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GUEST EDITORIAL

Biodiversity: Changed perceptions lead to conservation interventions

This editorial is an introduction to the New Zealand Biodiversity strategy, we hope that it will provide some much needed background for readers of ConScience News. *Over the next few months there will be an opportunity for further exploration of the ramifications of the strategy.*
The author of the editorial is Dr Aidan Challis, a principal policy officer in the Conservation Policy Division. Dr Challis is an archaeologist, with an impressive record of archaeological work in New Zealand. Some years ago Dr Challis took part in a series of lectures on biodiversity sponsored by Science and Research Division, which were subsequently published in the volume: Biodiversity. Papers from a seminar series on biodiversity, hosted by Science and Research Division, Department of Conservation, Wellington, 14 June–26 July 1994.

The World Resources Institute publication, *Global Biodiversity Strategy: Guidelines for Action to Save, Study, and Use Earth's Biotic Wealth Sustainably and Equitably* (1992), is not only about the protection of the few remaining areas of relatively undisturbed nature. It is particularly about conservation in the more humanly populated and culturally modified environments. It is about ensuring the sustainability of ecologies as the basis for human economies.

Determining a changed balance between biodiversity conservation and economic development in modified environments requires processes of communal decision-making, and subsequently also requires changed community behaviour. Deciding the trade-offs in biodiversity conservation is inevitably a political process. As a prerequisite to taking action, communities need to determine the interests of the state and its citizens, taking into account the views of all sectors.

Consistent with this reality, in New Zealand, as a result of a long process of consultation and debate we now have the *New Zealand Biodiversity Strategy* (2000) which has been adopted as Government policy. The Department of Conservation must operate in a way, which is compatible with this overall approach of the Government.

It is instructive to consider the list of themes in the *New Zealand Biodiversity Strategy*. Some are predictable enough, such as Biodiversity on Land, Freshwater Biodiversity, and Coastal and Marine Biodiversity. The community dimension is also strongly represented in the themes of Community Participation and Awareness, Maori and Biodiversity, and Governance.

Other themes in the *Strategy* demonstrate changes in perception or emphasis in recent years. The theme on Conservation and Use of Genetic Resources marks an extension of perception beyond traditional nature conservation. This theme includes conservation of threatened introduced species provided that this does not conflict with conserving

Department of Conservation
Te Papa Atawhai

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indigenous biodiversity.

Following hard on the heels of the *New Zealand Biodiversity Strategy* process, there has been further extensive public consultation on proposals to address the effects of private land management on indigenous biodiversity (*Bio-What? Preliminary Report of the Ministerial Advisory Committee*, 2000). Clearly the Government has interests in achieving conservation outcomes beyond protected areas. Again, the Department of Conservation must operate in a way, which is compatible with the overall approach of the Government, and has a range of methods at its disposal.

The biodiversity concept is therefore subject to an expanding range of perceptions, including conservation in culturally modified environments and introduced elements. To our credit in New Zealand, integrated strategies are emerging, but implementation is now required. The Department of Conservation is a leading contributor to these collective efforts. In order to meet the expectations of the Government, an equitable amount of research effort should be directed to conservation in culturally modified environments.

A good example of this is recent work by Dr Philip Simpson of Uruwhenua Botanicals (formerly of Science and Research Unit, DOC). In 1999 Philip was commissioned by the Department of Conservation to attend an international symposium on 'Landscape Futures'. In his paper, *Landscape Restoration at a Regional Scale*, Philip said: 'Most New Zealanders today, as opposed to nineteenth century New Zealanders, seem to value landscapes with a **characteristic mix of nature and culture**' (emphasis as in the original).

Philip argues that the present nature/culture mix in the Wellington Region is unlikely to achieve the goal of sustainable land management. The spatial pattern of protected areas means that indigenous biodiversity is not adequately protected, nor adequately accessible to the community. Philip recommends landscape enhancement within the culturally modified environment, by such means as riparian and roadside corridors, enhanced shelter belts, wetlands creation, revegetation of unstable areas, and plantation forestry. Philip Simpson's research shows a way forward towards more healthy relationships between people and the land.

Aidan Challis

REPORTING BACK

The 2nd International Conference on the Biology and Conservation of Albatrosses and other Petrels, 8-12 May 2000, Honolulu, Hawaii

Recently I attended the second albatross conference to hear about the advances in albatross research and bycatch mitigation since the last conference in Hobart 5 years ago. This time 'other petrels' were also included in the programme. About 150 people attended from 15 nations, including 23 New Zealanders.

Peter Moore reports on his recent trip to Honolulu for the International Conference on the Biology and Conservation of Albatrosses and other Petrels.

Although principally a scientific conference there were also fishery management and industry people there and a diverse range of topics was covered in the 56 oral papers and 41 posters. Below I will describe a few of my own personal highlights. It is planned that abstracts will be published in *Marine Ornithology*.

Genetics is an expanding field for seabird phylogeny and provenance. Gary Nunn (USA) discussed the *Pterodroma* petrels and further work on DNA microsatellite loci reinforced the division of 24 albatross species and went further to identify islands of provenance, a useful tool for the identification of bycatch specimens. Theresa Burg (UK) identified three distinct groups of black-browed albatross. 'Do these become species too?' we asked. Mike Double (Australia), in discussing the identification of provenance of shy albatross from bycatch specimens, explained that the division of species based on DNA is to some extent subjective, but we should think of 'management units' if we find that particular island groups are distinct because of lack of mixing.

An interesting line of inquiry was the use of olfaction by seabirds to locate prey or burrows. One study by Gabrielle Nevitt (USA) tested the effects on seabird behaviour of odours applied to the water. It was postulated that seabirds foraging over vast areas of ocean used odour cues to recognise productive foraging areas.

Hal Caswell (USA) gave an interesting talk about the use of matrix models for albatross population dynamics. Although complicated models have been developed to describe the population parameters of these long-lived, often biennially breeding, species, he showed that a matrix model could be pared down to a minimum number of parameters. This technique, therefore, could be very useful for species with limited data collected. He proposed that a workshop on this topic be held in the near future. Jean-Dominique Lebreton (France) followed with a similarly mathematical talk about the sensitivity of long-lived species to small increases in mortality. He showed that the maximum growth rate varies inversely with generation time. The latter can be predicted from the combination of age at first breeding and annual survival. Along with recruitment rate, these are critical factors to be determined in any population study.

Satellite telemetry and various loggers were used in several studies of albatross and petrels to illustrate foraging ranges during and after the breeding season and to determine overlap with fisheries. For example, John Croxall (UK) showed that white-chinned petrels travelled 3000-8000 km on foraging trips away from South Georgia while breeding, resulting in high risk of overlap with long-line fisheries. Chris Robertson (NZ) and David Nicholls (Australia) showed that royal

albatrosses circumnavigate the globe via South America when not breeding, whereas Chatham mollymawks return to New Zealand back across the Pacific via a more northerly route. Henri Weimerskirch (France) illustrated that foraging trips of wandering albatross to the north of Crozet Island were anti-clockwise and those to the south were clockwise because the birds took advantage of side and tail-winds in the prevailing cyclonic weather systems. Heart-rate monitors showed that soaring flight expended very little energy, equivalent to sitting at rest, whereas taking off from the water was costly.

Although the most impressive long-term studies of albatrosses have been conducted by the British on South Georgia and French researchers on Crozet, in many ways Australia and New Zealand have led the way in research and development of management practices which seek to mitigate accidental seabird bycatch. It seems that New Zealand's Conservation Services Levy, which recovers funds from the fishing industry to conduct research on bycatch species, is unique. Janice Molloy's (NZ) poster very nicely illustrated various projects designed to give fishers better options for reducing bycatch, including tori lines, underwater setting devices and weighted lines. Work is now underway elsewhere. Ed Melvin (USA) gave a good talk about bycatch experiments in Alaskan waters which found a >75% reduction in seabirds caught when lines were weighted (i.e. hooks sank too fast for the birds to get the bait) or an underwater setting device was used, with little effect on the capture of fish. Paired streamer lines were even more effective, but setting at night tripled the capture rate of birds. Kathy Cousins (USA) showed that the Hawaii-based longline fishery caught 1000-2000 each of black-footed and Laysan albatrosses each year. She also presented a National Marine Fisheries Service training package that all ship masters are required to attend once a year. This is designed to encourage fishing practices that reduce bycatch of birds and improve the release of uninjured birds. It was clear that it was as much a struggle in the USA to maintain adequate observer coverage on fishing boats as it was in poorer countries. We all needed reminding at times that effective mitigation would only come through the active co-operation and interest of the fishers themselves rather than trying to force them to do something.

Although, in theory, improvements in mitigation of bycatch should be achievable in the territorial waters of developed countries, this still left unanswered the potentially vast problem of bycatch on the high seas and in the waters of developing countries. Cultural differences between countries also affect how easy it is to change fishing practices. Adrian Stagi (Uruguay) told us that fishers in South America actively killed seabirds around their boats and one photograph showed two albatrosses hooked together on a length of fishing line– they had been released this way for the amusement of the crew.

Despite the above efforts to reduce bycatch, the most effective changes have come about through overfishing and changing to fishing grounds that do not overlap with seabird foraging zones. Henri Weimerskirch reiterated that the decline of wandering albatross on Crozet during the 1970s was apparently caused by high mortality of females whose foraging ranges overlapped with the Japanese Southern bluefin tuna fishery. A shift in the fishery resulted in gradual recovery of the albatross population. Despite this,

though, a recent study of chick diet showed that 30% of chicks had hooks in their stomachs, showing that it would not take much to tip the balance again. Few species have such a long monitoring data history, nor is there adequate fishing data to determine overlaps. Henri also looked at the varying effect of sea-surface temperature anomalies on different petrel species. Warm temperatures had a negative effect on breeding of species that foraged south of the Polar Front and a positive effect on those feeding in subantarctic waters. Hence global warming and climate change is likely to have a major effect on seabird populations.

Paul Scofield (NZ) gave a good talk on population trends since 1969 of sooty shearwaters on the Snares using old and new census techniques. A substantial decline since 1982 coincided with disappearance on mainland NZ, with fishing bycatch the likely cause. Paul pointed out to the albatross researcher-dominated audience that advocates for night-setting by fishers could 'save an albatross and kill a petrel', as some species are caught in greater numbers at night.

Removing pests from seabird islands is an easier problem to deal with than reducing bycatch. Other countries have taken heed of the many successful pest removals in New Zealand and James Murphy (USA) described how several islands in the Hawaiian chain had recently been cleared of rats by the Department of Agriculture. David Priddel and Nicholas Carlile (Australia) told of the endangered Gould's petrel, which was declining and largely restricted to a single island. Rabbits had degraded and opened up the understorey so that adult petrels were more vulnerable to predation by currawongs and ravens, and a sticky fruit was falling to the forest floor and ensnaring the birds in large numbers. Eradicating the rabbits and controlling the avian predators saw the petrel population rocket up from 250 to 750 pairs in only 7 years, showing the value of a pragmatic approach to conservation. Translocations to a nearby island were under way.

The last two days of the conference were dedicated to workshops, including one on island restoration and predator control and another on bycatch issues. It is hoped that the published recommendations will help provide some focus for future research and management.

The conference was a great opportunity to catch up on the latest research on procellariiforms and establish contacts with experts in the field. It is ironic that many of the kiwis had had little contact over the previous five years through lack of a suitable forum to get together to discuss seabird work. Perhaps this should be redressed in future. Meanwhile there are moves afoot to hold the next conference in New Zealand or South America. The latter is favoured because of the great political boost it would provide by highlighting the problem facing seabirds in that part of the world.

Peter Moore
Science & Research Unit, DOC
Wellington

REPORTING BACK

Weed forum in Brazil

Picture 670 delegates from 61 countries—truly an international gathering of people concerned with weeds—mostly scientists, but also some in management, policy, and technical transfer. This was the *Third International Weed Science Congress* held in Foz do Iguacu, Brazil, 6–11 June 2000.

Susan Timmins reports on the Third International Weed Science Congress in Foz do Iguacu, Brazil

While there was a heavy emphasis on agricultural papers, and a focus on herbicide resistance, there was plenty with conservation relevance among the 260 oral papers and over 300 posters. Of particular interest were sessions on biocontrol, aquatic invasives, modes of movement and the geopolitics of limiting world movement of invasives. Also several papers which espoused the need to communicate weed awareness to politicians and the public.

Gathering a diverse collection of weed scientists together fostered some interesting debates. Jonathon Gressel promoted biotechnology as the answer to the global millennial weed problems of agriculture. In his view, organic agriculture offers no solutions and there is no going back to mixed agriculture. He sees the future in biotechnology including transgenic herbicide-resistant crops, i.e. crops that are more competitive with weeds. This is scary stuff for those of us coping with the last rash of bright new horticultural ideas. His view was tempered by that of Robert Zimdahl who spoke of the moral certainty that pervades agricultural practice. The bottom line rules and it is assumed that increased production at reduced cost creates the best social good. He argued that the continued promotion of Western agriculture for all would destroy both lifestyles and, more importantly, the environment. Similarly, Steve Radosevich, a forester, decried the common commerical practice of developing simple systems that are invariably more vulnerable to weed invasion. Several other agricultural papers concluded what many plant ecologists take as a given—that increased biodiversity improves system stability. Perhaps the light is dawning. Robert Eplee described the essentially unfettered global exchange of utilitarian plants, now turned invasive. Unlike chemical pollutants that degrade over time, these biological pollutants grow, adapt, multiply and spread *forever*. We need to take action now, but awareness precedes action—as he says, 'you gotta wanta'. But want to or not, we pay for invasive species—in control and loss of biodiversity. Part of that awareness must come from having good evidence *demonstrating* that weeds have a negative impact. John Randall did just that quoting examples from all round the world of the ecological impacts of invasive weeds in natural areas—we are not alone!

Biological control was well represented at the congress. Many new techniques have been developed including co-operative modelling. Despite this progress, 80% of past biocontrol programmes have not achieved the desired objective, i.e. reduced weeds to non-troublesome levels. It was good to hear a growing awareness of the need to go beyond monitoring the effect of the

REPORTING BACK

biocontrol agent on the target weed and do *outcome* monitoring of biocontrol programmes. Enter, SOP monitoring!

'Weed science doesn't kill weeds—people who couple management with good weed science kill weeds'. Randy Westbrooks took advantage of the gathering of weed scientists from around the globe to instigate World Weed Watch—a forum for debate on international weed prevention issues and to raise awareness of the importance of weed prevention. This group will share information, especially with developing countries, and a web site with links to weed resources was discussed.

I presented a paper in this section, co-authored with Susan-Jane Owen and Theo Stephens: Managing weed risk to New Zealand's protected areas: the policy and the practice. It was well received, especially the weed-led and site-led concepts and our approach to weed surveillance. So too were the four weed posters I took; indeed one of them won a prize—all credit to Chris Edkins for his expertise in producing fine posters.

On the basis of DOC's recent weed management initiatives, I was invited to attend two meetings in Fort Collins, Colorado 10 days later. One was on establishing a global weed database—a distributed network—a mind-blowing concept providing for global information exchange to match the global exchange of plants. The second was a workshop to develop an early warning system for the US. I was able to contribute DOC's experience in developing our Weed Surveillance Plan. Some aspects of the behaviour of weeds and people are constant the world over. I learnt first hand the need to share weed information freely and internationally.

Susan Timmins
Science & Research Unit
Wellington

CONSERVATION ACTION

Possum partner swapping

No partner swapping going unmonitored here! Murray Douglas is seen here building one of the new Electronics Lab's 'MateID' dataloggers—a gadget used to sneak an intimate look into the secret lives of possum mating and contact behaviour. This is part of a joint bio-control research programme between Dr Mick Clout (University of Auckland) and DOC.

Females are rather solitary, but when brief access is allowed it's all on, sometimes with several different males in one night. International interest in the ID device is high, and soon they will be for sale. A patent application is currently being lodged.

LETTERS

A letter from Samoa—June 2000

It has been a long time since we heard from Greg Sherley—our man in Samoa. This month Greg writes of serious conservation issues for the island nations of the Pacific.

It is a dramatic time to be holding a Pacific post, with a coup in Fiji and something like one in the Solomon Islands, and these not the only islands with political instability. One of the implications for environmental work is the reaffirmation that you need political stability and basic good governance before you can hope to achieve environmental or conservation objectives. These are last on the list of needs when essential life support and personal safety is compromised. So it seems, for all practical purposes, that the Fiji and Solomon Islands are out for setting up in-country conservation projects during the rest of my term, and perhaps for years after. Yet these countries harbour some of the greatest conservation needs—especially when it comes to birds. We had just finished the Melanesian sub-regional workshop for determining bird conservation priorities (specific needs—project briefs for each case—not just your general 'chew the fat' meeting) and were planning the first post-workshop project (as is the practice) when the strife in the Solomons started. But, as you can imagine, there are plenty of 'plan B's' so we are trying to sort out something for Papua New Guinea. Prior to the workshop, I thought the country delegates would be pushing for biological projects for their countries. However, their specific priorities turned out to be various versions of training and awareness, as items by themselves, not just add-ons to a species-oriented project.

Recent experiences have included the international conservation circuit including the two main types of meetings that administer the Convention on Biological Diversity. These meetings form the Scientific, Technical and Technological Body which advises the Conference of Parties which is made up of the country delegations and decides what should be done next in implementing the Convention. The reason for my involvement on behalf of SPREP is to help the Pacific delegates defend their interests at the negotiations. Unlike other country groups, the Pacific (as a region) has yet to co-ordinate its strategy for winning favourable decisions. This phenomenon of countries pooling their resources and co-ordinating their policy creates strong lobby groups that definitely get their way. In practical terms this means influence in the Conference of Parties committees that advise the Global Environment Facility on what types of projects to fund. With this in mind I have been conducting a small and relatively successful campaign to ensure that the Conference's recommendations can be read to include the interests of small-island developing states, especially when the recommendations pertain to invasive species. The idea is that with these recommendations now made, the Pacific is in a stronger position to successfully bid for serious funds from the Global Environment Facility to implement the Regional Invasive Species Strategy. I am working on it.

The latest of the Convention meetings was the full biennial Conference of Parties held in Nairobi. It was good to see the friendly and capable faces of the New Zealand delegation. It struck me that, while New Zealanders knows a lot of what the needs of the Pacific are (and vice versa), this is more by virtue of people knowing each other than by design. I think it would be a

huge advantage to all if New Zealand, Australia, and the Pacific countries met as other countries do to co-ordinate their Conference strategy (where their national policies permit). Except for Australia, we Pacific countries are too passive or non-assertive in getting our needs met by the Conference. I am not referring to people simply making interventions (when a country delegate formally makes a statement to the Conference), I am talking about having a game plan with pre-set objectives. Admittedly, better attendance by the Pacific countries would be a start. This may improve as the chances for further preparatory meetings before the Convention increase. (The first such meeting was tagged onto another regional workshop earlier in the year.)

At the risk of giving the impression that all my time is spent on policy matters, I should mention the biosecurity issue in the Pacific. This topic has brought out some of the most pertinent biological diversity issues in the region. Excluding the large islands states (like PNG, Solomons, Fiji, and New Caledonia), most Pacific states have only their native biodiversity as their main and unique natural/non-human resource. It is imperative to protect (in the security sense here) these species by, for example, ensuring that indigenous genetic information remains the property of the Pacific state. Thus one aspect of the biosecurity issue for the Pacific is whether to let specimens of their indigenous biota go offshore for taxonomic purposes, or to keep them 'locked up'. (Of course there have been blatant cases of theft, which can prejudice one's views.) Lock-up might be the best option if it can't be guaranteed that non-Pacific interests will not use the material for commercial gain. On the other hand, a country ignorant of the biosystematics of its native biota is less likely to be able to capitalise on its genetic resources and determine which species are aliens and, therefore, possibly invasive. Onshore collections are no solution—the practical problems and costs are too large. I have not yet worked out what I think is best for the Pacific countries.

I will relate other biosecurity issues, such as meeting obligations under the Biosafety Protocol, and keeping the World Trade Organisation at bay, another time.

Now to support my contention that most of my time is spent on the practicalities of getting in-country projects underway. I had a delightful experience recently, meeting with senior matai and chiefs from 11 Samoan villages to explain the pros and cons of eradicating rodents from an island with priceless conservation values (including, for example, three critically endangered birds and breeding turtles, to name a few). The interesting thing was that permission was sought and granted in the same (admittedly long) meeting. No fanfare, no posturing, no politics, no more discussion—just go and do it! Such a contrast to what I am used to. And what was the difference here? It hit me today: they trusted us.

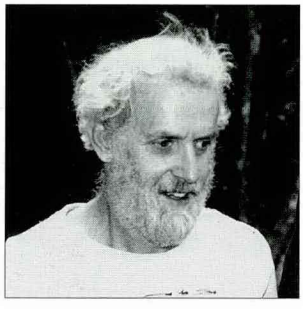
Greg Sherley
Programme Officer, Avifauna Conservation and Invasive Species
South Pacific Regional Environment Programme
Apia, Samoa

The Science Senior Management Team

In this issue we introduce the Senior Management Team of Science & Research. As a result of the reorganisation of Science the management structure went from two to five specialist managers supporting the director. Specialist managers not only have their area of expertise but also act on behalf of the team.

Dr Geoff Hicks, Manager, Science & Research

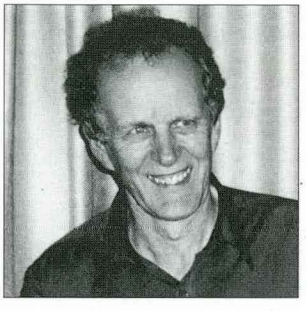
My role is to facilitate the provision of high-quality science and research products and services for the benefit of the department. I have a team of 5 science managers who are individually responsible for specific portfolios of activity. My own primary focus is presently in the redirection of our research into nationally set strategic priority areas and to maintain relationships with outside science providers. In addition I act as Chief Technical Officer for Biosecurity, ensuring the department's interests in this matter are well exercised.



Dr Rod Hay, Science Manager, Ecosystems

Rod's role on SMT is partly defined by his responsibility as science manager ecosystems but, as the only manager who resides, by choice, outside Wellington, he brings a provincial perspective to the table. As well as managing ecosystem staff in six locations from Auckland to Dunedin, Rod, along with other Christchurch science staff, has a regular role in liasing with Landcare Research and the Southern Regional Office.

Dr Rob McColl, Science Business Manager



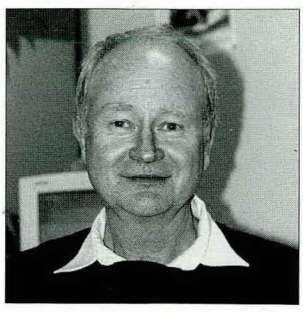
Rob oversees the department's science contracting and science support services. Over the last five years, science business management has become increasingly complex, with new streams of funding, new forms of accountability and risk management, tighter contracting conditions and changing science-planning systems.

Rob also influences science programmes in an advisory capacity, both internally through other science managers, and externally through science associates and government agencies. He has a special interest in forest management, representing DOC on the NZ Forest Health Research Collaborative and the MFE Carbon Monitoring Steering Committee. He would like to see DOC promote its role as New Zealand's foremost forest manager much more forcibly. Rob will help on the advisory committee of Landcare Research Ltd's new programme—Future Landscapes—which focuses on biodiversity management in fragmented and urban landscapes. He also retains an interest in freshwater management and is keen to see DOC's freshwater science strategy jointly developed with key science associates such as NIWA. Rob maintains liaison with a wide range of external science organisations that provide science information to DOC. 'I never cease to be amazed at the keenness and willingness outside science providers show in wanting to play a part in conservation. DOC gets terrific service, sometimes inadequately recognised, from these groups.'

Ian West, Science Manager, Marine & Freshwater

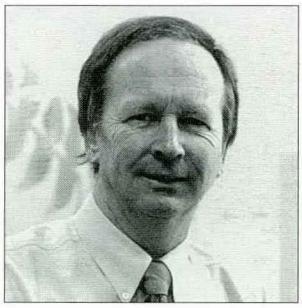
I see my job facing two ways. In one direction I support Geoff Hicks in his charting of national strategic directions for the necessary science to underpin conservation efforts. In doing this 'big picture' stuff my major contributions come from my experience as an experimental design statistician and from 20 years as a scientist working on marine themes and thinking about marine issues. My upbringing and training have given me a strong practical bent so I can often provide useful criticism of proposed systems outside my marine experience. My other direction is to manage science staff and portfolios of research. Here, once a job has been defined and finance secured, the most critical thing is getting the right people for the job—be they SRU staff or contractors. This means people management and often-intuitive judgement. A related activity is the enforcement of quality standards on the science we commission. So this direction involves attention to detail. The inherent tension between 'big picture' and 'attention to detail' is one of the most difficult areas of my job. As a statistical scientist attention to detail was a natural part of the job but stepping back to see the 'big picture' has had me on a steep learning curve.

Don Newman, Science Manager, Protected Species



Don manages the terrestrial threatened plants and animals research programmes of the department. Guidance for this task comes from strategies drafted for plants by Peter de Lange, David Norton & Suzan Dopson, and for animals by Colin O'Donnell. The key aim for both these programmes is to improve the knowledge base available for managing and restoring populations of threatened species and thus improve the effectiveness of management techniques. A particular challenge is the large number of NZ species regarded as threatened. Over 500 species have been listed as threatened; however, there are probably many more since our invertebrates and lower plant forms are generally poorly known. We simply do not have the time, or resources, to investigate each of the species at risk. Consequently, future emphasis will be given to developing approaches to managing multiple threatened species at key sites, and reviewing the adequacy of ecosystem protection programmes for threatened species conservation.

Paul Dingwall, Science Manager, Social and Historic



Paul feels his academic training in geography has encouraged a multi-disciplinary approach to his work, and a strong applied focus to his science—qualities that are vital for working as a scientist in DOC. His management responsibilities cover the wide range of 'people' aspects of conservation research: recreation, tourism, community involvement, history, and archaeology. He also supervices SRU's technical units: science illustration, electronics, and the national banding office. Paul was responsible for organising our recent move from Tory St to new offices in Victoria St (3rd floor of the Wellington City Public Library building). This was a prodigious task which, under Paul's direction, proceeded with remarkably few tears or lost belongings.

RESEARCH IN PROGRESS

Wetland restoration at Bullock Creek

Widespread drainage, burning and grazing have left wetlands as one of the most threatened habitats in New Zealand and elsewhere. Wetland restoration and creation, therefore, have an important role in contemporary resource management. However, successful wetland management needs a sound understanding of how to manage the water regime, as well as the habitat requirements of desired wetland flora and fauna. The Department of Conservation is working with NIWA and Landcare Research on a wetland restoration experiment that is part of a major FRST-funded study on the functioning and restoration of wetlands.

Wetlands, an important component of the New Zealand ecology, are the subject of extensive research. Here we report on a project undertaken by NIWA and DOC with funding from FRST.

The experiment is being carried out at the Bullock Creek polje, an enclave of farmland within the Paparoa National Park, inland from Punakaiki in the Buller District. A polje is a large, flat-floored depression in a karst landscape, and the Bullock Creek area was formed about 50 000 years ago. Europeans began clearing the area for pasture and felling the podocarp forest as early as 1874, and digging drains from the mid-1900s onwards. Grazing continued until as recently as 1986, and today the area is a mosaic of different vegetation types separated by a network of drains of different ages.

The present vegetation at the experimental site, a 100 ha area at the north of the polje, reflects this management history. The most modified area, which has relatively nutrient-rich soil and probably supported kahikatea-dominated forest in pre-European times, is now largely a mixture of introduced pasture grasses. These grasses have also spread along the edges of the drains, encouraged by the disturbance, drier soils and higher nutrient availability provided when the drains were dug. Further away from the drains, though, the wetland vegetation has retained some of its original character. Native sedges such as *Carex sinclairii* and *Baumea rubiginosa* still dominate much of the area, and areas of *Sphagnum* moss and flax (*Phormium tenax*) are also common. The persistence of these plants in spite of the drains makes restoring the site more feasible than if they had been eradicated completely, but also provides us with an opportunity to examine some broader issues in wetland ecology that we hope will have wider application outside Bullock Creek.

One central issue is the importance of water regime (i.e. the soil wetness, and the duration and depth of flooding) in controlling the distribution of plants and animals. Water regime can determine the rate of nutrient supply into the wetland, the rates of nutrient cycling in the soil, and the physical and chemical characteristics of the soil, as well as having direct effects such as mechanical disturbance on organisms. At Bullock Creek, the legendary West Coast rainfall and the local geography provide a water regime that is nothing if not spectacular. Within hours of heavy rainfall in the surrounding hills, vast quantities of water sweep down and inundate the area to a depth of a metre or more, swirling back into the wetland from subterranean passages unable to cope with such water volumes. Although impressive, these floods are short-lived and do not appear to have any significant long-term effects on the vegetation in the wetland. Instead, the gradual drying of the soils between floods, and how this has been changed close to the drains, appear to be the main factors controlling vegetation patterns at present.

Drainage ditch at Bullock Creek Farm (centre) dominated by the native pondweed *Potamogeton cheesemanii*. The vegetation on the spoil bank (left foreground) is introduced pasture grasses, whereas the less disturbed wetland vegetation to the right of the drain is flax (*Phormium tenax*) and *Carex sinclairii*.

Our research so far has provided an understanding of the hydrology and physical and chemical conditions at the site, together with the existing vegetation and fauna communities, which will be used as a baseline to gauge the success of our restoration efforts in providing additional habitat for native species. Within a few months, we will begin closing some of the drains and following how this affects water regime, soil chemistry, and vegetation. One of the important issues during the experiment is that although re-establishing a more natural water regime is an essential component of successful wetland restoration, is it enough on its own? Some overseas experience has shown that making a degraded wetland area wetter again will eliminate some exotic plant species, but that others tolerate flooding almost as well as the desirable wetland species and remain. The ability of desired wetland communities to 'self-assemble' in response to relatively simple interventions like closing drains is critical in wetland management, because other options such as weeding and planting can be much more expensive.

These issues also emphasise the need to establish clear management goals in wetland restoration projects. Little effort may be needed to allow an area to develop wetland characteristics, but providing the habitat to encourage particular target species can be more difficult. This becomes increasingly relevant further up the food chain. The wetland restoration literature is rife with ineffective or only partially successful projects, where the vegetation appears to respond well to changes in water regime, but does not develop the appropriate structure to allow, for example, nesting of desired bird species. Another problem is the extent to which the modified system has developed its own values and whether complete restoration to the pre-impacted state is desirable. At Bullock Creek, some of the drains now support diverse communities of aquatic plants and invertebrates, and large numbers of eels. Closure of all the drains would remove this habitat, and it may be that a more diverse approach, with some areas restored and the status quo maintained in others, is more appropriate.

RESEARCH IN PROGRESS

Predicting just how the different species in a wetland area are likely to respond to a changed water regime is not straightforward in any case, especially in New Zealand where there has been so little research into the biology of our wetland plants and animals. We are trying to redress this in our wetland research, which also includes investigations of growth responses and wetland functioning in more controlled environments, in addition to field studies such as the Bullock Creek experiment.

Our immediate aims are to use these experiments to develop the understanding of wetland ecology that will allow us to provide advice for a more scientific basis for wetland restoration projects in New Zealand. In the long term, experience from places like Bullock Creek will be put to use to reverse this country's unfortunate history of wetland loss and leave us with more wetland habitats in the future.

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