Ecology and Conservation of Forest Birds

Ecology and Conservation of Forest Birds is a unique review of the current understanding of the relationships between forest birds and their changing environments. Large ecological changes are being driven by forest management, climate change, introduced pests and pathogens, abiotic disturbances, and overbrowsing. Many forest bird species have suffered population declines, with the situation being particularly severe for birds dependent on attributes such as dead wood, old trees and structurally complex forests. With a focus on the non-tropical parts of the northern hemisphere, the text addresses the fundamental evolutionary and ecological aspects of forest birds using original data analyses and synthesising reviews. The characteristics of bird assemblages and their habitats in different European forest types are explored, together with the macroecological patterns of bird diversity and conservation issues. The book provides a valuable reference for ecologists, ornithologists, conservation professionals, forest industry employees, and those interested in birds and nature.

Grzegorz Mikusiński is an ecologist affiliated with the Forest Faculty of the Swedish University of Agricultural Sciences (SLU) where he also teaches ecology at the School for Forest Management. His research interests centre on conservation and management of forest biodiversity, with a particular focus on forest birds and their habitat.

Jean-Michel Roberge is a conservation specialist at the Swedish Forest Agency and adjunct lecturer at the Swedish University of Agricultural Sciences. He has a special interest in avian ecology and biodiversity studies in northern forests.

Robert J. Fuller is an emeritus Research Fellow at the British Trust for Ornithology and an Honorary Professor at the University of East Anglia. His central interests focus on temperate forest biodiversity, especially birds. The effects of forest management, the impacts of deer browsing and conservation strategies form the core of his work. He is author of *Bird Life of Woodland and Forest* (1995) and editor of *Birds and Habitat: Relationships in Changing Landscapes* (2012), both published by Cambridge University Press.

ECOLOGY, BIODIVERSITY AND CONSERVATION

The world's biological diversity faces unprecedented threats. The urgent challenge facing the concerned biologist is to understand ecological processes well enough to maintain their functioning in the face of the pressures resulting from human population growth. Those concerned with the conservation of biodiversity and with restoration also need to be acquainted with the political, social, historical, economic and legal frameworks within which ecological and conservation practice must be developed. The new Ecology, Biodiversity and Conservation series will present balanced, comprehensive, up-to-date and critical reviews of selected topics within the sciences of ecology and conservation biology, both botanical and zoological, and both 'pure' and 'applied'. It is aimed at advanced final-year undergraduates, graduate students, researchers and university teachers, as well as ecologists and conservationists in industry, government and the voluntary sector. The series encompasses a wide range of approaches and scales (spatial, temporal and taxonomic), including quantitative, theoretical, population, community, ecosystem, landscape, historical, experimental, behavioural and evolutionary studies. The emphasis is on science related to the real world of plants and animals rather than on purely theoretical abstractions and mathematical models. Books in this series will, wherever possible, consider issues from a broad perspective. Some books will challenge existing paradigms and present new ecological concepts, empirical or theoretical models, and testable hypotheses. Other books will explore new approaches and present syntheses on topics of ecological importance.

Ecology and Control of Introduced Plants
Judith H. Myers and Dawn Bazely

Invertebrate Conservation and Agricultural Ecosystems
T. R. New

Risks and Decisions for Conservation and Environmental Management
Mark Burgman

Ecology of Populations
Esa Ranta, Per Lundberg and Veijo Kaitala

Nonequilibrium Ecology
Klaus Rohde

The Ecology of Phytoplankton
C. S. Reynolds

Systematic Conservation Planning
Chris Margules and Sahotra Sarkar

Large-Scale Landscape Experiments: Lessons from Tumut
David B. Lindenmayer

Assessing the Conservation Value of Freshwaters: An International Perspective
Philip J. Boon and Catherine M. Pringle

Insect Species Conservation
T. R. New

Bird Conservation and Agriculture
Jeremy D. Wilson, Andrew D. Evans and Philip V. Grice

Cave Biology: Life in Darkness
Aldemaro Romero

Biodiversity in Environmental Assessment: Enhancing Ecosystem Services for Human Well-being
Roel Slootweg, Asha Rajvanshi, Vinod B. Mathur and Arend Kolhoff

Mapping Species Distributions: Spatial Inference and Prediction
Janet Franklin

Decline and Recovery of the Island Fox: A Case Study for Population Recovery
Timothy J. Coonan, Catherin A. Schwemm and David K. Garcelon

Ecosystem Functioning
Kurt Jax

Spatio-Temporal Heterogeneity: Concepts and Analyses
Pierre R.L. Dutilleul

Parasites in Ecological Communities: From Interactions to Ecosystems
Melanie J. Hatcher and Alison M. Dunn

Zoo Conservation Biology
John E. Fa, Stephan M. Funk and Donnamarie O'Connell

Marine Protected Areas: A Multidisciplinary Approach
Joachim Claudet

Biodiversity in Dead Wood
Jogeir N. Stokland, Juha Siitonen and Bengt Gunnar Jonsson

Landslide Ecology
Lawrence R. Walker and Aaron B. Shiels

Nature's Wealth: The Economics of Ecosystem Services and Poverty
Pieter J.H. van Beukering, Elissaios Papyrakis, Jetske Bouma and Roy Brouwer

Birds and Climate Change: Impacts and Conservation Responses
James W. Pearce-Higgins and Rhys E. Green

Marine Ecosystems: Human Impacts on Biodiversity, Functioning and Services
Tasman P. Crowe and Christopher L. J. Frid

Wood Ant Ecology and Conservation
Jenni A. Stockan and Elva J. H. Robinson

Detecting and Responding to Alien Plant Incursions
John R. Wilson, F. Dane Panetta and Cory Lindgren

Conserving Africa's Mega-Diversity in the Anthropocene: The Hluhluwe-iMfolozi Park Story
Joris P. G. M. Cromsigt, Sally Archibald and Norman Owen-Smith

National Park Science: A Century of Research in South Africa
Jane Carruthers

Plant Conservation Science and Practice: The Role of Botanic Gardens
Stephen Blackmore and Sara Oldfield

Habitat Suitability and Distribution Models: With Applications in R
Antoine Guisan, Wilfried Thuiller and Niklaus E. Zimmermann

Ecology and Conservation of Forest Birds

Edited by

GRZEGORZ MIKUSIŃSKI

Swedish University of Agricultural Sciences

JEAN-MICHEL ROBERGE

Swedish University of Agricultural Sciences and Swedish Forest Agency

ROBERT J. FULLER

British Trust for Ornithology

CAMBRIDGE
UNIVERSITY PRESS

CAMBRIDGE
UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

One Liberty Plaza, 20th Floor, New York, NY 10006, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi – 110025, India

79 Anson Road, #06–04/06, Singapore 079906

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning, and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9781107072138
DOI: 10.1017/9781139680363

First published 2018

Printed in the United Kingdom by TJ International Ltd. Padstow Cornwall

A catalogue record for this publication is available from the British Library.

Library of Congress Cataloging-in-Publication Data
Names: Mikusiński, Grzegorz, editor. | Roberge, Jean-Michel, editor. | Fuller, Robert J., editor.
Title: Ecology and conservation of forest birds / edited by Grzegorz Mikusiński, Swedish University of Agricultural Sciences, Jean-Michel Roberge, Swedish University of Agricultural Sciences and Swedish Forest Agency, Robert J. Fuller, British Trust for Ornithology.
Description: New York, NY : Cambridge University Press, 2017. | Includes bibliographical references and index.
Identifiers: LCCN 2017042297 | ISBN 9781107072138 (Hardback : alk. paper)
Subjects: LCSH: Forest birds–Ecology. | Forest birds–Conservation.
Classification: LCC QL677.79.F67 E26 2017 | DDC 333.95/816–dc23 LC record available at https://lccn.loc.gov/2017042297

ISBN 978-1-107-07213-8 Hardback
ISBN 978-1-107-42072-4 Paperback

Contents

Acknowledgements *page* ix
Contributors xi

1 Introduction 1
Grzegorz Mikusiński, Jean-Michel Roberge and Robert J. Fuller

Part I Forest Birds and Their Adaptations 9

2 Origins and Dynamics of Forest Birds of the Northern Hemisphere 11
Jacques Blondel

3 Ecological Adaptations of Birds to Forest Environments 51
Marc-André Villard and Ruud Foppen

4 Tree Holes and Hole-Nesting Birds in European and North American Forests 79
Tomasz Wesołowski and Kathy Martin

Part II European Forests and Their Bird Communities 135

5 Macroecological Patterns in Forest Bird Diversity in Europe 137
Grzegorz Mikusiński, Dani Villero, Sergi Herrando and Lluís Brotons

6 Boreal Forest Bird Assemblages and Their Conservation 183
Jean-Michel Roberge, Raimo Virkkala and Mikko Mönkkönen

7 **Subalpine Coniferous Forests of Europe: Avian Communities in European High-Altitude Woodlands** 231
Pierre Mollet, Kurt Bollmann, Veronika Braunisch and Raphaël Arlettaz

8 **Temperate Forests: A European Perspective on Variation and Dynamics in Bird Assemblages** 253
Tomasz Wesołowski, Robert J. Fuller and Martin Flade

9 **Mediterranean Forest Bird Communities and the Role of Landscape Heterogeneity in Space and Time** 318
Lluís Brotons, Sergi Herrando, Clélia Sirami, Vassiliki Kati and Mario Díaz

10 **Plantations of Non-native Tree Species: Opportunities and Limitations for Birds in Intensively Managed Forests** 350
John Calladine, Mario Díaz, Luís Reino, David Jardine and Mark Wilson

Part III Conservation and Management 387

11 **Population Trends and Conservation Status of Forest Birds** 389
Aleksi Lehikoinen and Raimo Virkkala

12 **Hunting and Other Forms of Exploitation and Persecution of Forest Birds** 427
Ilse Storch

13 **Conservation Strategies and Habitat Management for European Forest Birds** 455
Robert J. Fuller and Hugo Robles

14 **Future Forests: Avian Implications and Research Priorities** 508
Grzegorz Mikusiński, Jean-Michel Roberge and Robert J. Fuller

Species Index 537
Subject Index 546

Acknowledgements

Many people and several organisations have participated in various ways in the preparation of this book. First, we would like to thank all the authors for their outstanding contributions and for their patience. We are also grateful to all the reviewers who helped us improve the quality of the book; at least two independent reviews were received for each chapter. Michael Usher, Dominic Lewis, Jade Scard, Natasha Wheelan and Renee Duncan-Mestel at Cambridge University Press gave continuous encouragement and support. Kathy Martin very kindly took editorial responsibility for the final chapter.

We are very grateful to Sabita Gurung for drawing the bird vignettes located at the end of each chapter. We also thank Adam Wajrak for allowing us to use his beautiful picture of the three-toed woodpecker on the front cover of the book.

GM thanks students of forest management at the Swedish University of Agricultural Sciences (SLU) for asking him in 2009 to recommend an informative book on the ecology and conservation of forest birds – the question generated the initial idea for this book. He is very grateful to the other editors for their unceasing support, knowledge, enthusiasm, friendship and hard work. Several people and organisations generously provided him with inspiring working environments: Katrin Böhning-Gaese at the Biodiversity and Climate Research Centre (BiK-F), Zenon Rodhe at the Ornithological Station of the Polish Academy of Sciences and Lluís Brotons at the CTFC Forest Sciences Centre of Catalonia. He expresses his gratitude to the heads of the Department of Ecology and the School for Forest Management at SLU (Åsa Berggren, Anna Lundhagen, Sönke Eggers, Torgny Söderman and Staffan Stenhag) for their support. He is also grateful to Per Angelstam for introducing him to forest bird ecology in the 1990s. Finally, he thanks his wife, Ela, family and friends for their encouragement.

JMR is thankful to GM for his excellent editorial leadership, RJF for sharing his valuable insights about avian ecology and his wife, Cornelia,

for support and encouragement during the work with this book. He is also grateful to the Kempe Foundation for financial support.

RJF greatly appreciates the invitation from the other editors to join them in a most enjoyable partnership and for giving him the opportunity to learn so much more about forest birds. He thanks Angela for her patience and understanding.

Contributors

RAPHAËL ARLETTAZ
Division of Conservation Biology, Institute of Ecology and Evolution, University of Bern, Switzerland and Swiss Ornithological Institute, Valais Field Station, Sion, Switzerland

JACQUES BLONDEL
Centre for Functional and Evolutionary Ecology CEFE-CNRS, UMR 5175, Montpellier, France

KURT BOLLMANN
Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Birmensdorf, Switzerland

VERONIKA BRAUNISCH
Forest Research Institute of Baden-Wurttemberg (FVA), Freiburg, Germany and Conservation Biology, Institute of Ecology and Evolution, University of Bern, Switzerland

LLUÍS BROTONS
InForest JRU (CTFC-CREAF), Solsona, Spain and CSIC and CREAF, Cerdanyola del Vallès, Spain

JOHN CALLADINE
British Trust for Ornithology, University of Stirling, Scotland

MARIO DÍAZ
Department of Biogeography and Global Change, National Museum of Natural Sciences (BGC-MNCN-CSIC), Madrid, Spain

MARTIN FLADE
Department of Large Protected Areas and Regional Development, Brandenburg State Agency for Environment, Eberswalde, Germany

RUUD FOPPEN
Sovon, Dutch Centre for Field Ornithology, Nijmegen, Netherlands and Radboud University, Department of Animal Ecology and Physiology, Nijmegen, Netherlands

ROBERT J. FULLER
British Trust for Ornithology, Thetford, United Kingdom and School of Environmental Sciences, University of East Anglia, Norwich, United Kingdom

SERGI HERRANDO
Catalan Ornithological Institute/European Bird Census Council, Natural History Museum of Barcelona, Spain and CREAF, Cerdanyola del Vallès, Spain

DAVID JARDINE
Forestry Commission Scotland, Whitegates, Lochgilphead, Argyll, Scotland

VASSILIKI KATI
Department of Biological Applications and Technology, University of Ioannina, Greece

ALEKSI LEHIKOINEN
The Helsinki Lab of Ornithology, Finnish Museum of Natural History, University of Helsinki, Finland

KATHY MARTIN
Department of Forest and Conservation Sciences, University of British Columbia, Vancouver, Canada

GRZEGORZ MIKUSIŃSKI
Grimsö Wildlife Research Station, Department of Ecology, Swedish University of Agricultural Sciences (SLU), Riddarhyttan, Sweden and School for Forest Management, Swedish University of Agricultural Sciences (SLU), Skinnkatteberg, Sweden

PIERRE MOLLET
Swiss Ornithological Institute, Sempach, Switzerland

MIKKO MÖNKKÖNEN
Department of Biological and Environmental Sciences, University of Jyvaskyla, Finland

LUÍS REINO
CIBIO/InBIO - Research Centre in Biodiversity and Genetic Resources, University of Porto, Vairão, Portugal

JEAN-MICHEL ROBERGE
Department of Wildlife, Fish and Environmental Studies, Swedish University of Agricultural Sciences (SLU), Umeå, Sweden and Swedish Forest Agency (Skogsstyrelsen), Umeå, Sweden

HUGO ROBLES
Evolutionary Biology Group (GIBE), Faculty of Sciences, University of A Coruña, Spain and Evolutionary Ecology Group (EVECO), Department of Biology, University of Antwerp, Wilrijk, Belgium

CLÉLIA SIRAMI
Dynafor, Université de Toulouse, INRA, INPT, INPT – EI PURPAN, Castanet-Tolosan, France

ILSE STORCH
Chair of Wildlife Ecology and Management, University of Freiburg, Germany

MARC-ANDRÉ VILLARD
Université du Québec à Rimouski, Quebec, Canada

DANI VILLERO
InForest JRU (CTFC-CREAF), Solsona, Spain

RAIMO VIRKKALA
Biodiversity Centre, Finnish Environment Institute (SYKE), Helsinki, Finland

TOMASZ WESOŁOWSKI
Laboratory of Forest Biology, Wrocław University, Poland

MARK WILSON
British Trust for Ornithology, University of Stirling, Scotland