



# Reintroduction Biology

Integrating Science and Management

Edited by John G. Ewen, Doug P. Armstrong,  
Kevin A. Parker and Philip J. Seddon



# Reintroduction Biology

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*Edited by*

**John G. Ewen, Doug P. Armstrong, Kevin A. Parker  
and Philip J. Seddon**

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# Memorium of Don Merton

## Donald Vincent Merton (1939–2011), a reintroduction pioneer

Don Merton died on 10 April 2011, and although many of us had known for a while that he was fighting terminal cancer the news of his passing still came as a blow, since Don, or 'Mertie' to his friends and colleagues, had been an important figure in bird restoration for nearly fifty years and he had been a mentor to many of us. Don was a consummate field man and many of the techniques in bird management that he pioneered have now become accepted practice. The conservation programmes he developed and drove in New Zealand and on Indian Ocean islands have become iconic case studies of what can be achieved.

Don played a leading role in saving many New Zealand species and is best known for his work with the North Island saddleback *Philesturnus rufusater*, South Island saddleback *P. carunculatus*, Chatham Island black robin *Petroica traversi* and the kakapo *Strigops habroptilus*, but he also helped, advised and inspired work with a range of other species. Elsewhere he worked with the noisy scrub bird *Atrichornis clamosus* in Western Australia, the echo parakeet *Psittacula eques* in Mauritius and the Seychelles magpie robin *Copsychus sechellarum*.

The first significant bird conservation work that Don was involved with was the translocation of saddlebacks in the 1960s and this continued in subsequent decades. The North Island saddleback had been reduced to just one population on Hen Island due to predation by rats, cats and stoats. Don headed up a translocation programme for this species and successfully established new populations on predator-free islands. This work became a prelude to work on the South Island saddleback, which had become doomed following the invasion of its last island home, Big South Cape Island, by rats. Translocations to other islands were largely successful and set the scene for further translocations of this, and other species, to predator-free islands. The North Island saddleback has a population of about 6000 birds on at least 14 predator-free islands and the South Island saddleback has a population of about 2000 on 17 islands (Ballance & Merton, 2007).

This work demonstrated the value of translocating species on to predator-free islands and Don was eager to communicate the results. He gave an important paper at the 1972 conference on 'Breeding Endangered Species in Captivity' and put over the idea, novel at the time, that instead of having to breed highly threatened species in captivity they could be marooned on islands where they may be able to establish viable populations (Merton, 1975).

As a result of attending this conference Don became aware that there were many techniques being developed in Europe and North America that could be applied to managing bird populations and he wanted to discover how these could be applied to the threatened birds of New Zealand. In 1973 he spent three months in Hawaii, mainland USA and Europe visiting conservation programmes. Among these he visited the Endangered Wildlife Unit of the United States Bureau of Sports Fisheries and Wildlife at Patuxent in Maryland, the Peregrine Fund at Cornell University, the Wildfowl and Wetland Trust in Slimbridge and the Durrell Wildlife Conservation Trust in Jersey. He was able to see first hand the work being conducted on endangered species such as the Hawaiian goose *Branta sandvicensis*, whooping crane *Grus americana* and peregrine falcon *Falco peregrinus*. It was on this trip that Don realized the great contribution aviculture techniques could play; techniques that bird breeders used to encourage their birds to breed could be applied to free living birds. As a result of his trip Don was able to take back to New Zealand much important information on bird management. This included ideas on the use of captive breeding and the value of using related species as 'analogues' on which to develop skills. He was able to compile information on more sophisticated techniques for trapping, handling and transporting wild birds. Don also learned about captive diets, soft-release protocols and the new technology of radio telemetry. Perhaps most usefully Don was able to gather information on avian paediatrics such as egg harvesting and incubation, double clutching, the fostering and cross-fostering of eggs and young, and hand-rearing techniques. These techniques Don would use repeatedly in his work on the Chatham Island black robin, kakapo and other species.

In 1980 Don started the recovery of the Chatham Island black robin. The species had declined to five individuals and extinction seemed imminent. The black robin was restored by using a range of intensive management techniques including clutch and brood manipulations, close guarding and supplemental feeding (see Jones & Merton, this volume, Chapter 2). This is the species for which Don is most famous and the story has been well documented (Morris

& Smith, 1988; Butler & Merton, 1992; Ballance & Merton, 2007). There were about 200 black robins by 2011.

The species that he had the longest and most continuous involvement with was the kakapo, the ‘big budgie’ as he affectionately called it. He had been involved with this species for five decades and played a huge role in developing this programme and providing the vision for the species recovery, and saw it increase from 51 individuals in 1996 to 100 in 2009. The honour of naming the hundredth bird was given to Don, and he named it Te Atapo, meaning ‘the dawn after the night’, because of its significance to the recovery effort, and he went on to point out ‘the 100th bird symbolizes a very significant milestone in the ongoing struggle spanning more than a century of literally blood, sweat and tears by countless dedicated individuals to save one of New Zealand’s – and the world’s – most remarkable and iconic birds’.

All the kakapo now exist on predator-free islands outside their natural range since their historic habitats are now badly degraded and inhabited by exotic mammalian predators, making them largely unsuitable. Don worked with others to develop the techniques for clearing islands of exotic predators and then restoring them so they would be suitable for endangered birds like the kakapo (Butler, 1989; Ballance & Merton, 2007; Ballance, 2010).

The use of predator-free islands is a recurring theme in New Zealand conservation and has become important because of the appreciation of the damage that exotic mammals can cause. Don had witnessed the devastating impact black rats *Rattus rattus* had on Big South Cape Island in 1964–1965 when they caused the extinction of the Stewart Island snipe *Coenocorypha iredalei*, Stead’s bush wren *Xenicus longipes variabilis* and the greater short-tailed bat *Mystacina robusta*. This story is told in Don’s (auto)biography (Ballance & Merton, 2007) and in the book *Wild South* (Morris & Smith, 1988). The experience of seeing the collapse of the bird and other communities on the island had a profound influence on Don, and he often talked about it. He was incredulous that some scientists were myopic regarding the negative impact that rats (and other exotic mammals) were having on endemic island faunas (Merton, 1977). Together with Ian Atkinson and Brian Bell they were the first to realize just how destructive rats were to bird populations, and all three became major campaigners for the eradication of exotic rats from islands. Don led rat eradication projects on Mauritius and Seychelles as well as contributing to a range of exotic mammal eradications in New Zealand and elsewhere. On Mauritius he and a small team of helpers eradicated rabbits off Round

Island, which was at the time the largest island from which rabbits had been eradicated (Merton, 1987). Later Don went on to develop the management plan for the island (Merton *et al.*, 1989), and this plan has been successfully implemented.

A field trip with Don was an education. He planned it with meticulous attention to detail, building in contingencies for problems that may occur. For days before the trip he would work through long lists of items that were required. All provisions were carefully quarantined and packed and sealed in labelled boxes. The field camps that Don set up on Round Island and in the forest, when working on echo parakeets, were more organized than any that I or my fellow British and Mauritian biologists had experienced. So fastidious was Don in running field camps that his fellow 'kiwis' gave him the soubriquet of 'auntie'. Don was indeed a joy to share a camp site with and when we would remark that he ran a good camp he would reply that 'anybody can rough it in the field but effective field work is a product of being organized and comfortable'.

Don always had focus and stamina; he would be up earlier than everyone else and by the time the rest of the team had arisen Don would have breakfast ready, the day planned and be raring to go. In the field he had more energy than many half his age and I have memories of trying (unsuccessfully) to keep up with him. Don was, however, no paragon and could be stubborn and introspective, but these were traits that made the man determined and focused. Often when faced with a seemingly unsolvable problem he would become quiet and withdrawn while he weighed up the situation and thought through a strategy to find a solution. It was remarkable how often Don found the answer; he was very intuitive and could also draw upon his considerable experiences to solve problems big and small.

Most field conservationists spend the early part of their careers in the field and then when they reach middle age take on more and more management and office-based responsibilities. This was not Don. He spent virtually his entire career doing field-based work and resisted promotion that would take him away from hands-on conservation, for this was where he felt most comfortable and was most effective. In all he spent more than ten years of his career living in tents or field huts, usually in remote locations. In addition to this he spent several years working on the Indian Ocean islands of Christmas, Seychelles and Mauritius.

Don was never happier than when he was tinkering with birds. He used to enjoy just being with them, watching and soaking up all types of information



about how they behaved and reacted. He was empathetic and had a deep understanding that arose from years of intimate contact. I remember when I showed him some recently fledged hand-reared Mauritius fodies *Foudia rubra*; the birds were very tame and readily landed on him and climbed and fluttered up and down his arms and on to his head, inspecting his glasses and probing his ears. To most biologists they are small brown passerines but to Don they were special; 'Jeez, what beauts!' he exclaimed, 'what wonderful little birds.'

When working with birds, whether setting up a supplemental feeding station or placing a nest-box, he would pay careful attention to every little detail to make it attractive to the birds. Don's attention to detail influenced all he did, and was particularly evident in his approach to trapping. I remember clearly how, on Mauritius in 1992, we had a problem feral cat that was killing pink pigeons *Nesoenas mayeri* in our last wild population; at the time we had less than twenty birds left and the cat was making a significant dent in the numbers. We unsuccessfully tried all sorts of traps to catch it. Don visited Mauritius and I asked him if he could help us. He spent a day in the field studying the situation. When he had a good idea how the cat would be using the landscape and where it would be likely to travel, he carefully set a series of traps that were well camouflaged and baited with fish. Next morning Don got up early to go and check his traps and later greeted us at breakfast, beaming with delight and holding up the dead cat he had caught!

Don was not a trained scientist but he was nevertheless a careful and systematic worker. He realized that science was the most powerful tool that could provide knowledge to inform conservation management. Although he did not see publications as an end goal he did publish important findings and techniques, including the description of lekking in the kakapo, the only parrot that is known to do so (Merton *et al.*, 1984).

Don was a modest man who never bragged about his achievements but was, however, always eager to talk and share his knowledge with anyone who was interested. He wanted to know what others had to contribute, and travelled widely visiting bird conservation projects and attended and spoke at many international conferences. Without intending to, he was the greatest ambassador of conservation that New Zealand has ever had. A very generous man by nature he readily gave his time and helped projects outside New Zealand, including projects in Western Australia, Christmas Island, Mauritius, Seychelles and Fiji. Don did much work abroad, often at his own expense, and would usually do it during his annual leave or he would

take leave without pay. On Mauritius he helped develop the echo parakeet restoration project and for over 25 years he provided advice and guidance. He was a wonderful correspondent and would always be happy to respond to any queries and kept in close touch with projects he had helped.

Don was an optimist and believed that most critically endangered species are restorable and that in the future we would be restoring whole communities and rebuilding ecosystems. He showed us the way forward and the species conservation programmes he was involved with have matured into projects restoring suites of species and their island habitats.

During his more contemplative periods he would lament on just how short our human life span was compared to how long it was going to take to restore species with long generation times, like the kakapo, and to restore whole island systems. He would urge that we had to do what we could to develop the next generation of conservation leaders to continue the work. These were not just words since Don put these views into action and on his various trips to Mauritius and Seychelles he took along young conservationists at the beginning of their careers to give them the opportunity for broader conservation experience. Subsequently, in Mauritius we have had a whole stream of 'kiwi' conservationists who have been sent by Don, helping with the work while at the same time adding to their experiences and skills.

Don of course did not do his conservation work alone, and he would have been unable to develop the ideas of bird management, predator eradication and ecosystem reconstruction were it not for the intellectual and practical input of his colleagues. Notable among these have been Ian Atkinson, Brian Bell, Dick Veitch and others who together have made New Zealand the most progressive country for endangered species management. Don openly acknowledged the support of his wife Margaret and son David who often accompanied him on field trips.

Looking back at Don's achievements, he was the person who developed the techniques of intensively managing critically endangered wild birds. Don showed us that most species are saveable, and that species work drives the rebuilding of ecosystems. He was able to take the ideas of aviculturists and field conservationists, craft and combine them, and apply them to wild populations. In the coming decades more and more species are going to have to be managed in the long term if they are to survive and we can thank Don for showing us how to do this.

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Carl G. Jones  
May 2011



# Foreword

Reintroductions have come far and fast over the last thirty years. Starting with large vertebrates, often charismatic and with obvious sources of decline, the IUCN Reintroduction Specialist Group database is now witness to a host of species, plant and animal, vertebrate and invertebrate, being returned to the wild around the world. As well as the quantitative increase, the quality of well-designed and planned releases with subsequent monitoring and fine-tuning is also striking. Given that any reintroduction is a step into the unknown, and involves practical issues of the selection, handling, welfare and management of the released individuals, each effort must be a marriage between science and responsible management. As these are often poor bedfellows, this book is a timely corrective that demonstrates how each can inform the other in the interests of successful reintroductions.

Through my own experiences I have witnessed the changing face of reintroductions. Planning in the late 1970s for the return of the Arabian oryx into the deserts of Oman after an extinction of only twenty years, we virtually assumed the arid grasslands were there and adequate for a grazer with only six species of grass to choose from. Disease considerations were limited to ensuring the oryx imported from California brought no blue tongue with them. However, the lesson in this instance was that while ecological conditions were adequate for initial success, human social factors in the form of envy-based capture for sale reversed the situation.

Fast-forwarding many years, I have been fortunate to be involved, only in an oversight role, with the magnificent population restorations on Mauritius and its islets. Chapter 2 covers the dramatic events there, involving habitat restoration, the use of model and analogue species, the intensive care unit approach to bird species with numbers in the tens, marooning on islets and the restoration of ecological functions: these activities are prominent weapons in the armoury for small population management today. The level of individual management used here, based on a mixture of natural history observation, and a profound understanding of species biology and psychology has led to blurring the boundary between conventional in situ and ex situ conservation. This is a welcome trend as more and more of the world's species

will require some level of management support, of which reintroductions will play a significant role. In view of the pre-eminent expertise in New Zealand for both the removal of exotic and invasive species and the restoration and reintroduction of native fauna and flora, it is pleasingly appropriate that this book was conceived in that country and makes such good use of its experiences.

The evolution of reintroduction practice covers both our attention to its components and also to our perception, based on ecological understanding. The former is evidenced in the attention to genetic aspects given here (Chapters 11 to 13). The role of disease and parasites, covering not just the undesirable species whose release must be avoided but others as part of a released individual's personal community and as natural ecological factors, is important (Chapters 9 and 10). So, too, is the greater attention to the stresses faced by animals before, during and after release, with our increasing understanding that these factors can impact the performance in the wild of both individuals and populations, and may indeed be critical factors in a successful reintroduction (Chapter 4).

Our perceptions have also changed with greater ecological understanding. The simplistic view that a niche remains vacant and with fixed borders following a species' extinction is hopelessly naive. Nature abhors a vacuum, and any returning species has to fight to develop its own new niche. How can we predict what this niche will be? This is why analysis of habitat, used here in the broad sense of both a species place and landscape and also its biotic interactions, is so critical. Chapter 3 deals comprehensively with habitat suitability and selection (and these considerations for invertebrates with complex life cycles will be far more onerous), and should persuade anyone – manager or the public – that the last place a species occupied may rarely be the best place to return it to first.

A constant message across these chapters is that reintroduction has to face uncertainty and expect and deal with change. Therefore, the step into the unknown that is a reintroduction has to be based on techniques of dealing with ecological ignorance, identifying and assessing relative risks, specifying alternative outcomes in advance with indicators, to be followed by adaptively tweaked management. This is a major focus of Chapters 5 to 8.

A responsible reintroduction is already a tall order under current conditions. What for the future of reintroduction? We all know that biodiversity faces acute challenges over much of the globe: species are under ecological siege through loss of habitat and the pressures of invasives, and many species are already

responding to the impacts of climate change in various ways. Chapter 1 mentions the concept of assisted colonization as a form of conservation introduction. Underlying such translocations would be uncertainties in the face of major change, and they might be seen as heretical through defying the convention that species should not be released beyond an inferred historic range; yet they must be explored and considered seriously, especially as a large proportion of the earth's surface will enjoy novel climates for which novel ecosystems and communities of species must either assemble or be constructed deliberately through management. To ensure our biodiversity survives, we may have to shuffle the cards in the pack, but we must still keep all 52.

The best reintroduction practice is ideally placed to make major contributions here. By combining cutting edge science and responsible management, this book should be a beacon for biodiversity conservation in the future.

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# Preface

Like the biodiversity we are trying to conserve, this book is a product of evolution. In New Zealand the current century has seen a transition from reintroductions being largely run by government conservation managers to being often run by community conservation groups. The origin of this book came from discussions in 2005 about how to best facilitate these community-led reintroductions. The main problems being grappled with were: (1) how to decide which species are suitable for what sites; (2) how to plan and undertake the translocation process; (3) what sort of disease screening is needed; (4) what post-release monitoring is needed; and (5) how to avoid genetic problems. The community groups needed to address these issues in the proposals required by the New Zealand Department of Conservation, so were seeking advice not only on what to do but also on the basic theory underlying such advice. This presented a challenge to experienced reintroduction practitioners, but also an opportunity to think more deeply about the basis for the decisions being made.

Our original idea was to hold a workshop for community groups, but this idea morphed into an international symposium on Reintroduction Biology that was held in London in May 2008. Although the nature and location of the meeting represented a major shift from the original idea of liaison with local community groups, we felt the issues in New Zealand were not unique to the region and that an international perspective would produce benefits for reintroduction practice globally. We took pains to ensure that the symposium was attended by practitioners working at the coalface of reintroduction, as well as by researchers from a range of relevant disciplines.

This book in turn has evolved from the 2008 Symposium, but it is definitely not a conference proceedings. The topics have expanded to encompass key and emerging issues, and as a consequence many new authors have come on board, and a further three years of literature are covered. The general themes remain the same as those identified in 2005. However, because we aimed to provide a clear theoretical underpinning for decisions involved in reintroduction programmes, issues are discussed within a broad context. For example, offering sensible monitoring advice requires an understanding of how the data will be used to meet defined objectives; hence the monitoring chapter is presented

as part of a broader section including population modelling and adaptive management. The organization of the book is issues-based, so we specifically avoided having chapters based on case studies or focusing on particular taxa. The one exception is Chapter 2, which summarizes insights from bird reintroductions from two highly successful and pioneering reintroduction practitioners known for taking aggressive interventions based on clear logic. We acknowledge that our largely 'taxonomically neutral' approach means the examples given are a reflection of the dominance of bird and mammal studies in reintroduction research, with relatively few plant examples. It is timely, therefore, that the publication of *Plant Reintroduction in a Changing Climate: promises and perils*, eds. J. Maschinski & K. Haskins, Island Press) coincides closely with that of this book, as the two volumes should be complementary.

The first aim of the book is to further advance the field of reintroduction biology beyond the considerable progress made since the formation of the IUCN/SSC Reintroduction Specialist Group (RSG) in 1988. The main impetus for the RSG's formation was to facilitate the planning and monitoring of reintroduction projects; hence this is the focus of the 1998 *IUCN Guidelines for Reintroductions*. While the need for planning and monitoring is as important as ever, we propose raising the bar on reintroduction practice by advocating a strategic approach where all actions (including monitoring) are guided by explicit theoretical frameworks based on clearly defined objectives.

The second aim is to break down the perceived dichotomy between research and management, which can also be represented as a dichotomy between theory and practice. We cannot see how it is in any way practical to manage anything in the absence of explicit theory. We also believe that conservation research is best done in conjunction with management, so do not see these as distinct activities. Most of the authors of this book have considerable experience in planning and undertaking reintroductions as well as producing research papers, and their contributions reflect this. Similarly, we expect that this book will most appeal to people wanting to bridge the research–management gap, such as conservation managers wanting to expand their thinking about reintroduction-related decisions or researchers who seek to make useful applied contributions to reintroductions rather than simply publishing papers.

This entire project could not have occurred without the support and contribution of many. First, we thank all the reintroduction biologists whose research the book has drawn on. We hope that your work has been captured accurately and apologize for inevitably missing some relevant publications. The burgeoning of the field is a healthy sign, but also challenging to encapsulate

in a single volume. Second, we thank the IUCN/SSC Reintroduction Specialist Group and the Zoological Society of London for helping fund the London Symposium, and thanks also to all those who attended and spoke. Third, we thank the contributors to this volume. Wiley-Blackwell has been very patient and supportive, and we particularly thank Ward Cooper and Kelvin Mathews. This project was undertaken while JGE was funded on an RCUK fellowship.

Finally, we wish to acknowledge the contribution of two giants who have sadly left us recently. Devra Kleiman (1942–2010) and Don Merton (1939–2011) were true pioneers in the field of reintroduction biology. Devra was an academically trained biologist who creatively applied her research skills to solving practical problems in captive breeding and reintroduction. Don was a wildlife manager whose ability to combine on-the-ground experience with theoretical acumen allowed him to play an instrumental role in saving three species. They both managed to combine careful thinking with rapid action, facilitated by an ability to engage with and inspire the people they worked with. They are missed. We are humbled to have Don among the authors of this volume, and dedicate this book to his memory.

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May 2011



# Animal Translocations: What Are They and Why Do We Do Them?

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*'Translocation is now well entrenched as a conservation tool, with the numbers of animals being released in reintroduction and re-enforcement projects increasing almost exponentially each year.'*

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## Introduction

For as long as people have been moving from one place to another, which is as long as humans have been 'human', animals and plants have been moved with them, often hidden, unnoticed or ignored, but also as valued cargo. These so-called 'ethnotramps' include economically and culturally favoured species such as deer, macaque, civets, wallabies, cassowaries and wild-caught songbirds that were commonly carried around with humans (Heinsohn, 2001).

The variety of animals shown to have been translocated by prehistoric human colonists has been described as 'astonishing', with archaeological evidence of numerous and widespread human-mediated introductions as far back as tens of millennia, during the Pleistocene (Grayson, 2001). For example, it has been shown that people moved wild animals from the New Guinea mainland

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to and between islands to the east and west over at least the past 20 000 years, for food and trade items as humans expanded their distribution and sought to retain access to animals whose habits were already known to them (White, 2004). It was during the Holocene (from ~11 000 years before the present), however, that the translocation of non-domesticated animals into novel habitats became one of the most significant human impacts on native animal populations (Kirch, 2005).

Clearly there are many reasons to translocate animals and some broad-scale classifications have been proposed, for example to distinguish between conservation translocations and those for commercial or amenity values (Hodder & Bullock, 1997), and along the way the terminology relating to translocations has become confused, contradictory and ambiguous. In this chapter we provide a framework for classifying the different motivations for animal translocation. We propose a simple decision tree that will enable conservation managers to categorize easily the different types of translocation, from reintroductions to assisted colonizations, and standardize the terminology applied in the species restoration literature. Throughout this chapter terms given in *italics* are defined in Box 1.1.

#### Box 1.1 Glossary and definitions

<i>Analogue species</i>	Closely related form that could be used as an <i>ecological replacement</i> for an extinct species (Parker <i>et al.</i> , 2010)
<i>Assisted colonization</i>	<i>Translocation</i> of species beyond their natural range to protect them from human-induced threats, such as climate change (Ricciardi & Simberlof, 2009a)
<i>Assisted migration</i>	Synonym for <i>assisted colonization</i>
<i>Augmentation</i>	Synonym for <i>re-enforcement</i>
<i>Benign introduction</i>	Synonym for <i>conservation introduction</i>
<i>Biological control</i>	Intentional use of parasitoid, predator, pathogen, antagonist or competitor to suppress a pest population (Hodde, 2004)
<i>Classical biocontrol</i>	The introduction of exotic natural enemies to control exotic pests (Thomas & Willis, 1998)