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EDITORIAL

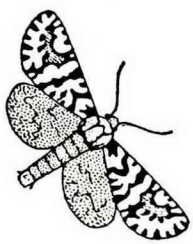
Looking toward a new reorganisation of the Department it is useful to revisit one of the good things that came out of the 1989/90 reorganisation, the Conservancy Advisory Scientist.

In 1987, Regional Managers (yes, children we started with Regional Managers!) and Conservators wanted to have working science advice at hand, and they argued for Science Units attached to regions, or for scientists seconded to Managers. Out of the 1989/90 reorganisation came the concept of the scientist as a second-tier manager involved in the day-to-day life of the Conservancy — in a position to provide scientific input into all decisions. So the Conservancy Advisory Scientist, or CAS, was born.

The primary role of a CAS is to ensure conservation operations are based on the best scientific knowledge, principles, and method. All CAS are also active scientists.

Over the next issues, *ConScience* will profile CAS around the country, both as working managers and as scientists. Our first CAS is Brian Patrick from Otago Conservancy.

K. Green
Editor



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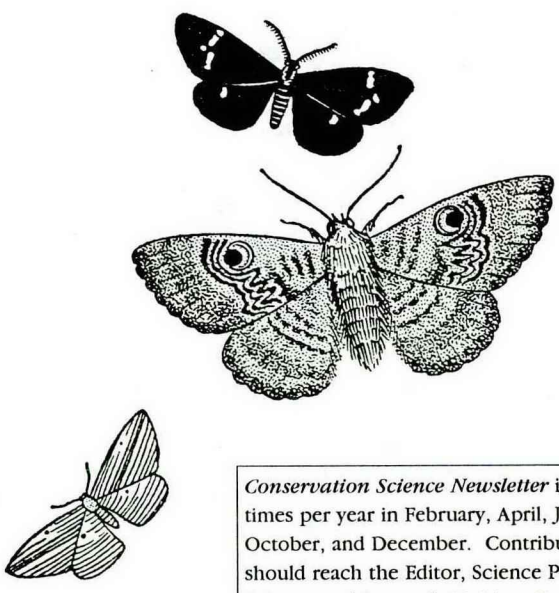


Conservation Science Newsletter is issued six times per year in February, April, June, August, October, and December. Contributions should reach the Editor, Science Publications, Science and Research Division, Department of Conservation, P.O. Box 10-420, Wellington, by the 1st of the month in which they are to appear.

Department of Conservation
Te Papa Atawhai

CAS PROFILE! Brian Patrick, from Otago Conservancy

Our first CAS Profile is Brian Patrick from Otago Conservancy. Brian is an entomologist, but, like any CAS, this just begins to describe what he does — Ed.

"After eight and a half years as a CAS in Otago I can only say that it is an extremely busy and highly challenging position. In reality you have to be hyperactive to survive it!

"The breadth of issues you become involved in is breathtaking from identifying the exotic plants that native galaxiids are spawning on to the effect of snow-making additives on snowbank flora. While advice and liaison work continues to be my major function, coordination of major one-off projects such as an invertebrate survey and assessment of the Rongahere Gorge funded by ECNZ or a head-office initiated, multi-disciplinary assessment of giant skink habitat in eastern Otago have taken up a lot of time in the past year.

"I find the unprogrammed advice fund particularly pleasing as it manages to achieve small bits of research within tight time frames, which satisfies management. Here in Otago, I am actively involved in the Tenure Review Process, both as an entomologist and CAS, ensuring that this freeholding process achieves the maximum gains to conservation. It is a marvellous chance to get access to remote lands that have often not seen an entomologist or botanist.

"One of my dreams has come to fruition over the past six months. That is the creation of a multi-disciplinary science unit in Otago Conservancy. Already it is strengthening the influence of science in the department here and I am positive about the future."

Here is a short bibliography of some of Brian's work:

Patrick, B.H. 1994b. Biodiversity in Semi-arid Central Otago. New Zealand Botanical Society Newsletter. 35: 11-12.

Patrick, B.H. 1994c. Hawkdun Ecological District Invertebrate Survey. Department of Conservation, Wellington. No. 64.

Patrick, B.H. 1994d. Antipodes Island Lepidoptera. Journal of Royal Society of New Zealand Vol 24(1): 91-116.

Patrick, B.H. 1994e. Lepidoptera of the Southern Plains and Coast of New Zealand. Department of Conservation, Dunedin. Miscellaneous Series No. 17. 44 pp.

Patrick, B.H. 1994f. Valley Floor Lepidoptera of Central Otago. Department of Conservation, Dunedin. Miscellaneous Series No. 19.

Patrick, B.H. 1994g. A Re-assessment of the Status of *Olinga fumosa* Wise 1958 (Trichoptera: Conoesucidae) as a Valid Species. New Zealand Entomologist Vol. 17: 78-80.

Patrick, B.H. & Dugdale, J.S. 1994h. Australian Lucerne Leafroller *Merophyas divulsana* (Meyrick) in New Zealand. New Zealand Journal of Zoology. Vol. 21: 305-308.

Patrick, B.H. 1994i. Lepidoptera of Kaitorete Spit. New Zealand Entomologist Vol. 17: 52-63.

Patrick, B.H. 1994j. Conservation of Key Sites for Southern Coastal Moths. Part 3. Cannibal Bay-False Islet. The Weta. 17(1): 7-12.

Chisholm, B. & Patrick, B.H. 1994k. Fauna. In The New Zealand Environment. A Guide for Environmental Impact Assessors. Ed. R.K. Morgan & A. Memon. University of Otago No. 6.

Patrick, B.H. 1994. Insects of the Maniototo, Ecological District. In Maniototo ED by P. Grove. Department of Conservation, Dunedin.

Patrick, B.H. & Woods, C.S. 1995a. Reaffirmation of the Type Locality of Stokells Smelt in Southland. Journal of The Royal Society of New Zealand. Vol. 25(1): 95-97.

Patrick, B.H. 1995b. Conservation of Southern Moths. Part 4 Aramoana Saltmarsh. The Weta Vol. 18(1): 7-9.

Patrick, B.H. 1995c. Invertebrates of Moutohora. Department of Conservation, Bay of Plenty, Technical Series No. 24. 24 pp.

Peat, N. & Patrick, B.H. 1995. Wild Dunedin. University of Otago Press. 144 pp.

Patrick, B.H. 1995. New information on the insects of the Lindis, Pisa and Dunstan Ecological Districts. Insects of the Dunstan Mts, Pisa Range and Upper Clutha Terraces. Pisa Flats Native Vascular Flora and Lepidoptera of the Cromwell Chafer Nature Reserve. Section 7, Appendices 7 and 8, 12 pp. In Grove, P. (Ed) Lindis, Pisa and Dunstan Ecological District. PNAP Re-

Brian displays one of his charges in its home environment. Obviously, it is not only "the breadth of issues" that is breathtaking!

port No. 36. Department of Conservation, Dunedin.
Patrick, B.H. 1996. Insects of Macraes Ecological District. In Prep.
Patrick, B.H. 1996. The Status of the bat-winged fly, *Exsul singularis* Hutton. (Diptera: Muscidae: (oenosiinae). New Zealand Entomologist.
Patrick, B.H. 1996. Japanese Swallowtail in New Zealand. The Weta.
Patrick, B.H. 1996. Mistletoe Moths. In Proceedings of Mistletoe Workshop. Department of Conservation, Wellington.
Peat, N. & Patrick, B.H. 1996. Wild Fiordland. University of Otago Press.
Patrick, B.H., Barratt, B.I.P., Dugdale, J.S., Roscoe, D. & Ward, J.B. 1996. Rongahere Gorge Invertebrate Survey. Department of Conservation, Dunedin, 32 pp.

NOTES AND NEWS

Workshop on Visitor Impacts

From 2-4 July S&R Division and VSD jointly convened a national workshop to examine impacts of visitors on conservation of natural and historic resources. The meeting, held at Futuna in Karori, brought together more than 40 participants, primarily drawn from DoC Conservancies (recreation planners, protection managers and field centre managers), HO policy division and including representatives from Regional Councils, the Tourism Board and Tourism Research Association, and Conservation NGOs (FMC, RFBPS). Dr Pat Devlin from Dept. Parks, Recreation and Tourism, Lincoln University chaired the workshop, and two American visitors contributed as resource specialists - Noel Poe, Superintendent of Theodore Roosevelt NP in N. Dakota, and Linda Merigliano, a senior researcher from US Forest Service in Wyoming.

The workshop was extremely successful in:

1. Reviewing the scope of visitor impacts.
2. Establishing the priority information needs.
3. Drafting a research and information plan to guide information developments to assist management over next 3-5 year period.

Proceedings of meeting will be published in due course and resource materials made available to appropriate staff. Workshop proved an excellent test case for developing research strategies and plans on a consultative basis by policy, management and S&R staff.

Contacts for further information are: Gordon Cessford & Paul Dingwall, at S&R Division, and Bev Abbott at VSD.

New Staff

The increase in staff brought about by the Green Package money continues. Some of the new staff members are people who have served DoC either as volunteers or contractors. One of these is Terry Green whose contribution to the Department's Protected Species Programme is legend — or do I mean legion? For this issue Terry has given us the following personal profile.

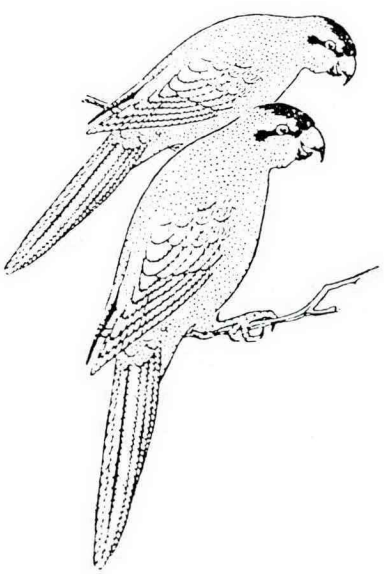
"After years of self imposed exile on Little Barrier Island and endless contracts it has come as something of a relief to return to the mainland and full time employment. Hopefully some remnant of my sanity has survived these wilderness years although I suspect some of you will be a trifle sceptical that sanity was ever present.

A brief flick through my cv shows that I graduated with a Bsc in Zoology from the University of Auckland in 1986. Having already become something of a parrot nut, the opportunity to study the ecology of red-crowned and yellow-crowned parakeets and collect an Msc at the same time was seized with open arms. This kicked off a seven year association with Little Barrier Island and a fixation with parrots that continues to this day. After graduation in 1988 a period of volunteer work was followed by an increasing number of contracts which included spying on the sex lives of parakeets, surveying and grappling with a large range of other birds and beasts and my introduction to kakapo. After a further four years on Little Barrier working with kakapo and becoming extremely fit I managed to call it a day and departed for the delights of the mainland.

Since then my research has largely been focused on the impacts of possum control operations using 1080 and carrot baits on North Island kaka and blue duck with periodic excursions (some successful and others not so successful) to catch kokako. The kaka and blue duck work was conducted within the Waihaha Ecological Area within Pureora Forest Park. Herculean efforts enabled us to monitor the fate of 20 kaka and 20 blue ducks using radio-transmitters and light-aircraft. Fortunately no impact on our study animals was detected. Unfortunately what our study did indicate was that the population of kaka in the area (one of perhaps only two "healthy" populations remaining within mainland North Island) was heavily skewed towards males suggesting disproportionate losses of female birds - probably by predation.

It is therefore of no great surprise that my current position deals with the national coordination and management of kaka research. Much of my time will be spent in "sunny" Pureora running a fairly intensive field research programme but I hope to spread myself around other projects and I look forward to meeting at least some of you.

Terry Green
Auckland



REPORTING BACK

Conference Report: 11th Australian Weeds Conference, Melbourne, Australia, 30 September – 3 October 1996

Susan Timmins (Science and Research Division) and S.J. Owen (Land Protection Division), along with three other New Zealanders, attended the Australian Weeds Conference held in early October in Melbourne.

Susan Timmins reports on the Australian Weeds Conference held during early October in Melbourne.

The 350 attendees included scientists, managers and policy analysts from government agencies, local bodies, chemical companies and universities interested in weed science and control for agriculture, forestry, and conservation. Ninety seven oral and 48 poster papers were presented over three days, a third of them in the Public Lands and Forest category. The papers, the people and the field trips run on day four brought forth a lot of useful information and ideas relevant to New Zealand and control of our environmental weed problems.

We also made a contribution. Our papers on the Department's strategic approach to weed control and methods for prioritising weeds generated a lot of interest and requests for more information. SJ Owen presented a paper, co-authored with Jane Sheldon, entitled "Strategies for ecological weed control on conservation lands in New Zealand". Susan Timmins prepared a poster paper, co-authored with SJ Owen and Carol West, on "Scoring the weediness of New Zealand's ecological weeds".

During the conference, several other papers discussed the steps for strategic weed management and the need to treat the underlying causes of weed problems rather than simply trying to control individual species. The importance of prevention of invasion, surveillance and early intervention were often stressed.

A useful diagram was given which described how weed control effort should reflect the conservation values of the site and the chances of success. Most effort should go into those weed species which are a serious threat to the conservation estate and are easy to control. Least effort should go into those species which are of limited threat and hard to control.

The papers on predicting invasiveness underlined that the predictive power for weeds is poor, especially for environmental weeds. That a species is a weed elsewhere in the world is the best predictor that it might be a weed in another country. Commercial conflict is reduced if environmental weeds are identified early. A useful pasture plant is almost bound to be an environmental weed. Perhaps the best legal protection for environmental weeds is the prohibition of their introduction, sale and distribution. Weeds spread fastest from several small populations rather than one large infestation.

The importance of informing others of the magnitude of the environmental weed problem and involving them in control efforts was stressed by many papers. We may be talking among ourselves but not getting the message across to the rest of the community.

Two of the papers struck me as timely reminders of how big is the environmental weed problem and how important it is to follow the principles listed above.

One paper described the undetected invasion and spread of *Praxelis clematidea*, a South American species closely related to mistflower and Mexi-

can devil, both environmental weeds of New Zealand. *P.clematidea* was overlooked in several surveys in northern Queensland because of its superficial resemblance to another related species. It was suggested that the weed may be present, but unrecognised, elsewhere in the Asian-Pacific region. The prospects for eradication reduce, and the cost of control increase significantly, the longer any new weed species goes unrecognised.

In the other paper, a student studying smilax *Asparagus asparagoides* explained why this species is so difficult to kill. It has 90-95% of the plant biomass in the root structures. Much of the root biomass is mature tubers, perhaps 15-20 years old. Smilax, an environmental weed of northern New Zealand, produces 1,000 fruits per m^2 and has very few weak links. As if control *per se* of this species were not problematic enough, what happens after spraying a blanket cover of smilax?

Susan M Timmins
S & R Division, Wellington

RESEARCH IN PROGRESS

What was the original forest composition of Great Island (Three Kings)?

By Peter J. de Lange[1], David J. Lowe[2] and Rewi M. Newnham[3]

[1] Science & Research Division, Auckland Conservancy, Department of Conservation, Private Bag 68908, Newton, Auckland, New Zealand

[2] Department of Earth Sciences and Geochronology Research Unit, University of Waikato, Private Bag 3105, Hamilton, New Zealand

[3] Department of Geographical Sciences, University of Plymouth, Drake Circus, Plymouth PL48AA, England

The Enigma of the King's Flora

Following the extermination of goats (*Capra hircus*) from Great Island in 1946 the recovery of that island's vegetation has been of tremendous scientific interest. Numerous papers have been written on the subject and recent visits to Great Island by the Northland Conservancy have continued to document changes in forest structure. Since 1989 it is becoming evident that in many places the monotonous and extremely dense kanuka (*Kunzea ericoides s.l.*) canopy is starting to collapse, presumably due to the combined affects of old age and exposure to the often stormy maritime climate. Of interest is what the new forest structure will be. While in places the canopy and understorey is now dotted with rapidly growing specimens of porokaiwhiri (*Hedycarya arborea*), mangeao (*Litsea calicaris*) (Cameron *et al.* 1987; P.J. de Lange pers. obs.) and albeit less frequently, titoki (*Alectryon excelsus* var. *A. grandis*), the spread of these trees is being hampered by a lack of natural seed dispersers. Therefore many patches of forest either lack an understorey or have a forest composition comprising short-lived smaller trees such as pukanui (*Meryta sinclairii*), cabbage tree (*Cordyline kaspar*), Three Kings rangiora (*Brachyglottis arborescens*) or shorter stature trees (really large shrubs) e.g. Fairchild's kohuhu (*Pittosporum fairchildii*) and Oliver's mapou (*Myrsine oliverii*).

The question of greatest interest is just what the actual forest composition of the Great Island will be when the kanuka dominated vegetation completely collapses? At present the only proposed model (Baylis 1951, 1958) is based on a comparison of the associated and presumably less disturbed, but significantly smaller, South West, North West and West Islands. These islands support pockets

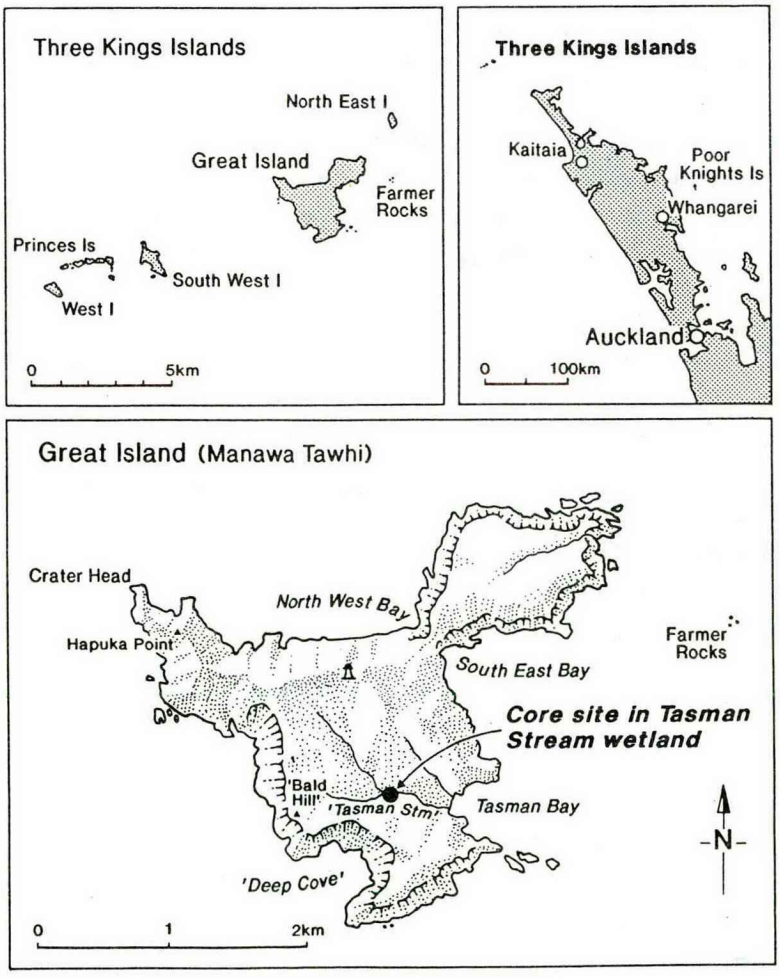


Figure 1 Great Island, in the Three Kings group, showing the core site and features named in the text.

of pukanui or pohutukawa (*Metrosideros excelsa*) dominated forest. Through comparison of these with Great Island Baylis (1951, 1958) suggested that in time the kanuka forest of Great Island will be replaced by a forest structurally similar to that of the smaller islands. However, there are some major differences in the composition of tree species between these islands and Great Island, and it will be interesting to see what role titoki, porokaiwhiri, mangeao, karaka (*Corynocarpus laevigatus*), tawapou (*Pouteria costata*), coastal maire (*Nestegis apetala*) and puriri (*Vitex lucens*) will have in the future forest composition of Great Island.

Furthermore, it is becoming increasingly evident that all of these smaller islands have been settled by humans for varying lengths of time, so their composition may not necessarily be an accurate reflection of what the "pristine Kings" may have looked like. Aside from this interesting problem, there are also the wider questions of whether other common Northland forest trees and shrubs were also present on the Kings in the past, and if these were eliminated during the human occupation of the Three Kings or later following the liberation of goats on Great Island. For example, during the recent Northland Conservancy December 1995 visit, plants of an undescribed sun orchid (*Thelymitra* "rough leaf") were found on Great Island. Elsewhere on mainland New Zealand this species has only ever been found in association with soils containing the remains of kauri (*Agathis australis*) (de Lange in press; B.P.J. Molloy pers. comm.). Does this mean that kauri was once present on Great Island? Possibly of greater conservation interest, however, is the question as to whether Three Kings endemics, such as the monotypic *Elingamita johnsonii*, known only from West Island and Hinemoa Rock, was ever present on Great Island. Furthermore, how common was *Tecomanthe speciosa* or *Pennantia baylisiana*? Both are currently known from single specimens only on Great Island. What is needed to answer these questions is a "window" into the pre-human occupation vegetation of Great Island.

During October 1991 a small (25 m^2) wetland was discovered halfway up the Tasman Stream (Fig. 1 & 3) by one of us (PdeL). This wetland occupies a small depression above the Tasman Stream. The present day wetland vegetation comprises a dense 1.2 m tall sedge/fernland (principal species: *Baumea rubiginosa, Carex virgata, Blechnum minus*) through which several tall cabbage trees protrude (Fig. 3). The wetland formed probably through the slumping of colluvium caused by a small spring which drains the upper slope 10 metres from the wetland. This is the only wetland of any reasonable extent on Great Island. So, despite its small size, the possibility that this wetland may preserve some pollen record of pre-Polynesian settlement Great Island vegetation could not be overlooked.

Tasman Stream Wetland Cored

In December 1995 one of us (PdeL) probed the wetland and found it overlies a shelf of hard argillite rock, and attains a maximum depth of 1 metre. Using a specially designed Russian Jowsey D-Section peat corer loaned from the Department of Earth Sciences, University of Waikato, three intact cores (Fig. 2 & 4) were sampled from this wetland for later analysis for plant macro "fossils" (PdeL), pollen (RMN), and volcanic ash and charcoal

Figure 2 Lower 50 cm of the core from the Tasman Stream wetland site.

coal (DJL). After each core was extracted it was photographed and carefully described in the field, wrapped in gladwrap and stored for later analysis. Back at Waikato University the cores were subjected to further scrutiny resulting in a composite stratigraphic log (Fig. 4), before each was systematically sampled for pollen and plant macro "fossils". Two samples from all three cores were submitted to the University of Waikato Radiocarbon Dating Laboratory (Fig. 4).

Preliminary Results

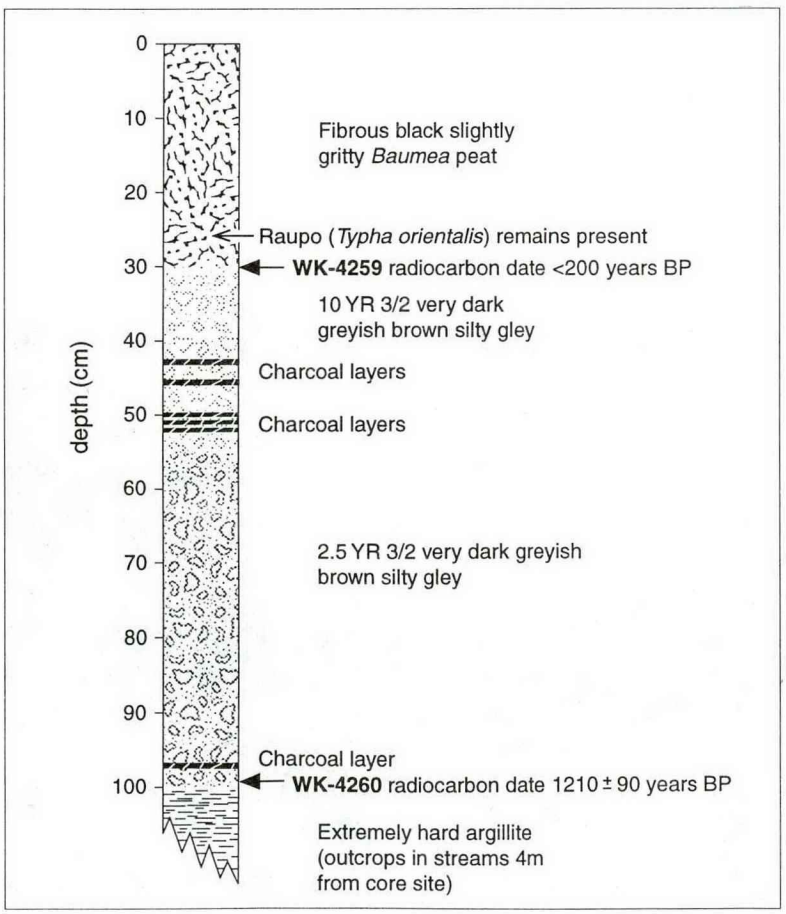
As of May 1995 analyses of the core have revealed that the upper 30 cm of peat contains no obvious volcanic ash, although small quantities of weathered glass are present in the lower part of the core. Beneath the peat layer, the core comprises gleyed organic silts through which several prominent lithic layers are dispersed. Charcoal layers occur to a depth of 60 cm and then again at the base of the core (c.108 cm). A radiocarbon date from the peat/gley (WK-4259) contact obtained a "modern" age (i.e. less than 200 years old) while that from the base (WK-4259) resulted in an age of 1210 ± 90 radiocarbon years BP.

Pollen analysis of the samples has not yet proceeded and it will be interesting to see whether the gleyed silts have preserved any pollen, and if so in what condition. Plant macro "fossils" were not evident in the gleyed silts, but the peat contains numerous fragments of *Baumea ?rubiginosa, Carex ?virgata, Blechnum ?minus* and, interestingly, raupo (*Typha orientalis*) (P.J. de Lange, Dec 1995, AK 225158) a species not presently known from the Three Kings. The

Figure 3 Dense sedge/fern vegetation i n Tasman Stream wetland.

raupo sample came from near the gley/peat contact and may suggest that when the wetland formed, there were pools of water covering its surface. However, raupo can also grow within seepages and on seasonally damp ground, so the discovery of this species has only limited palaeoecological value. Similarly, the other species recorded are present in the modern wetland and their presence in the peat was therefore not unexpected. Consequently, until the results from the pollen analyses are available, we can shed no further light as to the nature and composition of the Three Kings vegetation, or whether our core pre-dates human occupation of Great Island. While it is now generally accepted that Polynesian settlement of New Zealand happened within the last c.700 years (McFadgen *et al.* 1994; Newnham *et al.* 1995), the basal section of the Three Kings core contains charcoal. Although the basal date for this core is 510 years older than the recently proposed date of human occupation of New Zealand thereby suggesting that the basal charcoal layer is the result of a natural fire (cf Burrows 1996), the fact that the wetland formed through the slumping of colluvial material, could mean that the basal date has been influenced by the introduction of older carbon carried downslope by water draining the adjacent hillside (McFadgen 1996). It is therefore possible that our core is actually much younger than the basal date indicates.

Figure 4 Composite stratigraphic log from the three intact cores.



Acknowledgements

Peter de Lange is grateful to the staff of the Northland Conservancy for facilitating access to the Three Kings and the Ngati Kuri for permission to collect samples from there. David Lowe acknowledges an internal Department of Earth Sciences grant for the C-14 dates and Dr(s) Alan Hogg and Tom Higham are thanked for assaying these samples. Sean Hutton kindly drafted Figures 1 and 4. We would also like to acknowledge the comments received from Ewen Cameron (Auckland Museum), Bruce McFadgen (Science & Research), Brian Molloy (Research Associate, Landcare Research Ltd), and David Norton (University of Canterbury) on an earlier version of this article.

References

Baylis, G.T.S. 1951: Incipient forest regeneration on Great Island, Three Kings group. *Records of the Auckland Institute & Museum 4*: 103-109.

Baylis, G.T.S. 1958: A botanical survey of the small islands of the Three Kings group. *Records of the Auckland Institute & Museum 5*: 1-12.

Burrows, C.J. 1996: Radiocarbon dates for Holocene fires and associated events,

Canterbury, New Zealand. *New Zealand Journal of Botany 34*: 111-121.

Cameron, E.K.; Baylis, G.T.; Wright, A.E. 1987: Vegetation quadrats 1982-1983 and broad regeneration patterns on Great Island, Three Kings Islands, northern New Zealand. *Records of the Auckland Institute & Museum 24*: 163-185.

de Lange, P.J. *In press*: Orchids of Great and South West Islands, Three Kings Island Group, Northern New Zealand. *Tane 36*:

McFadgen, B.G. 1996: Dating the Rangitoto Ash and its implications: letter to the editor. *Geological Society of New Zealand Newsletter 109*: 4-9.

McFadgen, B.G.; Knox, F.B.; Cole, T.R. 1994: Radiocarbon calibration curve variations and their implications for the interpretation of New Zealand prehistory. *Radiocarbon 36*: 221-236.

Newnham, R.M.; de Lange, P.J.; Lowe, D.J. 1995: Holocene vegetation, climate and history of a raised bog complex, northern New Zealand based on palynology, plant macrofossils and tephrochronology. *The Holocene 5*: 267-282.

NEW PUBLICATIONS

New Books from Science and Research Division

Dilks P.J. and Kearvell, J. 1996. **Preliminary studies of Chatham Island tui: January 1995 population status and aspects of ecology.** *Science & Research Series No. 99.*

Tui have all but vanished from Chatham Island. Breeding tui are now abundant only on Rangitira Island where the population was estimated at 230 adults. Sixty were colour banded and measured, and feeding and breeding observations were recorded.

West, Carol J. 1996. **Assessment of the weed control programme on Raoul Island, Kermadec Group.** *Science & Research Series No. 98.*

The main exotic plant species are listed in the text in three categories for action (A, B, and C). A(i) lists 13 species, A(ii) lists 4, B lists 4, and C 8. The species' history on the island, ecology, control methods, and future work are described. Remaining species are listed with brief notes in the Appendices.

Green, Kaye (comp.) 1996. **Abstracts of science papers published and projects completed on 1994/95.** *S & R Internal Report No. 153.*

Abstracts reprinted from Science & Research Division publications published, and a list (under Key Outputs) of projects completed during this financial year.

Green, K. (Comp.) 1996. **DOC science project summaries – 1994/1995. Vol.2 Output classes 5.0–9.2.** *S & R Internal Report No. 152.*

Green, K. (Comp.) 1996. **DOC science project summaries – 1994/1995. Vol.1 Output classes 2.0–4.7.** *S & R Internal Report No. 151.*

Executive summaries arranged by key outputs, and indexed by locality and researcher.

Moore, P.J. 1996. **Light-mantled sooty albatross on Campbell Island, 1995–96: a pilot investigation.** *Science for Conservation: 41.*

Census of *Phoebetria palpebrata* nests on western Campbell Island in November 1995. Extrapolation from counts suggests at least 1600 nests on the island in 19i5-96. Standard vantage points were established for future index counts.

N.B. *Science for Conservation: 37, 38, 39 and 40* **are still in press, and are expected to be released with the next Distribution.**

Emberson, R.M., Early, J.W., Marris, J.W.M., and Syrett, P. 1996. **Research into the status and distribution of Chatham Islands endangered invertebrates.** *Science for Conservation: 36.*

Examination of public collections in New Zea-

land has established the former distribution of three protected beetle species: the Chatham Is. click beetle (*Amychus candezei* Pascoe), the coxella weevil (*Hadramphus spinipennis* Broun), and the Pitt Is. longhorn beetle (*Xylotoles costatus* Pascoe).

Lynch, Pip 1996. **Menstrual waste in the backcountry.** *Science for Conservation: 35.*

Personal interviews were conducted to determine the methods of menstrual waste disposal that are used in New Zealand's backcountry alpine, bush and coastal terrain. Carrying home used products was considered the best method of menstrual waste disposal.

Norbury, Dale 1996. **The effect of rabbits on conservation values.** *Science for Conservation: 34.*

Impacts of rabbits on idigenous flora and fauna are assessed from literature and people's observations. Most literature relates to short tussock grassland, little experimental research is available on impacts on invertebrate fauna. Contingency plans are needed prior to any widespread reduction in rabbit numbers.

Whitaker, A.H. 1996. **Impact of agricultural development on grand skink (*Oligosoma grande*) (Reptilia: Scincidae) populations at Macraes Flat, Otago, New Zealand.** *Science for Conservation: 33.*

The grand skinks occupy scattered rock outcrops in tussock grassland. The most likely cause of the collapse of the population in pasture was the changed environment between outcrops which impaired their ability to move between sites.

Taylor, Rowland H. 1996. **Distribution, abundance and pup production of the New Zealand fur seal (*Arctocephalus forsteri* Lesson) at the Bounty Islands.** *Science for Conservation: 32.*

Vertical photographs of the entire island group showed a total of 6,214 seals on 7 January 1994. Comparison with earlier counts suggest the population is still growing, but rate is slowing.

Fraser, Wayne 1996. **The effect of recreational hunters on deer populations in Pureora Conservation Park.** *Science for Conservation: 31.*

Use of recreational hunting data (1988–1993) for routine monitoring of hunting effort, deer density, and deer condition. Compares cost-effectiveness of density indices based on hunting data with traditional faecal pellet surveys.

Innes, J., Brown, K., Jansen P., Shorten, R., and Wiiliams, D. 1996. **Kokako population studies at Rotoehu Forest and on Little Barrier Island.** *Science for Conservation: 30.*

Studies from 1989/90 to 1993/94 at Rotoehu and 1990/91 to 1993/94 on Little Barrier Island, using time-lapse video cameras, identified ship rats, possums and kahu as principal predators of eggs, chicks, and (rarely) adults. The roles of mustelids and feral cats in mainland kokako decline remain unclear.

Rogers, G.M. 1996. **Control, demography, and post-control response of heather in the central North Island: Part 2.** *Science for Conservation: 29.*

The potential for herbicide control of *Calluna vulgaris*, likely changes in secondary vegetation if biological control is effective, and whether heather facilitates or impedes rates of native shrub invasion of red tussock grassland.

Ringer, Martin 1996. **Critical analysis of obtaining desired outcomes from voluntary programmes.** *Science for Conservation: 28.*

Literature review which examines factors in the design and implementation of conservation programmes that lead to positive outcomes for participants and the governing agency.

Pettigrew, John 1996. **Advancing public awareness.** *Science for Conservation: 27.*

Surveys the literature on communications and public opinion change, to improve media effectiveness of DoC staff working in publicity areas. Various recommendations are made.

1996. **Department of Conservation Historic Heritage Research Strategy. Working draft for 1997–98 research planning.** Dept. of Conservation, Wellington.

The strategy will provide a clear and sound basis for fututre research, and enable the Department to prioritise historic heritage research needs more effectively.