we have now successfully trialed in New Zealand. However, individual bats need to be regularly monitored and the position of the band checked. Bands can be replaced successfully if problems do develop.

Advances in technology

Holohil Systems (Canada) now produce a 0.4 gram radio transmitter. It has a life of up to 3 weeks.

Colin O'Donnell,
Christchurch

Colin picked up lots of useful information for bat research in New Zealand.

Staff — New Faces at Tory Street

Lots of new staff on the premises, as a result of the "Green package".

Peter Carey

Peter Carey worked previously with Industrial Research Ltd., Sensors and Electronics group (ex DSIR Physics and Engineering Laboratory) where he worked on electronics, mechanical design and software for a variety of projects including silicon pressure, tilt, odour and chemfet sensors, sun tracking and conducting polymers.

He will be working with Murray Douglas in the Electronics Laboratory giving advice, helping maintain S&R's electronic equipment and also designing and constructing new equipment for new projects funded under Species Protection.

Lisa Sinclair

I'm the person wandering around the Department with a "Hi, my name is STAFF" badge . . . I will be working with Greg Sherley. Initially my job will be searching for a Notoreid moth in Taranaki. Some points about me follow.

(1) I graduated BSc then finished on MSc (Hons) from Canterbury in 1995. My research was based in Twizel with Project River Recovery, and investigated the impact of bulldozing (habitat reconstruction) on terrestrial invertebrate and plant communities.

(2) During my research I counted over 160,000 collembola before I realised that I could pay an unsuspecting student to do it for me! (oooo, look at all those little black things. . .).

(3) I nearly ruined family harmony by conning them into being my field assistants. . . (chocolate bribery has a lot going for it!).

(4) During my student days, everyone told me that losing in 500 (card game) was a virtue, and earned the nickname 'Lisa of 2 weevils'. . .

(5) I have taught 7 year old humans how to read music!

(6) Despite (5), I have played flute and recorder in professional chamber music groups and also enjoy singing early music.

(7) For entertainment, I watch the cat trying to eat cicadas!

I look forward to working here and meeting everyone. — Lisa.

Someone who knows about fish and statistics:

Ian F. West

Ian West joined the Department on 8 February to manage the Conservation Services Levy (CSL) Programme. The CSL Programme uses a levy from the commercial fishing industry to fund research and mitigation programmes on species endangered from commercial fishing. Currently the programme focuses on marine mammals and seabirds.

Ian is by profession a scientist/mathematical statistician. He trained at Massey University (BSc (Hons) 1974) and has worked in the Fisheries Research Division of MAF — now NIWA (1974-77, 1981-92), University of St Andrews, Scotland (1977-81), and University of Hawaii (1992-94). Most recently he has been a consultant in private practice, something he still continues in order to supplement his DoC salary.

At Fisheries Research he worked on multilevel sampling designs for sampling trawl catches in processing plants, the design and execution of aerial counts and postal surveys, salmon and skipjack stock assess-

ments, age determination of deep-water fishes and small efficient experimental designs in aquaculture research.

Ian's professional statistical interests are in log-linear models (includes the analysis of table sand multiple mark-recapture), small experimental designs and new ideas for data exploration. He is a member of The International Association for Statistical Computing, The Biometric Society, The American Statistical Association and The New Zealand Statistical Association.

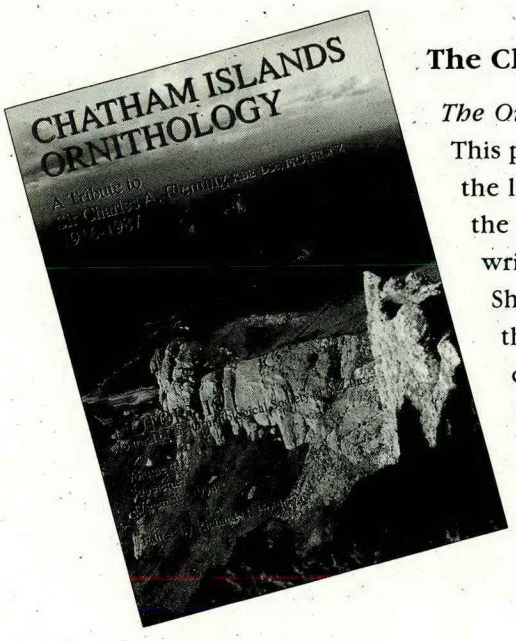
A Herpetologist for the South...

Mandy Tocher — in Dunedin

Mandy started a BSc degree at the University of Canterbury in 1987. With a strong background in the Biological Sciences she then went on to complete an MSc degree investigating and comparing the physiology of two populations of the common gecko *Hoplodactylus maculatus*, each of which naturally experienced a different thermal climate at respective habitats.

Mandy began her PhD in October 1992 and went on to spend one and a half years in Brazil working in the "Biological Dynamics of Forest Fragments Project" reserves. Mandy's PhD thesis has three component parts, and attempts to determine the fate of a central Amazonian frog community in a fragmented landscape. The first component investigates the impact of forest fragmentation on frog species presence/absence, breeding success of species attracted to artificial pools, and on the relative abundance of leaf litter species (those which breed ubiquitously throughout the forest). Results indicate that the majority of frogs are not as badly affected by fragmentation of their habitat compared with other taxa studied in the BDFFP reserves.

The second component of her thesis investigates the somewhat hotly debated topic of 'edge effects', and the last component investigates the importance of the so-called matrix habitat (habitat surrounding isolated reserves) as a habitat in itself, and as a corridor, potentially facilitating movement into and out of isolated forest patches. Mandy is in the final stages of writing up and will finish by June this year.



The Chatham Islands ornithology

The Ornithological Society's tribute to Sir Charles Fleming.

This publication is a supplement to *Notornis* so there will be a copy in the library. It contains 16 papers and 1 short note on Sir Charles and the ornithology of the Chathams, a few of the papers having been written by DoC staff.

Should you want to purchase copies of it for the Department I'm the contact person. They retail at $15 per copy, but a reduced cost could be negotiated for a bulk order.

Ralph Powlesland
S&R, Tory Street

RESEARCH IN PROGRESS

Stoats: Recent research and management

Stoats were introduced to New Zealand from England in the 1880s to control rabbits, but rapidly became implicated in the decline of native bird species. Stoats are now widely distributed in both the North and South Islands of New Zealand and are one of the commonest predators in forests.

Elaine Murphy (Science and Research Division, Auckland) specialises in predator biology. In this two-part report, she brings us up to date on the stoat situation.

Summary of current situation

Stoats, along with the other mustelids (ferrets and weasels) and feral cats, have been implicated in the decline and loss of a number of native bird species and may also be a factor in the demise of other native animals. There is strong evidence for the role of stoats in the decline of bird species, particularly those such as parakeets, mohua (yellowheads) and kaka which are more vulnerable because they nest in tree holes. The most comprehensive studies have been undertaken in beech forests, where periodic mast years produce an abundance of seed which results in increases of both birds and mice which in turn feed increased stoat numbers. Encouraging results during the last stoat plague in 1990/91, and the new development of stoat poison techniques, has led the Department to undertake experimental control of stoats over large areas of beech forest this year (where another stoat plague is under way).

The effects of stoats on other species in other habitats is less clear, though they are known, for example, to be having serious effects on kiwi in a number of sites, shearwaters in the Kaikoura Mountains and on shorebirds in Northland. While information has recently come to light about predation on birds by stoats, when their normal rodent prey has been controlled, less is known about the interactions between stoats and other predators such as cats, rats and ferrets and their relative and combined effects on threatened species.

The following synopsis of recent research highlights findings on the effects of stoats, summarises progress towards their management and also shows some of the uncertainties which still need to be resolved. More research is planned on control methods, and the provision of new funding for threatened species management has helped to facilitate this.

Recent research on impacts of stoats

Stoats and hole nesting birds (especially Mohua)

Colin O'Donnell, Peter Dilks, Graeme Elliott, Steve Phillipson (DoC)

In the Eglinton Valley, Fiordland, significantly more mohua nests in a Fenn-trapped area produced young than in a untrapped area, during the 1990/91 stoat plague year. No significant differences were found between areas in the subsequent two years when fewer stoats were caught. The same was not true for yellow-crowned parakeets, where stoat predation was found to be important in non-plague years.

Traps baited with standard egg baits (one whole egg, one cracked egg) caught as many, or more stoats, than traps baited with just whole eggs, hard boiled eggs, possum flesh, cat food or artificial lures. Traps baited with dead mice caught more stoats than the standard egg bait but this difference was not significant.

No significant differences were found in the number of stoats caught in hidden and exposed traps in tunnels, or

double ended and single entrance tunnels. Male stoats were more likely to be caught in the edge traps of a 50 ha grid. Female stoats were equally likely to be caught anywhere on the grid.

Understanding the role of stoats from a live animal study

Elaine Murphy and John Dowding (DoC)

This study was the first to radio-track stoats in New Zealand and yielded valuable information on their ecology and interactions with native birds in Fiordland beech forest. Stoats were found to be very mobile and capable of covering large distances (one juvenile female moved 65 km within four weeks). Mean range length of stoats was found to be 2.5 km (n=19).

Adult female stoats avoided using the road, whereas adult males preferred it. In contrast, in the stoat plague year when most stoats were juveniles, females and males did not avoid, or show a preference for the road.

Even when other foods were abundant, birds were the most frequent prey item of stoats. Endangered and vulnerable bird species found in stoat dens, stomachs and droppings, included yellowhead, kereru & kakariki. As some bird species (e.g. hole-nesters) are more vulnerable than others, stoats are probably slowly changing the species composition of the beech forest bird community. Stoat densities fluctuate widely in beech forest. Even at low densities however, some stoats are still dispersing and areas cleared of stoats are re-colonised within a few weeks.

Stoats as predators of kaka

Peter Wilson, Brian Karl & Richard Toft (Landcare Research, Nelson)

There are now fewer kaka found on mainland New Zealand than at the turn of the century. Initially they thought that the decline may have been due to competition with introduced browsers and wasps for high energy food, however their research has indicated that stoats are the major factor in kaka population decline on the mainland. Both nestlings and adult females are preyed on nests. Funds are a limiting factor for this project.

Role of predation in the decline of kiwi species

John McLennan (Landcare Research, Havelock North)

At least three of the four species of kiwi have declined significantly in abundance and range since European settlement, and introduced mammalian predators are strongly implicated. Stoats are viewed as the most important, as they are the main predator of juveniles. Most mainland kiwi populations have only 3% juveniles, and this recruitment level is not high enough to stop the decline.

McLennan currently has an application to ECNZ for research funding on predators at Lake Waikaremoana.

Predators of Shorebirds

John Dowding (Ecological consultant funded by DoC S&R) and Richard Parrish (DoC Northland).

Many of New Zealand's ground-nesting shorebirds suffer very high levels of egg and chick predation as well as loss of adults to predators. There is mounting evidence that stoats are the major cause of such losses. A single stoat killed 11 adult New Zealand dotterels and an unknown number of eggs and chicks in two months at a site in the Bay of Plenty in 1994, and another killed a number of captive reared New Zealand dotterels released at Omaha, North Auckland in 1995.

Diet switch in stoats

Elaine Murphy & Philip Bradfield (DoC)

Large-scale aerial poisoning with 1080 is now used routinely to control possums in forests. Some of the direct effects of these operations on other animals have been studied. Ship rat numbers can be reduced by over 90% but this effect is short lived. The indirect effects of these operations, particularly on predators, are not well understood.

At Mapara (near Te Kuiti) the abundance and diet of stoats were compared before and after different control methods for possums (and rats). After a successful aerial 1080-poison operation for possums, rat abundance was reduced dramatically. Although rats were the main prey item of stoats before the poisoning, stoat abundance was unaffected by the operation and there was a diet shift from rats to birds. After successful possum and rat control using bait stations with Talon (brodifacoum), there was a diet shift in stoats from rats to both birds and mice.

The conservation benefits and risks of the above are not clear. It is not known whether the predation risk for any particular species of bird (or other animal) will be higher or lower with fewer rats but the same density of stoats. As large-scale poison operations are now common in New Zealand forests, a better understanding of predator-prey relationships under different control regimes, is required as soon as possible.

Elaine Murphy, S&R Auckland

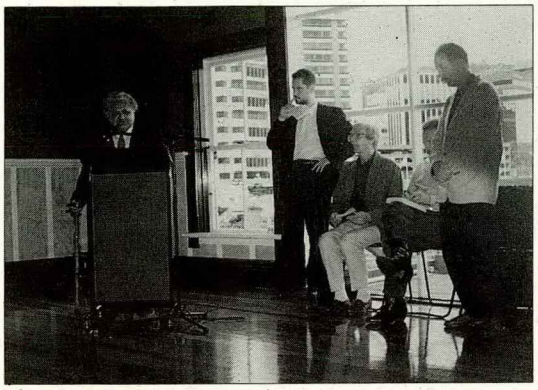
Continued in next issue: *Recent research on stoat control, and student research on stoats.*

BOOK LAUNCH

Nga Uruora: The groves of life

by Geoff Park

The evening of 4 December saw Geoff Park's book launched at the unusual venue of the Star Boating Club on the Wellington waterfront.



Mr Joseph Tukupua opens the speeches by welcoming guests to Whanganui a Tara.

With some 300 people in attendance, the book was launched by Shane Jones with Fergus Barrowman, Managing Editor of the Victoria University Press introducing the speakers. The speakers line-up included Mr Joseph Tukupua of Kawiu, Horowhenua, who welcomed guests in Maori and spoke about the Rangitane and Muaupoko influences in the Wellington region. Joseph is a kaumatua of Muaupoko with a special interest in Lake Papaitonga which features in the book. Professor Emeritus Bill Oliver spoke of the Stout Research Centre and its role in supporting and encouraging the writing of the book while Geoff was a research fellow there. John Holloway, newly appointed Director of Science and Research gave his support to the concepts behind the book, especially the need to research or to understand the process by which our reserve lands were formed just after the turn of the century and the value of understanding Maori values and understandings of forest lands both in its own right and as a means to improving conservation programmes. Shane Jones then officially launched the book, noting his respect for the courage it takes to write on topics of Maori history in the contemporary setting.

Below: Geoff addresses the gathering, with (l. to r.) Fergus Barrowman, Joseph Tukupua, John Holloway, and Shane Jones.

The formal proceedings were completed by a response from Geoff who thanked his partner Lindsay and his family for their support. Anne French, poet and editor with the Museum of New Zealand finished with a poem "at last the failure of words", including appropriate lines:

. . . At the end of the work we must keep still.
The first time you misunderstand me.
It is not that I do not think it is good
but I am humbled by what has spoken
through us. Though the house is burning,
the ahi ka must be kept alight
by those poor forked creatures
we do not at first recognise
as ourselves; and the world,
the damaged glorious land
which is ours, and all we have,
is the only place for all of us to live . . .

As the speaking finished, Tungia Baker spoke her support.

The book has been very favourably received by readers including Maori, historians, reserve lands managers and ecologists. It is structured around passages of conventional academic history of the attitudes of European explorers and settlers to the forests of New Zealand, especially the Thames and Hutt valleys. A labour for anyone not versed in historical writing, Geoff Park has mastered this and is able to exploit a wealth of documentary evidence from 1770 and the visit of James Cook to the Wasihou to 1840 and later as the New Zealand Company settlers landed at Petone. This is

Speakers at the Star Boating Club (l. to r.) Anne French, Lindsay Park, Geoff, Fergus Barrowman.

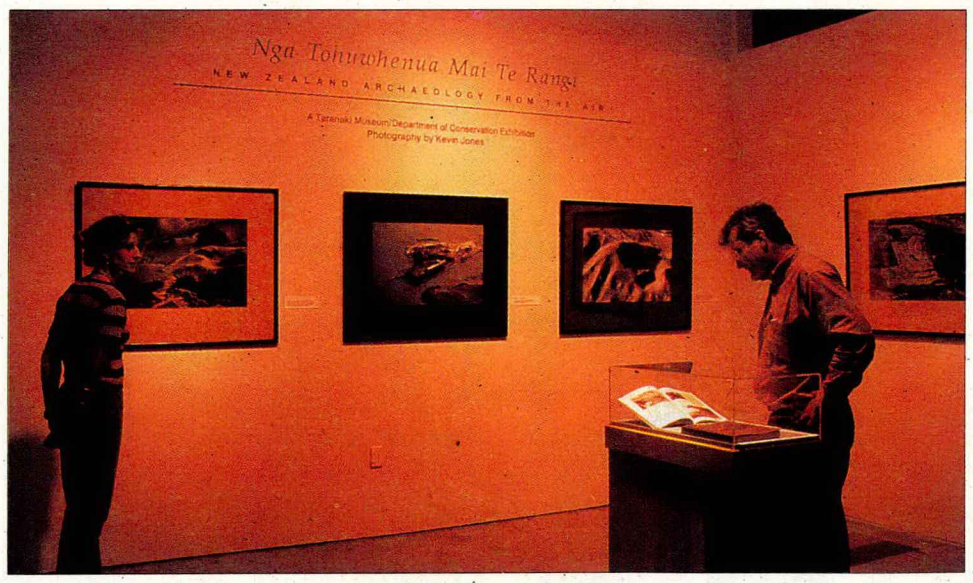
contrasted, in a much more difficult historiographic task, with the description of Maori sentiments and understandings of the value of forest. To do this Geoff turns to four different lowland forest reserves — at Punakaiki, Whanganui Inlet, Lake Papaitonga and the Mokau River — where he draws on his knowledge of ecology, the history of reserve acquisition and, crucially, the feelings and knowledge of local Maori communities about those places. Though the text is punctuated by long tropes of personal — the Minister of Environment has called it "elegiac" - descriptions of experiences in (walking, canoeing, talks with locals, exploring their attitudes) and reflections on the value and loss of these places. Setting a long and intensely argued text off with the spice of such passages makes this a piece of writing in the vein of Thoreau's essays or Aldo Leopold's and a host of similar contemporary American writing - but it is a startling and major innovation in New Zealand scientific writing.

Kevin Jones

Nga Uruora: The Groves of Life is published by Victoria University Press. ISBN 0-86473-291-0. Retail price: $39.95. The wholesaler is Harper Collins, Private Bag 1, Auckland.

Copies are available to DoC staff at a discount. Contact Kaye Green, Department of Conservation, at Tory Street.

AERIAL PHOTOGRAPHIC EXHIBITION OPENS



Showing at the Taranaki Museum until 25 February, the exhibition will then move to Wanganui (3 April - 2 June), Christchurch (17 June - 11 August) and Gisborne (26 August - 27 October).

Dr Alastair Buist opened an exhibition of Kevin Jones aerial photographs on Tuesday 16 January. The exhibition is entitled *Nga Tohiwhenua mai Te Rangi: New Zealand Archaeology in Aerial Photographs.* It has been jointly prepared by the Science and Research Division and Kelvin Day, deputy director of the Taranaki Museum, and consists of 27 oblique aerial photographs, colour and black and white, of archaeological and historic sites ranging from the inland Bay of Islands to Central Otago. Some of the images come from the book of the same name by Kevin Jones, but a number represent more recent work such as horticulture on the Wairarapa coast or pa in the Wanganui and Hawkes' Bay districts.

NEW PUBLICATIONS

A joint publication with Lincoln University

New Books from Science and Research Division

Outdoor recreation in New Zealand. 1995. Devlin P.J., Corbett, R.A., and Peebles, C.J. (Eds) **Volume 1: A review and synthesis of the research literature.** 259 p. Peebles, C.J. **Volume 2: A bibliography.** 299 p.
The first systematic attempt to describe and integrate New Zealand outdoor recreation research to date and project future research needs.

Ecroyd, C.E., Franich, R.A., Kroese, H.W. and Steward, D. 1995. The use of *Dactylanthus* nectar as a lure for possums and bats. *Science for Conservation: 19.* 31p.
Development of possum lures from Dactylanthus nectar, and detection and monitoring of short-tailed bats using *Dactylanthus.*

Burns, Bruce and Leathwick, John 1995. Geothermal vegetation dynamics. *Science for Conservation: 18.* 26 p.
Map of the geothermal vegetation of the Te Kopia Scenic Reserve, and plant species organisation along major environmental gradients.

Ross, C.W., Mew, G., Jackson, R.J. and Payne, J.J. 1995. Land rehabilitation to indigenous forest species. *Science for Conservation: 17.*
Soil studies of the mining site, earthworks, and trial design, lay-out and results. Part II is soil drainage studies at the Giles Creek trial site, conclusions and recommendations.

Meads, M. and Notman, P. 1995. Surveys of giant weta: Little Barrier Island, Pig Island (Foveaux Strait), and Mt Faraday and Price's Basin (Southern Alps). *Science for Conservation: 16.*
Surveys of four weta species in these areas, with methods, results, conclusions and recommendations for management of the populations.

Johnson, P.N. 1995. The rare grass *Simplicia laxa*: Field status, ecology, and conservation. *Science for Conservation: 15.* 87 p.
Aims to understand the ecology, habitat requirements, population sizes, and conservation requirements of the grass, the most highly rated of plants on the threatened species list.

Harris, R., McDonald, R., and Calvert, P. 1995. A sound-based system for locating wasp nests. *Science for Conservation: 14.*
The potential of a sound-based system for aiding the location of wasp nests was investigated by Weed & Pest Div., Landcare Research, in conjunction with Engineering Development Group, Hort Research, Hamilton.

Smale, M.C., Rose, A.B., Frampton, C.M, and Owen, H.J. 1995. The efficacy of possum control in reducing forest dieback in Otira and Deception catchments, central Westland. *Science for Conservation: 13.*
Determining changes in possum densities, tree mortality, and crown condition between 1988 and 1993, and assess the effectiveness of possum control in slowing/arresting canopy dieback.

Cessford, Gordon 1995. Canoeing and crowding on the Whanganui River. *Science & Research Series No. 97.* 94 p.
Visitor research undertaken on the Whanganui River during the 1991/92 summer season. Describes canoeists using the river, including motivations, satisfactions, and perceptions of crowding.

Cessford, G.R. and Dingwall, P.R. 1996. Tourist visitors and their experiences at New Zealand subantarctic islands. *Science & Research Series No. 96.* 68 p.
Surveys of shipborne visitors to subantarctic island nature reserves, 1992/93 and 1993/94. Covers visitor characteristics, positive and negative features of visits, attitudes, conclusions and recommendations.

Cessford, Gordon 1995. Conservation benefits of public visits to protected islands. Science & Research Series No. 95. 62 p.
Pre- and post-visit surveys of visitors to two reserve-status islands: Tiritiri Matangi and Little Barrier, in the Hauraki Gulf, Auckland.

de Lange, P., McFadden, I., and Cameron, E.K. 1995. Preliminary report of the flora and fauna of Fanal Island, Mokohinau Islands Nature Reserve. *Science & Research Series No. 94.*
Part of an on-going survey programme within the Mokohinau Islands Nature Reserve. Findings of a nine-day visit in September 1994.

Cessford, G.R. 1995. Off-road mountain biking: A profile of participants and their recreation setting and experience preferences. *Science & Research Series No. 93.*
Reports the results from a postal survey of 504 off-road mountain bike riders. Identifies some key findings and makes recommendations for future management and research.

Cessford. G.R. 1995. Off-road impacts of mountain bikes: A review and discussion. *Science & Research Series No. 92.*
Reviews current state of knowledge, discusses physical and social impacts. Setting and recreation experience preferences of mountain bike riders are also discussed.

Pierce, R.J., and Graham, P.J. 1995. Ecology and breeding biology of kukupa (*Hemiphaga novaeseelandiae*) in Northland. *Science & Research Series No. 91.*
Results from a 1991-93 study in the Whangarei area and the Chickens Islands. Includes capture, radio tracking, nesting, feeding, home range and movements, diet, and recommendations.

Jones, K.L. and Simpson, P.G. 1995. Archaeological site stabilisation and vegetation management. Case studies II: Auckland and Northland, Otago and Canterbury, and Wellington. *Science & Research Series No. 90.* The three vegetation covers recommended for sites are: grazed or mown grass swards; early succession bracken or shrubland; and forest canopies with manipulation of understorey to maintain a gallery effect.

Challis, Aidan J. 1995. Ka pakihi whakatekateka o Waitaha: The archaeology of Canterbury in Maori times. *Science & Research Series No. 89.* 118 p. Economy, material culture, and settlement patterns in Canterbury during the 14th and 15th centuries, based on a review of the archaeological evidence.

Hamel, Jill 1995. Archaeological assessment of the Otago Central rail trail: the line today. *Conservation Advisory Science Notes No. 137.* 34 p.

Crosby, Trevor K. 1995. Motu-o-Kura (Bare Island): report on invertebrates in pitfall traps. *Conservation Advisory Science Notes No. 136.* 5 p.

Johnson, P.N. 1995. Manorburn Conservation Area: vegetation assessment. *Conservation Advisory Science Notes No. 135.* 17 p.

Mitchell, Charles 1995. Modification of the floodgates and drainage pattern into Lake Pounui: implications for fish passage. *Conservation Advisory Science Notes No.134.* 5 p.

Webb, Colin J. 1995. Seed production in Gunnera hamiltonii. *Conservation Advisory Science Notes No. 133.* 3 p.

Collins, Chris. 1995. Forests and the carbon cycle: Emerging opportunities for native forest protection and afforestation in New Zealand. *Conservation Advisory Science Notes No. 132.* 28 p.

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