Conserving Bird Biodiversity
General principles and their application

The Earth's biodiversity currently faces an extinction crisis that is unprecedented. Conservationists attempt to intervene in the extinction process either locally by protecting or restoring important species and habitats, or at national and international levels by influencing key policies and promoting debate. Reliable information is the foundation upon which these efforts are based, which places research at the heart of biodiversity conservation. The role of research in such conservation is diverse. It includes understanding why biodiversity is important, defining 'units' of biodiversity, priority-setting for species and sites, managing endangered and declining populations, understanding large-scale processes, making predictions about the future and interfacing with training, education, public awareness and policy initiatives. Using examples from a wide range of bird conservation work worldwide, researchers consider the principles underlying these issues, and illustrate how these principles have been applied to address actual conservation problems for students, practitioners and researchers in conservation biology.

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Conservation Biology

Conservation biology is a flourishing field, but there is still enormous potential for making further use of the science that underpins it. This new series aims to present internationally significant contributions from leading researchers in particularly active areas of conservation biology. It will focus on topics where basic theory is strong and where there are pressing problems for practical conservation. The series will include both single-authored and edited volumes and will adopt a direct and accessible style targeted at interested undergraduates, postgraduates, researchers and university teachers. Books and chapters will be rounded, authoritative accounts of particular areas with the emphasis on review rather than original data papers. The series is the result of a collaboration between the Zoological Society of London and Cambridge University Press. The series editors are Professor Morris Gosling, Professor of Animal Behaviour at the University of Newcastle upon Tyne, Professor John Gittleman, Professor of Biology at the University of Virginia, Charlottesville, Dr Rosie Woodroffe of the University of California, Davis and Dr Guy Cowlishaw of the Institute of Zoology, Zoological Society of London. The series ethos is that there are unexploited areas of basic science that can help define conservation biology and bring a radical new agenda to the solution of pressing conservation problems.

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Preface

The death of a pigeon called Martha in Cincinnati Zoo on 1st September 1914 was a significant event. She was the last passenger pigeon (*Ectopistes migratorius*) in existence. In 1878 the total population of passenger pigeons was estimated at 50 million birds, roaming the forests of the eastern United States. By March 1900, the last individual was killed in the wild (see Wilcove 1999). Although the dodo (*Raphus cucullatus*) of Mauritius has become a symbol of extinction and the efforts of conservationists to save endangered species, the story of the passenger pigeon is probably a starker example of the capacity of human activities to threaten the Earth's biodiversity.

Sadly, the passenger pigeon is not an isolated example. In its latest assessment, BirdLife International describes 1,186 species of bird that are currently threatened with extinction worldwide. A total of 128 species are believed to have become extinct in the last 500 years, 103 of these since 1800 (BirdLife International 2000). The rate at which bird species are being lost is currently much more rapid than at any time in the evolutionary history of this group (F.D.M. Smith *et al.* 1993; Pimm *et al.* 1995). The loss of biodiversity is not just the random deletion of species – certain families are more at risk than others. This bias in the extinction process means we are not just losing individual bird species, but significant parts of the Earth's evolutionary history (e.g. Purvis *et al.* 2000).

The scale of conservation efforts needed to save threatened birds is immense. Nevertheless, conservationists can intervene in the extinction process. Action can be local, at individual species or site levels, or can be national, influencing policies to protect the integrity of habitats or regions. Finally, conservationists can act to influence processes that contribute to biodiversity loss globally, such as climate change, through a range of international conventions and intergovernmental agreements.

One of several recent examples shows that individual species can be brought back from the verge of extinction. The Chatham Island black robin (*Petroica traversi*) was reduced to six birds with a single breeding female

called 'Old Blue' in 1980. Intensive management efforts resulted in the population increasing to *c.* 300 individuals by 2001 (Butler & Merton 1992; see also Chapter 6).

The uneven distribution of threatened birds is highlighted by the fact that less than 5% of the Earth's land surface holds almost 75% of the world's threatened bird species (BirdLife International 2000). Conservationists have taken significant steps in identifying and advocating the protection of key sites and regions at national and continental scales through the identification of the most important sites for bird conservation, Important Bird Areas and Endemic Bird Areas (Stattersfield *et al.* 1998; Heath & Evans 2000). Influencing policies and processes that act globally to reduce biodiversity, such as world trade and climate change, is one of the greatest challenges facing conservationists.

Practical steps to conserve the world's birds are hampered by the fact that most threatened species occur in the tropics and subtropics (e.g. Stattersfield *et al.* 1998). Unfortunately, countries in these areas often lack the resources, be they monetary, infrastructural or technical, to undertake conservation projects. Conservation efforts in any country cannot hope to succeed without a sound information base on which to build initiatives for training, education, public awareness, conservation policy and practical action. This places research and monitoring at the heart of conservation efforts for biodiversity, including birds. The important question then becomes: what sort of research and monitoring skills are needed, and how can these be transferred to the people who need them?

In our view, the most important skill is in good project design and management that delivers effective conservation action. Technical skills, infrastructure and resources then support project implementation. As scientists, we need to teach people how to ask the 'right' question and how to design a project capable of answering that question. This need is global, but is urgent particularly in those countries 'rich' in biodiversity conservation problems yet 'poor' in terms of the resources necessary for dealing with these.

This was our primary motivation for producing this book. Currently, there are a number of excellent textbooks available that discuss the general principles of Conservation Biology, and a steadily increasing number on practical techniques used by conservationists, such as census techniques, habitat management, tracking techniques, etc. The main aim of our book is to bridge the gap between these areas. We aim to show, by means of detailed practical examples, how ecological principles can be applied to particular problems. We also hope to illustrate how practical techniques can be integrated into well-designed research that can promote effective action.

The book itself is organised into a series of chapters each dealing with a particular conservation problem or issue. Chapters are written by specialists, and include practical examples of actual projects plus an extensive review of the scientific literature. We hope that this is a good formula for transferring project-design skills and making different subject areas accessible to readers. The chapters are designed to be challenging and sometimes provocative to stimulate readers to think about unresolved problems.

Conservation science does not operate in a vacuum, and we felt it important to include areas that may be regarded by researchers as rather peripheral to the research or monitoring project itself, but which are important components of project-based conservation. These include Chapter 2 by Bibby on why we should conserve bird biodiversity, an important topic given the increasing role that economics plays in ecology and conservation (e.g. Edwards-Jones *et al.* 2000), and the different values societies and sectors within a society place on biodiversity conservation. Researchers should not be remote from this debate. Bennun discusses in Chapter 11 how research can interface directly with training and education. Research projects offer an excellent way of providing people with practical experience in project design and implementation, but they may also act as a catalyst for education and public awareness initiatives that can outlive the project. Finally, in Chapter 12, Boere and Rubec outline policy mechanisms involving birds. It is important to understand the needs of decision-makers when planning research, and existing policy instruments often require research and monitoring support for effective implementation.

Although we consider these areas important, the main body of the book concerns specific conservation problems and the science underpinning their resolution. In 'Biodiversity – evolution, species, genes', Bruford (Chapter 1) discusses the current debate about 'units' of biodiversity and their definition. Defining 'units' and identifying those that are most threatened is important because it influences many other decisions (research, training, education, public awareness, policy, action) contingent on threat assessment. Underhill and Gibbons (Chapter 3) go on to discuss how we describe the distribution and abundance of bird biodiversity. Typically, this takes a species approach to biodiversity, i.e. individual species are the 'unit' of biodiversity. Mace and Collar (Chapter 4) describe how we identify threatened species and prioritise which components of bird biodiversity are in urgent need of conservation efforts; Balmford (Chapter 5) recognises that saving each bird species individually is not likely to be practical, so discusses the growing body of experience and literature on methods for selecting priority sites for conservation. Chapter 6 and 7 describe areas that may be

more generally recognised as traditional components of conservation biology. Bell and Merton describe the management of critically endangered species. What can conservationists do when faced with a population reduced to only a small number of individuals? Green also deals with declining populations, but those in which abundance is still sufficiently high to enable causes of the decline to be investigated, and actions designed to halt or reverse the decline before the population reaches critically endangered status. Pain and Donald (Chapter 8) discuss large-scale processes threatening birds, because effective action at this scale cannot depend on small-scale efforts for specific populations. Norris and Stillman (Chapter 9) look into the future, and ask how conservationists can predict how populations might respond to future environmental change. This is an increasingly important area, and one in which ecological modelling is assuming a potent role. Opdam and Wiens (Chapter 10) examine what is arguably the greatest single threat to all biodiversity – habitat loss and fragmentation in a landscape context.

Who should read this book? We have attempted to make this book interesting to a broad readership. First, we hope the text will prove valuable for final year undergraduate and postgraduate students in applied ecology, conservation biology or wildlife management. Second, it provides an up-to-date review of conservation research of use to researchers at all levels that are actively involved in conservation work. Third, the book is designed with conservation policy-makers and practitioners in mind. In producing a book with problem-based chapters, we hope that practitioners will recognise 'their' problem, and will then be able to get some ideas about the best ways to tackle it.

Our discussion of biodiversity conservation up to this point has entirely centred on birds. Since the general issues relate to any taxa, why produce a book with such a narrow focus? There are a number of reasons for this. First, we wanted to produce a book that dealt with actual conservation problems both in principle and in practice. This is difficult to do without a narrow taxonomic focus because there is a trade-off between breadth and depth. Secondly, birds are perhaps the best known and most thoroughly studied component of the Earth's biodiversity, thus considerable scientific information exists with which to illustrate how particular conservation problems are tackled. However, the principles and the way they have been applied offer general insights that are relevant to biodiversity conservation in all taxa. As such, this book is about biodiversity conservation illustrated with examples from birds, rather than a book about bird conservation *per se*. Thirdly, bird conservation captures the imagination of the public. This means that birds

(together with mammals) have an important role as flagships for wider conservation efforts.

In putting this book together and reading the final product we have learned a considerable amount about biodiversity conservation – we hope you do too.

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