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GUEST EDITORIAL

On 10 December 1996 Richard Sadleir received the Royal Society of New Zealand's Thomson Medal for excellence in science administration and publishing. We reproduce below an edited version of his acceptance speech, on at topic relevant to all those working in science.

I would like to make a few remarks about the direction of scientists under the present Government systems. There is a theory, which unfortunately has become common practice, that managers do not need to be technically competent in the subject matter of the people they manage just as long as they are good managers. The theory says it doesn't matter what they actually manage, they can always get technicians to advise them.

My experience of directing scientists has been completely in antithesis to these ideas. The management of science depends essentially on two things: the recognition of interesting research which can advance understanding, and the encouragement of scientists, by a knowledge of their subject. Both of these require the manager to have gained experience within the discipline. This can only come from years of practice as a researcher. While I am convinced that science managers should have exposure to management training, I am steadfast in my belief that managers without previous research experience cannot effectively direct science and scientists.

There is another aspect of these matters. When I looked up the shorter Oxford Dictionary as to the definitions of manager and management, I found some interesting descriptions:

1. The working of land hence — in dialect — spreading manure.
2. The use of contrivance for effecting some purpose, often in a bad sense implying deceit or trickery.
3. To train a horse in his paces.
4. To cause persons or animals to submit to one's control
5. To bring over to one's wishes by artifice or flattery.

Of course there are also some more appropriate definitions but I like those ones. However what I was looking for wasn't there. The definitions of management do not include any ideas of leadership or of partnership I have always felt that effective science direction requires firstly, leadership, especially *unostentatious* leadership and, secondly, a feeling amongst scientists that they are part of a partnership, that their work and advice is a necessary and important part of the development of the organisation they work in.

During my career in New Zealand, first in DSIR and latterly in the Depart-

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ment of Conservation, I have been very lucky to have as my immediate supervisors people who had been practising scientists.

However the executive managers of both organisations had apparently given minimal priority to spending time thinking ahead about future needs. The sort of research I directed almost always took at least three years to deliver information or new ideas I was therefore frequently in the position, with my senior scientists, of establishing research programmes to fulfil what we *guessed* were future needs. Sometimes we got it right. But when we guessed wrong we were accused by the selfsame executives who had not done their jobs, of following personal agendas which were of little use to the organisation! A no win game if ever there was one.

This leads me to my last point. Organisations like the Department of Conservation must fully involve science directors at the most senior decision and resource allocation levels so that, by working with full knowledge, they can best organise science to fulfil the needs of conservation. Good conservation must be based on good science. When shooting at the targets more bulls will be scored when science directors and their management colleagues are both completely aware of each others ideas and intents. Full respect can only develop with full understanding.

Richard Sadleir is both a noted biological scientist and a Science Manager; he holds a PhD from the University of Western Australia and has extensive professional publications in animal science and pest control. Dr Sadleir, a former Manager of Ecology Division of the DSIR, was the founding director of the Science and Research Division of the Department of Conservation and served in that capacity from April 1987 to July 1995 when he retired for health reasons. Dr Sadleir continues to study and publish in marsupial reproductive physiology.

CAS PROFILE!

Our third CAS Profile is of Carol West, from Southland Conservancy

A little bit like . . .

Being a CAS is a bit like being a botanist in Science and Research Division but with one major difference: instead of providing advice on any aspect of botany to a wide range of people a CAS provides advice on any aspect of any scientific discipline to the same wide range of people.

The role is very facilitative and I have chosen a subtitle for the title which seems to sum up the job - CAS: making things happen - although I have recently joked with some of the Southland Conservancy staff that CAS stands for Correct All Spelling because they get a bit peeved when I habitually correct their spelling. Of course, improving people's spelling and grammar is a minor part of the quality control (or audit) which is a significant part of the job.

Like many CASs I spend a fair amount of time on national issues as well as local ones. I am a plant ecologist by training and I continue to conduct research into my particular interest areas: weed ecology; ecology of coastal ecosystems, island ecology and lichen distribution and ecology.

Southland Conservancy is responsible

for a huge area of land including the largest National Park and hundreds of islands reaching as far south as Campbell Island. In order to manage the information which we have on natural values of and threats to all of these places, I have been overseeing the development of ecological information and bibliographic databases. This has been done partly to identify gaps in our knowledge as well as to provide synthesised information quickly. Better information should lead to better management of these valuable pieces of New Zealand.

There are a vast number of wonderful places in Southland Conservancy, and I have written a poem to celebrate one of them. If anyone can figure out the name or location of this place I will come up with a suitable prize, and award it to the person responsible for the first correct guess that arrives on my desk or computer screen.*

*Employees and their families of Southland Conservancy are not eligible to enter, nor is Peter Johnson, Landcare Research, who I thank for reading and commenting on my poem.

Publications

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West, C.J. 1994: (compiler) Wild willows in New Zealand. Proceedings of a willow control workshop hosted by Waikato Conservancy, Hamilton. Department of Conservation, Wellington. 103 p.

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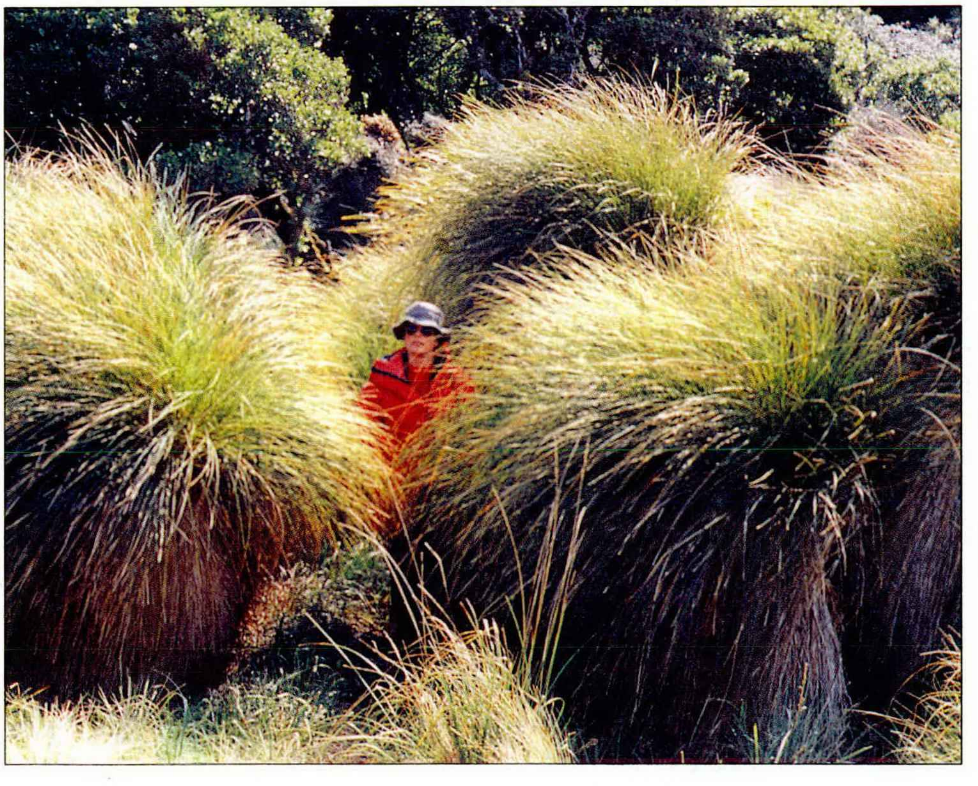

Carol West standing amongst some magnificent purei (*Carex secta*) in a remote part of Southland Conservancy. In answer to your questions: (a) yes, she is standing; (b) no, she is not standing in a hole; (c) yes, this photo was taken at the place the poem (at left) describes.

CAS PROFILE!

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Moore, P.J., S.M. Waugh, C.J. West and G. Mitchell 1996: Trip report: preliminary results of the southern royal albatross *Diomedea epomophora epomophora* census, Campbell Island 12 January - 10 February 1995. Department of Conservation, Wellington.

It's modified, but it's magic!

Picture a bay
With a sheltered harbour
In the south of an island
Set in the wild southern ocean.

Imagine two tree species —
One from an island far away —
On a gentle rise,
Their canopies intertwined.

See the ground-cover
Of carices, green and red.
No shrub understorey,
Just a space for the wind.

Be amazed by the stature
Of the purei in the swampy hollow.

Know that people lived here, once:
The mint by the stream is testament
to that.

Feel the spirit of this place
And believe that nature will triumph.

Carol West

NOTES AND NEWS

GPS for DoC users

I would hate to try and find my way home with this . . .

Introduction

GPS stands for *Global Positioning System*. It is a method of finding a position in three dimensions which uses earth orbiting satellites. The system comprises 24 (US military) satellites and 5 monitoring stations which service many thousands of users. Receivers in common use vary from pocket calculator size to back-pack size.

The satellites broadcast radio signals which are picked up by the receivers and used to calculate positions. The radio signals are *carrier phase* signals (called L1 and L2) and *coded signals* or *pseudoranges* (called C/A, P1 and P2). For security reasons the US military reduces the accuracy of GPS positions by degrading the radio signals to give positions which may be in error by up to 100m or more (*Selective Availability*), or by modulating the P code to restrict access to the full L2 signal (*Anti-Spoofing*).

GPS is quick and can be used day and night in all weathers. GPS signals do not pass through buildings or through vegetation, which may limit the usefulness of GPS for recording positions in cities, under bush, or near large trees.

GPS positions

The positions calculated by GPS are co-ordinates expressed either as *geodetic co-ordinates* (latitudes and longitudes), or as *grid co-ordinates* (metres north and east of some origin). The positions have errors associated with them the size of which depends on the type of GPS receiver used. They are not grid references. A grid reference specifies the corner of a square on a map grid containing a point.

Latitudes and longitudes will be given in terms of a system called WGS-84 unless they have been converted to some other system either by software installed in the receiver or by post-processing software. Latitudes and longitudes in terms of WGS-84 are not the same as latitudes and longitudes shown on New Zealand 1:50,000 topographic maps. Latitudes and longitudes on New Zealand 1:50,000 topographic maps are in terms of New Zealand Geodetic Datum 1949. The difference between the two systems amounts to about 200 m in northings and eastings, and about 30 m in height.

GPS errors

The size of the error in a GPS position depends on which radio signals the receiver uses to find its position, and whether or not the signal degradation is corrected. Without correcting for signal degradation, a GPS position is only accurate to about 100m horizontally, and about 150m vertically, regardless of the receiver used.

Signal degradation is corrected using a technique called *Differential GPS* (DGPS). This technique uses a *base station* at a known location to receive satellite signals at the same times as the user's receiver (*rover*). Differences in the position of the base station between its known location and GPS derived location are applied to the roving GPS.

The distance of the base station from the roving GPS affects the accuracy of the user's calculated position. In general the distance between a base station and a rover should be no more than 50–70 km. Corrections can be applied in real time by establishing a radio link between the base station and rover, or by processing the readings from the base station and rover at a later date (*post-processing*).

The accuracy of the various GPS receivers is given by manufacturers in their promotional material. The quoted accuracies are standard errors, not absolute errors, and normal statistical principles apply. On average, the error of one out of every three readings will exceed one standard error, the error of one out of every twenty readings will exceed two standard errors, and the error of one out of every one hundred readings will exceed three standard errors.

Examples of receivers and their errors after differential corrections are applied are as follows:

10 - 100 m
- Trimble Scoutmaster (using acculock)
- Sokkia Spectrum

2 - 5 m
- Trimble Scoutmaster (real time correction)
- Sokkia Spectrum (code differential)

1- 5 m
- Trimble Geoexplorer

10 - 75 cm
- Trimble Pro XR
- Sokkia GIR1000
- Trimble 4000RSi/DSi

Sokkia Spectrum
(phase differential)
<10 cm
Trimble Surveyor Ssi
Sokkia GSR1000
Trimble 4000 series
Sokkia GSR1200
Trimble 4400 series
Sokkia GSR2100, 2200

What to record with GPS readings

Where GPS positions are recorded for later reference (e.g. as part of a database), it is suggested that the the following details are also filed as an indication to subsequent users of the positions as to the quality of the data:

1. The GPS position.
2. The GPS receiver used.
3. Manufacturer's accuracy specification.
4. Were Differential GPS corrections applied, and if so what was the distance to the base station.
5. The software and version number used to process the GPS data.

Climate change

There are still many areas of uncertainty in the measurement and prediction of climate change and vegetation responses. For example, at least five more years of global climate monitoring are needed to establish whether climate warming is statistically separable from natural climate variation. New Zealand workers are leading the world in trying to understand regional variability in climate change. Such variations are uncertain and affect the reliability with which global models can be used to predict change, say, in Northland.

The climate change scenarios developed by Brett Mullan (NIWA, Wellington) and others, are based on global models. They include a worst-case scenario that a doubling of carbon dioxide level in the atmosphere by the year 2100 would lead to a 1.5–3.5°C temperature rise. It is emphasised that this is a worse-case scenario.

Work carried out by Neil Mitchell at Auckland University suggests that, under this scenario, the East Coast area of North Island would indeed become climatically suitable for kauri. However, it seems unlikely that kauri would disappear from its present range in Northland, given the lack of evidence that increased temperatures would alone cause increased mortality of adult trees, and the potential for survival of kauri on cooler sites at higher altitudes. Other factors such as inter-species competition and increased incidence of tropical storms are considered to be more important and these factors might result in vegetation change and an increased "patchiness" in present forest distributions.

While it would seem from this there is a low risk of forest loss over the next century, it is nevertheless important to ensure that forest dispersal can occur, particularly in many of our lowland landscapes, where forests are highly fragmented. Management intervention may be needed to assist species to migrate across gaps such as that caused by urban and suburban Auckland. Seed establishment may be enhanced by direct intervention or by restoration of indigenous bird species capable of transporting seed. There are no specific plans to assist dispersal at the present time, but this should be addressed when work on climate change responses replaces the current process and modelling studies over the next few years.

Rob McColl
S & R, Tory Street

Hip-chain cotton & Bird deaths

Craig Miller (West Coast Conservancy) & Kerry Brown (Ecosystems Consultants, PO Box 6161, Dunedin)

Hip-chain cotton, that indispensable tool used by foresters and scientists to measure distances in forested areas, may not be quite the environmentally safe option it is assumed to be. Kilometres of this cotton is often left out in the forest after use, because most operators believe it to be biodegradable. While in the past this may have been so, it is not necessarily so now. Some of the cotton rolls presently available (e.g., COTT30 & COTT50) are mixed with polyester, which does not biodegrade so quickly. Experience by the authors, and an email survey of DOC science staff, revealed that hip-chain cotton is capable of catching and killing birds when left out, even for short periods of time (see Table 1). The hazards are not just to birds. One respondent reported that a rider was dismounted from a horse, when the horse shied away from flapping hip-chain strung along some bushes.

The responses of those who replied to the surveys ranged from those who found hip-chain a useful tool to those who hated and detested "the stuff". Alternative means of measuring distance were suggested including counting footsteps and measuring with a retractable cord of known length. More high tech options include the use of measuring wheels and Global Positioning System equipment (although our experience has found GPS to be of limited use in forest).

Minimising the risks to birds of hip-chain is more of an ethical question rather than a real conservation issue. Most species are unlikely to be affected at the population level by the use of hip-chain cotton, as only a few individuals appear to be caught at any one time. The risks of its use in areas where there are rarer bird species may however be unacceptable.

Whatever, hip-chain cotton is a useful tool, and we are certainly not recommending that its use be discontinued. The risks of entanglement to birds can be minimised by careful use, i.e. only using it when necessary and removing it after use rather, than leaving it to biodegrade. Common sense really!

TABLE 1 SUMMARY OF BIRDS CAUGHT, AND THEIR FATE, FROM EMAIL SURVEY AND EXPERIENCE.

SPECIES	FATE	LOCALITY	SOURCE
Blackbird (*Turdus merula*)	Released alive	Maruia, West Coast	K. Brown
Blackbird	Dead	Boundary Stream, Hawke's Bay	G. Walls
Little shearwater (*Puffinis assimilis*)	Dead	Coppermine Island, Northland	R. Pierce
Magpie (*Gymnorhina tibicen*)	Dead	Boundary Stream, Hawke's Bay	G. Walls
Morepork (*Ninox novaeseelandiae*)	Released alive Bay of Plenty	Kaharoa,	K. Brown
Morepork	Released, but suspect later mortality	Ohakune, Tongariro	M. Wakelin
Robin (*Petroica australis*)	Dead (x 2)	Maruia, West Coast	K. Brown

RESEARCH IN PROGRESS

The Case of the Ancient Rats

Richard Holdaway (1996) has recently reported radiocarbon dates of kiore bones from eight predominantly South Island sites which suggest that rats were living in New Zealand some 2000 years ago.

Since it is unlikely that the rats could have reached New Zealand except as passengers on a boat the dates, if correct, would more than double the accepted time since humans first discovered New Zealand. If the dates are confirmed, then it will be necessary to revisit the role of kiore as a predator of native fauna. The implications for interpreting human history are less clear. The rats imply the presence of humans, but do not in themselves give evidence for human *colonisation* at that time.

However, the rats may not be as old as claimed. In addition to the dates reported by Holdaway, six dates have been reported by Atholl Anderson (1996) on rat bones from the moa-hunter site at the mouth of the Shag River in North Otago. The Shag River moa-hunter site is well dated by more than 30 dates on shell, charcoal, and moa eggshell to about 600 years ago. The rat bones, which are from the cultural layers of the site, returned dates of ca 900 years ago and ca 1500 - 2000 years ago. The 900-year old dates were measured at Oxford University and the 1500 - 2000-year old dates at the Rafter Radiocarbon Laboratory at Gracefield.

The discrepancy between the ages of the Shag River rat bones compared with the age of the site itself is regarded by Anderson as evidence that there is something wrong with Holdaway's old rat dates. Anderson has also answered Holdaway's alternative suggestion raised at a seminar in Wellington last year: that the rat bones were present as subfossil remains in the underlying natural sand of the site and were dug up during occupation and incorporated into the cultural layers. Certainly Holdaway has a point. Bones from sub-fossil natural deposits are not uncommon in archaeological sites, and the sand beneath the Shag River site is shelly and might have preserved such bones. Furthermore, the range of ages given by the two laboratories is consistent with a subfossil origin of the rat bones. But Anderson's reply is that no bones were found in the underlying natural layers when the site was excavated. Rat bones were only found in the cultural layers where they were abundant, and in the intervening natural sand layers where they were scarce, a distribution which is difficult to explain if the bones were derived from the natural sand beneath the site.

If the rat bones from the Shag River site have come from rats which were alive when the site was occupied, then some explanation for their ancient radiocarbon age needs to be found. If the Shag rats had eaten lots of fish this may perhaps account for the 300-year difference between the rat dates from Oxford and the age of the site. Yet the Gracefield dates are still too old. Anderson suggests that the difference in the dates reported by the two laboratories is a result of incomplete removal of old contaminated carbon by the Gracefield laboratory when the samples were prepared for dating. As all of Holdaway's dates were measured at the Gracefield laboratory any residual old carbon would also explain Holdaway's rat dates. The Gracefield laboratory has taken very seriously the possibility that residual old carbon may have affected the dates and is currently comparing their sample preparation proceedures against those of the Oxford laboratory.

To check the consistency of dates on rat bones with dates on other archaeological materials, rat bones from a 400-year old shell midden site near Wellington are being dated. The site near Wellington is on loess, which would not preserve rat bones for one year let alone a thousand years unless the bones were in a shell midden (thus minimising the possibility of dating subfossil rat bones).

It is standard practice in scientific research, especially when results such as the rat dates reported by Holdaway conflict with a generally held interpretation, that other possible hypotheses which might produce the same result are tested. One such possible hypothesis is that something in the diet of the rats might have given rise to the old rat dates. Accordingly, the effects of rat diet on radiocarbon dating is also under investigation by the Gracefield laboratory.

There are many sources of old carbon in the environment which rats may have ingested as part of their diet. Rats get their radiocarbon from the food they eat, particularly protein, and their diet includes invertebrates, young birds, and birds' eggs. Bugs such as weevils, huhu grubs, and wetas, which live on old wood, would be eating old carbon which would be incorporated into rat bones when the rats ate the bugs. Similarly with other species, such as the chicks and eggs of water fowl, it is not difficult to construct an hypothetical food chain whereby old carbon finds its way into rats.

An important part of Holdaway's argument is the date for a rat jaw bone excavated from below Taupo Tephra by John Yaldwyn in 1959 and retained in the collections of the then Dominion Museum. The radiocarbon age of the bone, which agrees with its reported provenance, is strong supporting evidence for Holdaway's thesis. Yet the agreement could still be coincidental because of two uncertainties: the first relates to the problems of old carbon already discussed, the second is the interpretation of the stratigraphy in the shelter. The jaw bone was excavated from a rock shelter in Hawkes Bay and seems to be the only independently dated sample earlier than the currently accepted date for human settlement of New Zealand (ca 700 years ago). The Taupo Tephra was erupted ca 1800 years ago. The rock shelter is small. It is only about 0.6 - 0.8 m high, with an overhang of no more than 1 - 2 m, and it faces away from the Taupo volcanic centre. The question is by what process did the tephra get into the shelter. If airfall tephra sealed the jaw bone then its age would be older than the Taupo eruption. If the shelter was protected by the overhang and the tephra was not deposited in the shelter until sometime later, then the jaw bone may be younger than the tephra by an unknown and possibly long time.

Other bones excavated from the shelter included petrels, from both above and below the tephra, and the shelter appeared to have been an inland nesting site for petrels. Some petrels are notorious burrowers and it is possible that the position of the jaw bone may have been due to burrowing petrels. Whatever the process by which the rat jaw came to be lying beneath the Taupo Tephra, it is perhaps sig-

nificant that no other rat bones have been reported from under the tephra. They are all on top.
None of the foregoing discussion proves anything, but it does raise questions which need to be resolved before the rat dates can be accepted or rejected. If the rats are as old as claimed, our understanding of the latter stages of the development of New Zealand's unique biodiversity will change. For New Zealand's human history the implications are less clear. If the rats are as old as claimed this probably means that humans visited New Zealand very early, but it does not necessarily mean that New Zealand was colonised early. If the rats are younger than claimed it indicates that the dates do not reflect the true age of the material being dated. This cautionary note applies to all materials which are dated and emphasises the need to understand thoroughly the processes involved in the uptake of radiocarbon by organisms when interpreting radiocarbon dates.

Bruce McFadgen
Conservation Sciences Centre,
S & R, Tory Street.

References

Anderson, A.J. 1996. *Archaeol.Oceania* 31: 178-184.
Holdaway, R.N. 1996. *Nature* 384: 225-226.

BOOK REVIEW

Diet overlap between coexisting populations of native Blue Ducks and introduced trout: Assessing the potential for competition

PhD thesis by Dale Towers, Massey University, 1996.

This study was supported by a Department of Conservation Wildlife Scholarship, the last such scholarship to be awarded. The study was intended to address a long-time thorny issue - do trout compete with Blue Ducks? - .
Competition is one of those "easy" ecological concepts. Its easy to talk about and it is easy to understand what is meant. But it is enormously difficult to demonstrate. The bottom line is that where populations of two species are exploiting the same resource, and that resource is in limited supply, then competition is occurring when one species is more effective at securing that resource and denies the other access to all or most of it. The outcome of any competitive interaction is that the population most affected is eliminated from that particular niche. Thus, because competition is a process, it will inevitably resolve itself, and you have to get in early in the history of contact between populations to find evidence of competitive interaction.
This has been one of the problems for this PhD study from the outset and it would be fair to say that , by the study's end, the jury remains "out" on the primary question.
Despite that, Dale Towers has given the study his best shot. Firstly he showed that in four study rivers (Tongariro and Manganuiateao in central North Island, and Ikawatea and Makaroro in Hawkes Bay), trout and blue ducks ate similar food and had similar prey selection patterns throughout the year — evidence of common resource use. Next, he established that, generally, trout ate aquatic invertebrate prey that were significantly larger than the average

sizes of those prey in the benthos whereas blue ducks captured prey significantly smaller than avergae size in the benthos — possible evidence of resource partitioning that could arise from competition.. Next, he showed that for blue ducks living above waterfalls where trout were absent the prey selection patterns didnt differ significantly from that of blue ducks living below falls where trout were present — evidence that the possible resource partitioning may be the result of deliberate selection, not competition.

Dale's next approach was experimental. First he conducted exclusion and caging experiments in the Tongariro River to determine if the invertebrates responded to the presence and absence of trout. He concluded "yes - trout, by their feeding, can alter the composition of the benthic invertebrate community". This would imply that if trout colonise a blue duck river they will alter the invertebrate community composition which, by inference, must require a response from the blue duck population. However, the results of these experiments are capable of other interpretations. For example, the cages used in the experiment may simply have prevented invertebrates drifting into the caged area and re-colonisation it. The second experiment sought to determine whether blue ducks would respond to different prey densities established as a result of trout feeding. This was done in an aviary with the bird being given the choice of feeding in an artificial stream channel stocked with trout and another without. The experiment showed that blue ducks could indeed detect and respond to variations in invertebrate density.

So there it remains. While blue duck and trout eat similar foods, there seems to be selection for different prey sizes, possibly sufficient to limit direct competition. Trout can alter the composition of an invertebrate community which, by inference, will cause some change in prey selection by blue ducks. However, the above/below falls comparisons suggest that any change induced by trout is not a major one. Blue ducks can detect changes in invertebrate densities and will obviously try to feed in areas of the river where prey density is highest. All good stuff, but still not conclusive. While it is clear that trout and blue duck can and do use the same rivers, and the same sections of the same rivers, the possibility that trout have lowered the carrying capacity of those rivers for blue duck is still a very plausible hypothesis. This study has merely touched the surface of the blue duck *v.* trout interaction!

Murray Williams
S & R, Tory Street

NEW PUBLICATIONS

New Books from Science and Research Division

SCIENCE REPORTS

Spurr, E.B., Harris, R.J., and Drew, K.W. 1996. **Improved bait for wasp control.** *Science for Conservation: 43.* 15 p. $12.50 (incl. G.S.T.)

Alternatives to freezing as a method of storing bait for wasp control. Shelf-life, attractiveness, palatability, and toxicity, after re-canning, bottling, vacuum-packing, irradiation, or the use of preservatives, were investigated.

Science for Conservation: 42 **is still in press.**

Morgan, D.R., Innes, J., Ryan, C., and Meikle, L. 1996. **Baits and baiting strategies for multi-species pest control and feral cats.** *Science for Conservation: 40.* 27 p. $12.50 (incl. G.S.T.)

A 2-year study investigated the feasibility and effectiveness of multi-species pest control. Cat aversion to 1080 led to tests using brodifacoum and alphachloralose for feral cat control.

Cessford, G.R. and Dingwall, P.R. (Editors) 1997. **Impacts of visitors on natural and historic resources of conservation significance. Part 1—Workshop proceedings.** *S & R Internal Report No. 156.* 109 p. $23.65 (incl. G.S.T.).

Agenda, participants, and a summary of proceedings of a workshop convened by S and R Division and Visitors Services Division of the Dept of Conservation, Wellington, 2–4 July 1996.

Timmins, Susan M. 1996. **Report on the 11th Australian Weeds Conference, 30 September–3 October 1996, Melbourne, Victoria.** *S & R Internal Report No. 155.* 10 p. $6.75 (incl. G.S.T.).

Includes notes on selected papers from the conference, and a list of papers delivered in the Public Lands and Forest Sessions.

CAS NOTES

Hedley, M.D. 1997. **An assessment of risks associated with the use of CCA-treated timber in sensitive environments and options for its substitution with alternative timber materials.** *Conservation Advisory Science Notes: 154.* 37 p.

Dijkstra, L.H. and McDowall, R.M. 1997. **Electrophoretic identification of whitebait species.** *Conservation Advisory Science Notes: 153.* 13 p.

Townsend, J.I. 1997. **An insect survey of Paengaroa Scenic Reserve, Mataroa.** *Conservation Advisory Science Notes: 152.* 9 p.

Spurr, E.B. 1997. **Assessment of the effectiveness of TransonicÒ ESP and Yard GardÒ ultrasonic devices for repelling stoats (*Mustela erminea*).** *Conservation Advisory Science Notes: 151.* 4 p.

Simpson, Philip 1997. **Natural pohutukawa in Taranaki.** *Conservation Advisory Science Notes: 150.* 9 p.

Conservation Advisory Science Notes: 149 **is still in press.**

Lawlor, Ian 1997. **Inspection of Motukoruenga and Motukoranga Islands, Whitianga, Coromandel Peninsula, 28 January 1995.** *Conservation Advisory Science Notes: 148.* 9 p.

Comfort, J.A. and Single, M.B . 1997. **Literature review on the effects of seawalls on beaches.** *Conservation Advisory Science Notes: 147.* 8 p.