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GUEST EDITORIAL

Genetic modification and conservation

Some time ago my attention was drawn to the excellent popular science writing being produced by Veronika Meduna, then resident in Christchurch. I thought she was really on to something, and I asked her to write us some articles on new and exciting areas of science that may have an impact on our conservation management work. Here is the first one!—Ed.

Wind forward 25 years or so and you could find yourself walking past paddocks with herds of medicine-producing cow clones or through possum-free forests with flocks of flying kakapo and resurrected huia—all courtesy of genetic engineering!

Such are the visions of some scientists who see gene technology as the source of unprecedented possibilities and quick solutions to some of our most pressing problems. For others, genetic manipulation is the harbinger of environmental disaster.

Of all the sciences, genetics is likely to remain the fastest growing in the next century and already its influence

Department of Conservation
Te Papa Atawhai

is encompassing all other areas of research, including conservation. The fiercest debate might be raging about genetic engineering of food ingredients, but even there the public's main concerns focus on the possible effect of foreign genes on the environment. The same issue is at the core of any discussion of the use of gene technology in conservation.

Genetics could have an impact on conservation through two different approaches: cloning and modification. A team of AgResearch scientists came second in the world in cloning sheep from an embryo cell line only months after the controversial announcement of Dolly by Scottish researchers. Soon after, the last surviving Enderby Island cow was recreated and now shares her paddock with one daughter produced by artificial insemination and another cloned from her own cells. The successful cloning of the rare breed was hailed as a new way of saving species from extinction by multiplying the remaining members to provide a bigger pool for natural mating.

But is a herd of clones the same as a naturally bred population? The Chatham Island black robin is an interesting example of a population with such a high degree of inbreeding that the individual birds are genetically indistinguishable. Each of the almost 300 birds alive today can be traced back to the last breeding pair, Old Blue and Old Yellow, to which the population had been reduced in the early 1980s.

Despite their genetic closeness, the birds are thriving. The species' only limitation to further growth is the small size of the two islands to which it is confined. This has proven a bottleneck through which any successful and long-term recovery effort must pass no matter which techniques are applied along the way. What is the point then of trying to clone an extinct bird such as the huia when it is uncertain if it would survive in the wild?

In July this year, the project to clone the huia from genetic material that may be found in some of the preserved birds was launched by a group of scientists and ethicists. Researchers have since started tackling the first major hurdle, that of learning how to clone a bird: something that hasn't yet been achieved with a living bird, let alone with DNA extracted from remnants of an extinct species. However, sooner rather than later, cloning will be possible, technically. Morally it may be justifiable, given the huia's cultural significance, but the consequences such an experiment will have on other conservation efforts should be part of the debate now, before any attempts are made.

Many opponents argue that the money put into the huia project would be better used for recovery projects of species at the brink, and for habitat restoration.

While cloning proposals are likely to attract wider public debate, modification of individual genes could also have major impact on conservation. It could change our definition of what we regard as a species.

Generally, two populations are regarded as distinct sub-species when they are shown to be so different genetically that no natural breeding occurs. This genetic variation is often achieved through geographical separation and many generations of isolated breeding. Hector's dolphins living off the North Island west coast and the kiwi found in the Okarito forests have both been shown to be sufficiently different, and at the moment

the reaction to such a find is an increase in conservation efforts.

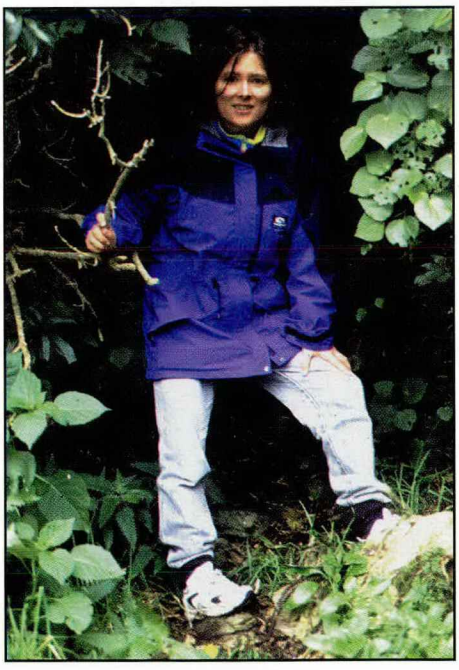
What conservation status would we give an organism that arose from a deliberate genetic manipulation? Would creating a flying kakapo do anything towards saving the flightless parrot or would we end up with a new species which may experience unexpected environmental risks or become a threat to others? Would a genetically engineered virus designed specifically to kill possums get rid of the pest or set off a new plague?

The main problem with most gene technology issues is that our technical know-how has advanced faster than our understanding of ecological consequences and interactions.

Steve Jones, a professor of genetics in London, writes in his latest book, *Almost Like a Whale*, that biotechnology, with its 21st century powers, has an 18th century view of what species are. He says the views of genetic engineers 'take no account of the notion of species as interacting groups of genes, the properties of one gene depending on the others with which it is placed—as shown so starkly in the cancers of hybrid fish'.

Outside laboratory conditions, no organism lives in total isolation so it is unlikely that a gene introduced into one species would remain contained forever. It seems that genetic engineers deny the central facts of evolution: that the action of a gene depends on the species in which it finds itself and that all species were once varieties, which means that the boundaries between many can still be breached.

Veronika Meduna



Veronika Meduna combines experience in both science and journalism. She trained and worked as a microbiologist in Germany and New Zealand, focusing on applied environmental projects such as the use of soil microbes as indicators of chemical contamination.

Veronika changed careers a year after arriving in New Zealand in 1993 and has since worked as a feature writer and sub-editor, most recently for The Press *in Christchurch. She has also contributed articles to a range of magazines in New Zealand and overseas and has written a book about early education in mathematics.*

She now lives in Wellington, working on her second book and working as a freelance writer and editor.

The Marine and Freshwater Group

Staff, locations, major tasks, and responsibilities

Ian West

Science Manager—Marine & Freshwater

Location: Conservation Sciences Centre, Wellington.

Early in his career he worked on the estimation of salmon juvenile and adult numbers in New Zealand rivers, and then as research assistant to Prof. R.M. Cormack (of Cormack-Jolly-Seber multiple mark-recapture fame). This was followed by 12 years as an experimental design statistician for the Fisheries Research Division of the New Zealand Ministry of Agriculture and Fisheries where he worked on tuna and on fish age determination techniques. In the early 1990s Ian was an associate professor at the Hawaii Institute of Geophysics and Planetology in Honolulu. His principal work there was on the fate of plastics in the abyssal depths: How does one measure the decay of a plastic? A very short period in the Department of Justice Audit Unit looking at what constituted a well-managed prison prepared Ian to come to DOC in 1995 where his first appointment was to run the research that is funded by a levy on the commercial fishing industry. When not at work, Ian grows and breeds roses.

Jacqui Burgess

Programme Manager, Conservation Services Levy

Location: Conservation Sciences Centre, Wellington

Jacqui studied Zoology at Victoria University, Wellington, where she obtained her Batchelor of Science with First Class Honours in 1992. As part of her studies she carried out research on the New Zealand Fur Seal. She was also employed on many short-term projects at MAF Fisheries (now NIWA). Initially she worked on the issue of seabird bycatch on tuna longline vessels, but later participated in projects on a range of species including hoki, kahawai, geoducs, rock lobster and scampi. In 1993 Jacqui went to Noumea, where her interest in marine mammals quickly led her to discover the dugongs and dolphins of New Caledonia. In collaboration with Claire Garrigue, a French research scientist, she became fully involved in a humpback whale research programme. Together they formed Operation Cetaces, an organisation dedicated to marine mammal research and public education. Jacqui returned to New Zealand in April 1999 to take up her present position in DOC.

Location: Conservation Sciences Centre, Wellington

Reg Blezard

Briefing Officer—Conservation Services Levy Programme

Location: Conservation Sciences Centre, Wellington

Reg qualified as a hydrographic cartographer with the former Navy Office, producing navigational charts. From there he was seconded to New Zealand Oceanographic Institute for the Balleny Islands Expedition—and to DSIR to assist Euan Young establish the Adelie penguin/south polar skua study. He was Department of Civil Aviation Officer in Charge, Campbell Island, in 1967/68. He then joined the Marine Dept./MAF Fisheries Research Division for a decade, spending 4˚ years at sea sampling coastal commercial trawl fish species, and following this he became the Fisheries Research Division laboratory's cartographer and scientific illustrator. Reg then retired into small farming, culinary herbs, childcare, teaching, and contract surveying, before joining the Ministry of Fisheries Scientific Observer Programme in 1996. He came to DOC Science & Research to map and count a few hundred thousand mollymawks, portrayed in 40-odd years of photographic records from Campbell Island, for Peter Moore. He is now the CSL Briefing/Debriefing Officer and administers by-catch projects for that Programme. Beyond these duties Reg encourages his and other young folk to be 'out there' but not always to be 'cold, wet, and hungry!'

Ian Wilkinson

Scientific Officer—Marine Mammals

Location: Conservation Sciences Centre, Wellington

Upon completing a zoology degree in London, Ian moved to South Africa in 1984. He then spent 27 months at Marion Island employed as a biologist in the South African Antarctic Programme (University of Pretoria) to study population dynamics of southern elephant seals (topic of his PhD). This was followed by a move to Cape Town and 4 years as a fisheries

biologist working on commercial demersal fish species and the emerging shark fishery. Then came 18 months in the Kruger National Park conducting population studies of the African wild dog: Africa's most endangered large carnivore. New Zealand (Dunedin) became home in late 1995, and work as a policy analyst for the Ministry of Fisheries, with primary responsibility for regional research issues. Ian came to DOC in 1998 and leads the New Zealand sea lion research programme.

Investigations:

1638: Leader: New Zealand sea lion population status and foraging ecology.

3090: Leader: Monitoring of populations of protected marine mammal species.

Alan Baker

Scientist—Marine Species (Cetacean)

Location: Conservation Sciences Centre, Wellington

At Auckland and Victoria universities Alan focused on Botany and Marine Zoology. He almost became a botanist following a stint in Antarctica as biologist with a Victoria University Expedition, which resulted in publications on the freshwater algae living in Antarctic lakes. Marine-type teachers (Richard Pike, Jack Garrick, H.B. Fell) took over, however, and Alan completed his studies with theses on the kahawai and (PhD) the New Zealand pilchard. He joined the staff of the Dominion Museum in 1970, and developed a research interest in deep-sea echinoderms and cetaceans during a period of concentrated deep-sea exploration around New Zealand by the museum. After 25 years of research and field work within New Zealand and overseas, plus a stint as director of the (by now National) Musem, he joined DOC in 1993 to branch out into new fields. He was Manager, Introduced Animals Policy in the old Land Protection Division under John Holloway, and had a short job setting up a Marine Protection Unit in the former SPD under Janet Owen. Following restructuring, Alan worked for External Relations Division for a period, and then moved to Science &Research to handle scientific aspects of the sea lion mortality event in January–February 1998. As in the case of expatriate tea planters in India, he 'stayed on', and is now back doing his favourite work studying whales and dolphins. Alan is, of course, a keen sea angler in his spare time.

Projects:

2421 Marine Species Protection Programme leader

3137 Marine Species Research CCAMLR & OPAC

3225 Status of Bryde's whales in the Hauraki Gulf and Northern waters

Peter Moore

Seabird ecologist, penguins, albatrosses, oystercatchers

Location: Conservation Sciences Centre, Wellington

Peter started his career in 1982, on contract to New Zealand Wildlife Service studying wetland bird usage of Lake Wairarapa, followed by a period as research assistant on takahe and red-billed gull projects. A year on Campbell Island in 1987/88 saw him begin to specialize on penguins and albatrosses. This led on to a study of Yellow-eyed Penguin foraging, following the 1990 crash of the Otago Peninsula population. Returning to his Campbell Island haunts in 1995, Peter continued albatross population studies. His latest project is video monitoring of Chatham Island oystercatcher nests.

Investigations:

2050: Population ecology and status of mollymawks and Southern royal albatross on Campbell Island

3273: Causes of nest failure in Chatham Island oystercatchers

Chris (C.J.R.) Robertson

Scientific Officer—Seabirds

Location: Conservation Sciences Centre, wellington (and the Chatham Islands)

Chris has lead or participated in many research expeditions to New Zealand's outlying and subantarctic islands and the Ross Dependency during 40 years as a research ornithologist, taxonomist, and science administrator with the Dominion Museum, Antarctic Division DSIR, New Zealand Wildlife Service, and Department of Conservation. As a writer, editor and publisher he has authored, co-ordinated or produced a wide range of publications. Chris was Banding Officer for 16 years until 1980, and CAS Co-ordinator until 1998. He is the current editor of CAS NOTES, at least until he retires during the year 2000.

Significant research interests include ecology and population trends of the Australasian Gannet, and various albatross species, especially the Northern Royal at Taiaroa Head; experimental satellite and passive logger tracking systems for seabirds; taxonomy and DNA of albatrosses, autopsy of seabird bycatch from fisheries; bird distribution; habitat requirements of wetland birds. Chris was Business Manager of the 20th International Ornithological Congress in 1990, and a member of the International Ornithological Committee. In New Zealand he is the current President of the Ornithological Society of New Zealand.

Investigations:

1225: large sea birds (gannet, albatross and mollymawk)

Diomedea research and monitoring in the Chatham Islands

2290: Albatross contaminants

3051: Collection of biological data on protected seabird species incidentally caught in commercial fisheries

3091: Foraging of Chatham Islands albatross (Chatham Island mollymawk)

3180: Identification of seabirds, especially albatross, incidentally caught in commercial fisheries

3200: Royal albatross, Taiaroa Head

Mike Imber

Scientific Officer (Petrels)

Location: Conservation Sciences Centre, Wellington

Mike was in the field, working in the Taiko (Magenta Petrel) programme when this note was compiled. He has a distinguished career as an ornithological scientist, particularly working on petrels, with numerous papers published in international journals. He is also an internationally recognised expert in squid taxonomy—some squids being petrel food. Mike's eminence has been recognised by the award of a DSc.

Investigations:

1226: Survey of marine and coastal birds

1229: Petrels: ecology, translocation and conservation

Effect of Norway rats on grey-faced petrels, White Island.

Black-browed Mollymawk killed by fishers in Chile to obtain band

Recently, the Banding Office received a band recovery via the Australian Bird and Bat Banding Scheme of a Black-browed Mollymawk *Thalassarche melanophrys* in Chilean waters. The bird was banded by Graeme Taylor on Campbell Island in 1986. Very few members of this species are found in our waters and this individual habitually bred on the island with one of the locally more numerous Campbell Mollymawks *T. impavida*. We followed its breeding in most years since 1991.

In late 1998 the Black-browed Mollymawk was found dead off the coast of Punta Lavapie in central Chile. The bird's long-distance movement of over 8000 km was in itself interesting, but so was the way it died. A conversation between a school-teacher and crab fishermen about seabirds that gathered around their boats revealed that banded birds were deliberately captured and killed to collect their bands, presumably to keep as curiosities. Such was the fate of our bird from Campbell Island, along with seabirds from other nations.

In recent years in our part of the world there has been much publicity about declines in some albatross populations as a result of accidental capture of birds during fishing operations. Deliberately targeting banded birds may be rare, but it could have implications for our estimates of survival from banding studies. Obviously, changing the attitudes and practices of fishers around the world is a long slow process, as traditionally they would find little difference between killing a bird or a fish. In this case, with the help of translation

from Eduardo Villouta, I have written to the fishers co-operative (via the school teacher) to explain that we value band recoveries, but not to the detriment of the birds. We enclosed a copy of the excellent English/Spanish booklet by Nigel Brothers of Parks and Wildlife Service, Tasmania: *Longline Fishing Dollars and Sense*. This shows in a very down-to-earth way the value of not catching seabirds. Hopefully in this small way we can help the situation for seabirds in this part of Chile.

Peter Moore,
Science & Research

RESEARCH IN PROGRESS

Captive rearing of the Middle Island Tusked Weta (*Motuweta isolata*)

Despite its large size the spectacular Middle Island tusked weta is a relatively recent discovery, with the first specimen being found by Tony Whitaker (DSIR) in 1970. Adults of both sexes measure from 8 to 10 cm in length. Females may weigh over 30 g and males up to about 28 g. Their bodies have an orange-red background with dark brown patches on the thoracic shield and dorsal surfaces of the abdominal tergites. The male has prominent tusks, which are outgrowths of the mandible and curve forward to cross at the tip. The tusks are used in sparring confrontations, which seem to be a key component in a mating system where dominant males acquire access to females. The weta are nocturnal and during the day shelter in underground burrows.

The Mercury Islands group consists of seven islands ranging in area from 3 to 1860 ha and several small unnamed stacks and islets. The weta occurs only on Middle Island, a small (13 ha) ecologically fragile island in the group. Middle Island has a dense and diverse invertebrate and reptile fauna and a large population of burrowing seabirds. It is unusual for a northern New Zealand island in that it has not been modified in recent times by humans and has no introduced mammalian predators. The tusked weta population does, however, suffer intense predation from abundant lizards, tuatara, giant centipedes, and possibly other vertebrate and invertebrate predators. To minimise the threat of extinction of the Middle Island tusked weta, new populations should be established on neighbouring islands. The weta population is thought to be too small to enable adequate numbers to be directly translocated without putting its survival on Middle Island at risk. Therefore, captive rearing is necessary for such introductions.

An investigation into aspects of the biology of the Middle Island tusked weta is being carried out by Landcare Research, Mt Albert, Auckland, for the Department of Conservation, in order to develop a reliable captive rearing method. Rearing is being carried out in a room approximately 3 m ∞3 m. During the cooler months, air circulation is provided by two fans drawing air in from the outside. During the warmer months, temperature control and air circulation are provided by an air-conditioning unit. Day lengths in the rearing room corre-

Male Tusked Weta

spond to day lengths at the latitude of Middle Island. Important information about tusked weta biology has been gained during the course of this investigation. This species initially proved to be difficult to rear in captivity. However, several factors causing poor breeding success, and mortality of eggs, juveniles and adults, have been recognised, and modifications have been made to the rearing method to try to alleviate these problems. These modifications are now showing signs of succeeding.

At the beginning of 1999, one male and two female Middle Island tusked weta were contained in the rearing facility. The two females were housed individually and were allowed access to the male at regular intervals. Oviposition substrate was provided in two-litre ice cream containers with drainage holes and a layer of pumice in the bottom. The females were given a choice of three different oviposition substrates: soil; a peat/pumice mix; and a soil/peat/pumice mix, and the number of eggs laid in each substrate was recorded. Both females mated and oviposited successfully and a total of 501 eggs were collected. Fifty eight of these had been destroyed by fungus or predation by soil organisms. The 443 intact eggs were re-buried in smaller pottles in the same type of substrate from which they were collected. In the past, difficulties had been experienced in knowing when eggs had hatched and finding the hatchlings. This is because the hatchlings burrow underground after hatching and in a loose, friable substrate all trace of hatching and burrowing can be obscured. Therefore, a thin layer of a white, powdery substance called perlite, was spread over the top of the substrates in the small pottles to make it obvious when the eggs hatched. The eggs produced in 1999 were laid between March and July and the first egg hatched in mid-August. The egg hatch rate was slow throughout August and September but increased as spring progressed and by early November, more than one hundred and forty had hatched. Hatching is expected to continue into early summer.

Juvenile weta are housed individually in ventilated plastic containers. Moist fine-grade vermiculite several centimeters deep, depending on the size of the weta, is provided as a substrate for them to burrow into. Water is added to the vermiculite when necessary to keep it moist. This species is mainly carnivorous, but a small amount of plant matter is also eaten. Food is placed in small plastic trays (weighing trays) and replaced every 3 or 4 days as it goes mouldy quickly in the humid atmosphere inside the containers. Foods offered to the weta include a wide variety of invertebrates, tropical fish flakes (Masterpet community diet flakes), cereals of various types (organic to ensure no pesticides are present), and a wide variety of vegetation including berries and flowers. Water is provided in small plastic containers. For younger weta, wet cotton wool or tis-

sue paper is placed in the water dish to prevent drowning.

Our immediate aim is to establish a viable captive population, possibly at three locations: Landcare Mt Albert, the Auckland Zoo, and Massey University. However, if excess juveniles become available, a field release on one of the islands of the Mercury Group may be possible this coming autumn. Red Mercury Island is currently the favoured option for a release but Double Island is also a possibility. The long term aim is to establish the Middle Island tusked weta on all of the larger islands of the Mercury Group.

Chris Winks
Landcare Research

REVIEW

Counting mollymawks on Campbell Island

Department of Conservation technical series 16 and *17; Science & Research Internal Report 169.*

Albatross numbers in the world have declined over the last decades; for some, such as wandering albatross *Diomedea exulans*, this phenomenon has been linked to fishing. Many seabirds have reportedly been killed on long-lines in the New Zealand region.

South of New Zealand, another albatross species (the Campbell mollymawk *Thalassarche impavida)* has suffered this fate. But DOC staff who were responsible for preparing an action plan for managing rare seabird populations found they had few hard data available on population size or trends.

That question was not easy to answer. The problem is that the colonies at the north of Campbell Island are mixed associations of Campbell mollymawk and grey-headed mollymawk (*T. chrysostoma).* The mixed species could not be separated in historic photographs and coverage of colonies was incomplete. It was necessary to conduct ground counts on the island. This was done by DOC staff (led by Peter Moore of DOC's Science & Research Unit) during three mollymawk breeding seasons in 1995–97.

The censuses were conducted early in the egg incubation period (8–18 October), and occupied nests were counted at close quarters. Counting techniques were documented in notebooks, photographs and maps. Count methods varied from the more intensive counts where every nest was visited and the birds marked individually, to less intensive counts and views of inaccessible parts from vantage points.

A newly published report (TS16) now standardises the mollymawk census methods by outlining the proven reliable and repeatable count methods. This will make it easier for future workers to repeat and/or interpret the counts of 1995–97, and so to monitor future population trends. Often the intricacies of methodology are abbreviated in our reports and papers, so this is an important development.

A separately published report (TS17) deals with aspects of mollymawk photography, photopoints, and counts from photographs. A further

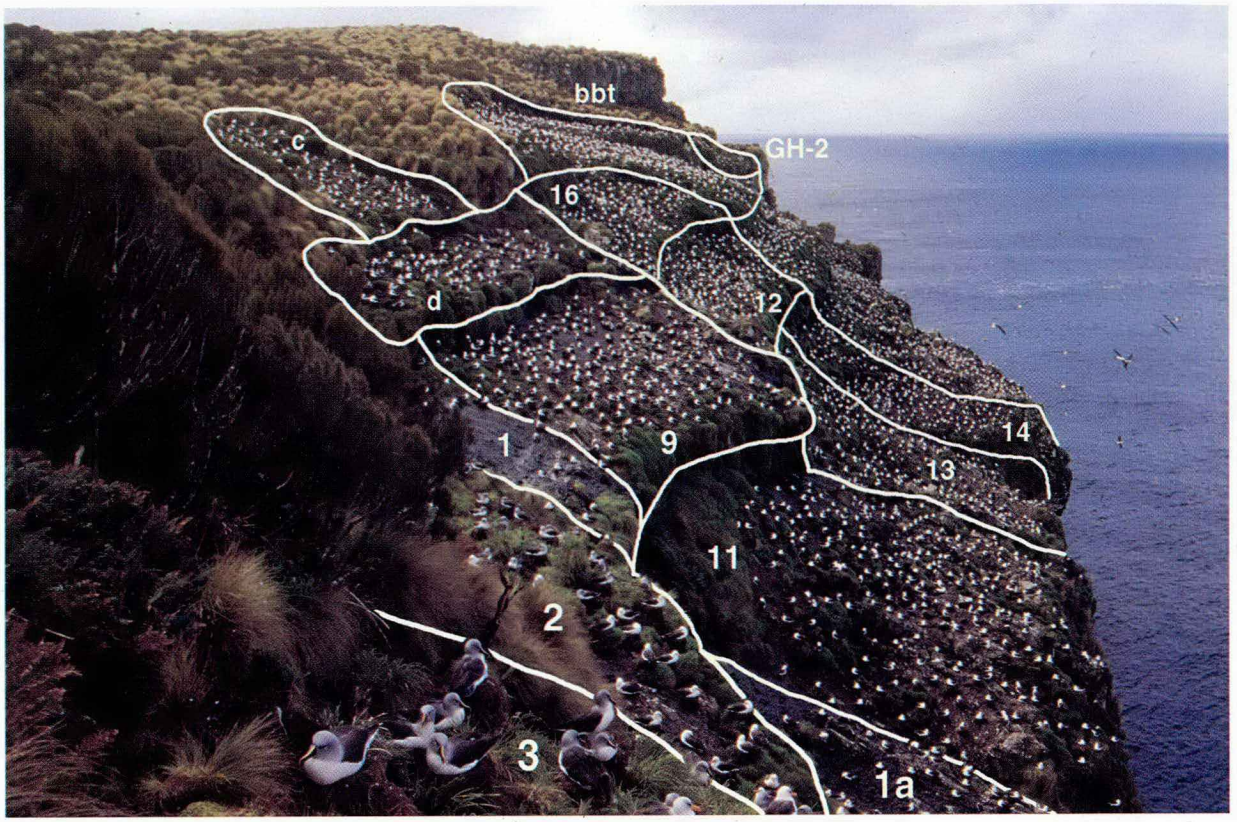


Photo of individual mollymawks within nesting colonies on inaccessible cliff ledges of Campbell Island, with the counting zone boundaries drawn in.
Photo: P. Moore 1995.

data supplement (IR169) contains photograph count data conducted in the 1990s. Tory Street staff became familiar with the sight of co-author, Reg Blezard, hunched over the microscope in the laboratory as he counted the thousands of dots on the hundreds of photos, now reproduced in *Technical Series 16 & 17*. The colour and black-and-white pictures (including historic ones) make for an interesting browse through.

The production of these reports was a great challenge. After all the photos were scanned, science illustrator Chris Edkins painstakingly drew in their boundaries electronically. While essential for achieving a high-quality end product, this method also stretched our production system to the limit: including all photographs, each several megabytes large, the two publications grew to around 400 megabytes each.

These large computer files needed massaging while Connect2000 was being implemented, and well-established means of file transfer were unavailable. That posed various interesting problems for science editor Ian Mackenzie, IT staff, and contractors alike—and created inevitable delays in production. Nevertheless these publications have now come to fruition; they represent an excellent archive and analysis of the mollymawks populations at Campbell Island, and a baseline for future research.

DOC staff can preview these publications on the Intranet (follow the link from Science Publications on the home page), and of course the high-quality bound volumes can be obtained from the Science & Research Unit, DOC, Wellington.

Jaap Jasperse
Chief Science Editor

NEW PUBLICATIONS

New from Science & Research Unit

Science for Conservation

Powlesland, R.G.; Knegtmans, J.W.; Styche, A. 1999. **Impacts of aerial 1080 possum control operations on North Island robins and moreporks at Pureora in 1997 and 1998.** *Science for Conservation 133.* 20 p. $12.50 incl. GST.

Parkes, J.P.; Thomson, C. 1999. **Impact of Himalayan thar (*Hemitragus jemlahicus*) on snow tussock in the Southern Alps.** *Science for Conservation 132.* 46 p. (incl. 7 colour pages) $29.50 incl. GST.

Gardner, P.; Wilson, K.J. 1999. **Chatham petrel (*Pterodroma axillaris*) studies—breeding biology and burrow blockading.** *Science for Conservation 131.* 37 p. (incl. 1 colour page) $13.50 incl. GST.

Whitaker, A.H.; Alspach, P.A. 1999. **Monitoring of Hochstetter's frog (*Leiopelma hochstetteri*) populations near Golden Cross Mine, Waitekauri Valley, Coromandel.** *Science for Conservation 130.* 36 p. (incl. 1 colour page) $13.50 incl. GST.

Brook, F.J. 1999. **Distribution and conservation status of the dune snail *Succinea archeyi* Powell (Stylommatophora: Succineidae) in northern New Zealand.** *Science for Conservation 129.* 29 p. $12.50 incl. GST.

Coleman, J.D.; Thomas, M.D.; Pracy, L.T.; Hansen, Q. 1999. **Fluctuations in possum numbers in the Pararaki Valley, Haurangi State Forest Park.** *Science for Conservation 128.* 16 p. $12.50 incl. GST.

Lee, W.G.; Loughnan, A.; Lloyd, K.; Fenner, M. 1999. **Long-term (20 years) effect of artificial defoliation of mid-ribbed snow tussock, *Chionochloa pallens*, in the Murchison Mountains, Fiordland, New Zealand.** *Science for Conservation 126.* 17 p. $12.50 incl. GST.

Jamieson, I.G.; Ryan, C.J. 1999. **Causes of low reproductive success of translocated takahe (*Porphyrio mantelli*) on predator-free islands.** *Science for Conservation 125.* 65 p. $22.50 incl. GST.

Sorrell, B.; Partridge, T. 1999. **Conservation values and management of the Kongahu Swamp, Buller District.** *Science for Conservation 124.* 50 p. (incl. 7 colour pages.) $29.50 incl. GST.

Ferreira, S.M.; McKinlay, B. 1999. **Conservation monitoring of the Cromwell chafer beetle (*Prodontria lewisii*) between 1986 and 1997.** *Science for Conservation 123.* 34 p. $12.50 incl. GST.

Bergin, D.O.; Kimberley, M.O. 1999. **Rehabilitation of coastal foredunes in New Zealand using indigenous sand-binding species.** *Science for Conservation 122.* 52 p. (incl. 5 colour pages.) $27.50 incl. GST.

Stephenson, G. 1999. **Vehicle impacts on the biota of sandy beaches and coastal dunes. A review from a New Zealand perspective.** *Science for Conservation 121.* 48 p. $22.50 incl. GST.

Fahey, B.; Wardle, K.; Weir, P. 1999. **Environmental effects associated with snow grooming and skiing at Treble Cone Ski Field.** *Science for Conservation 120.* 62 p. (incl. 5 colour pages) $27.50 incl. GST.

DOC Technical Series

Moore, P.J.; Blezard, R. 1999. **Photographs of Campbell Island mollymawk colonies: a guide to photopoints, historical comparisons and counting mollymawks.** *Department of Conservation Technical Series 17.* 106 p. $45.00 incl. GST.

Moore, P.J. 1999. **Counting mollymawks on Campbell Island—a guide to techniques and field procedures.** *Department of Conservation Technical Series 16.* 89 p. $45.00 incl. GST.

Internal Reports

Cessford, G. 1999. **Social impacts of visitors to conservation lands. Part 1. Research and information needs.** *Science & Research Internal Report 171.* 38 p. $12.50 incl. GST.

Moore, P.J.; Blezard, R.; 1999. **Counting Campbell Island mollymawk colonies from photographs—data supplements.** *Science & Research Internal Report 169.* 63 p. $22.50 incl. GST.

DOC Science Publications in the electronic age

Have you checked out the full catalogue of DOC Science Publications on the Intranet?

It's been there since the Intranet was first developed in DOC, and is growing at an amazing rate. Updates are done monthly, when the 'traditional' publications distribution memo comes out. Works aren't just listed, many are there for all to see!

The catalogue lists all publications from 1987 to present, and is beautifully indexed by subject.

Recent publications (1999) can be previewed on the Intranet in electronic form—the so-called portable document format (pdf). No more waiting for the publications to arrive in the mail. Now they can be downloaded immediately, and printed as if they were photocopies of the real thing! The exceptions to this are publications which carry many illustrations: these may be incomplete or of low resolution, to keep file sizes (and, therefore, network traffic) down.

You can find the catalogue by clicking on 'Science Publications' on the Intranet home page.

In the future the Intranet will also bring you more information about Science & Research activities and staff in DOC.

Visitors to our web-site can find the catalogue (but not the index or pdf files as yet) at:
http://www.doc.govt.nz/cons/scires/scires.htm

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