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Book reviews

Camera Trapping: Wildlife Management and Research

By P. Meek and P. Fleming (principal editors)
2014. Published by CSIRO Publishing, Melbourne Australia. 392 pp.
Paperback, AU$89.95, ISBN 9781486300396

The automated camera-trap has been used to remotely observe animals in various habitats since the middle of the 20th century (Kucera and Barrett 2011). Camera-trapping was initially a complimentary monitoring tool rather than a primary survey method (e.g. used in addition to track or scat surveys), but this changed in the 1990s when conservation scientists successfully used cameras to detect and estimate the population size of cryptic tigers (*Panthera tigris*) in India (Karanth 1995; Trolliet *et al.* 2014). Since then, camera-trap technology has rapidly increased in sophistication (e.g. improved image resolution, time-lapse photography, and advanced night settings; McCallum 2013), and become more user-friendly and affordable, which has allowed a greater number of field-studies to embrace camera-trap technology (Trolliet *et al.* 2014). Consequently, type 'camera trap' into any internet search engine and one will be inundated with peer-reviewed publications, reports and advertisements for the technology which is rapidly changing the nature of field experiments in conservation science and wildlife management.

In response to the popularity of camera traps for research, the *First International Camera Trapping Colloquium* was hosted in Sydney, Australia, in 2012. It was at this forum that wildlife researchers and managers gathered to present findings and discuss the benefits and constraints of using camera traps on multiple taxa in diverse ecosystems. Meek and Flemings' 'Camera Trapping: Wildlife Management and Research' is a collation of 32 of the research papers, plus a review, presented at the *Colloquium*. While this is not the first book to explore the use of camera traps by researchers (e.g. O'Connell *et al.* 2011), Meek and Flemings' text is the first book to use the results of a survey of researchers and managers to identify common topics of interest, and use these topics to structure the text. Australian and several international papers are grouped under four broad topics.

Camera trapping for animal monitoring: case studies – The first section presents 10 studies from the *International Colloquium* which exemplify the current scope of camera-trap research. The studies are representative of the types of logistical, social and technological challenges facing researchers attempting to evaluate standard and novel hypotheses. A good example is that of Sangay *et al.* (p. 87), who honestly recount the challenges of monitoring mammal diversity using traditional methods in the Himalayan Kingdom of Bhutan. Like other studies, camera traps have enabled researchers to circumvent the logistical challenges of traditional surveys and generate baseline data for many mammal species, including confirming the occurrence of charismatic mammals such as the national animal, the Bhutan takin (*Budorcas taxicolor whitei*). The research in Bhutan also illustrates how camera data can have positive social outcomes; with information on the activity-budgets of tigers (*Panthera tigris*) and their main prey, sambar deer (*Rusa unicolor*), being used to educate graziers on how to modify farming practices to protect livestock, graziers and tigers alike.

Camera technology, constraints and pitfalls – This section includes papers which highlight the benefits and perils associated with using camera traps in wildlife studies. There are several examples of how choice of camera models can alter accuracy of survey data (e.g. detecting different mammal sizes, Urlus *et al.* p. 111), and particular settings and placement of different models are discussed. Hradsky (p. 181) carried out a study on the relationship between canopy cover and the swamp wallaby (*Wallabia bicolor*), to establish whether removal of the yarra burgan shrub (*Kunzea leptospermoides*) from a forest reserve would impact wallaby populations. The presence of wallabies at all 42 of Hradsky's trap sites in Victoria, made relationships with habitat variables difficult to test. However, grouping camera images into four diel periods, revealed that wallabies were actually using yarra burgan as important habitat and modifying use with time of day. This study exemplifies how the strength of ecological relationships can be misinterpreted or overlooked if camera data are not broken down and analysed in a variety of ways (i.e. at coarse and fine scales).

Survey design – Inappropriate survey design is a common issue for those beginning or replicating camera-trap studies (Rovero *et al.* 2013; Burton *et al.* 2015). Speakers at the *International Colloquium* repeatedly linked weak survey design with failure to achieve research outcomes, and acknowledged that time and resources were consequently wasted– commodities that few wildlife researchers can afford to misuse. There are several papers in section 3 which exemplify how clever adaptation of survey design can improve surveillance of 'tricky' taxa (e.g. arboreal mammals, reptiles). However, it is the paper by Jansen *et al.* (p. 263) which should pique the interest of readers. **T**ropical **E**cology **A**ssessment and **M**onitoring is a network of camera traps across 16 disturbed tropical sites on three continents, which monitor large–medium animal communities for change as a result of anthropogenic disturbances. Systematically deployed cameras gather data which are compared across site and year, and analysed using tailored software. Data are uploaded and made available to the wider scientific community for discussion. TEAM is an example of how camera traps are being used to upscale remote monitoring of wildlife populations, to collaboratively answer 'bigger' ecology questions.

Data management and analyses – Data from any monitoring method are only as good as their analysis and interpretation. Any tools which simplify the collation and analysis of camera-trap data, are therefore worthy of researchers' consideration. This section introduces readers to the types of techniques being used by *International Colloquium* delegates to streamline the entry, organisation and interpretation of camera data. For instance, Sanderson and Harris (p. 283) provide a step-by-step guide to managing camera data without the need to enter it manually; and Flazon *et al.* (p. 299) develop an algorithm model to automate the analysis of images. Tucked in at the end of Part 4, is Meek

and Butlers' discussion of the legal issues facing camera-trap users in Australia (p. 331), much of which will also be relevant to international readers.

Conclusion – The final section discusses the future of camera traps as a research tool in light of the 'wish list' of delegates attending the *International Colloquium* (e.g. international standards for survey design and analysis; role of citizen science etc.).

Throughout Meek and Flemings' text, the hard-earned lessons of researchers repeatedly emphasise the importance of updating knowledge as technology advances, and investing time in developing, testing and re-evaluating study designs. It is also clear that as data sharing about camera traps improves between organisations and countries, haphazard use of the technology will no longer be overlooked in favour of any artefactual findings.

'Camera Trapping: Wildlife Management and Research', is a founding compendium on the science of camera trapping, and belongs on the reference shelves of libraries and all wildlife managers, scientists and even students, who wish to embrace this powerful and evolving research tool.

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HBW and BirdLife International Illustrated Checklist of the Birds of the World, Volume 2: Passerines

By Josep Del Hoyo and Nigel J. Collar (Eds)
2016. Published by Lynx Edicions, Barcelona, Spain. 1013 pp., 4.6 kg.
Hardback, Euro €225.00 (~$312 AUD) free shipping worldwide, ISBN 9788496553989.

The accounts in this volume are based on data from the *Handbook of the Birds of the World* (HBW) (del Hoyo *et al.* 1992–2013). This illustrated edition was written by many, including the authors of the aforementioned volumes. It was edited by Josep del Hoyo the Senior Editor of HBW and Nigel J. Collar a Leventis Fellow in Conservation Biology, BirdLife International. The other authors were: David A. Christie Assistant Editor, British Birds (1973–2002) and Editor, Handbook of the Birds of the World (2003–2013); Andrew Elliott, Editor, Handbook of the Birds of the World (1992–2013); Lincoln D. C. Fishpool, Global Science Co-ordinator (IBAs); Peter Boesman, Bird vocalization expert and recorder, and Editor, HBW Alive; and Guy M. Kirwan, Research Associate, Field Museum of Natural History and Editor, HBW Alive. Lynx Edicions published this volume in association with BirdLife International. Essentially, these are the people and organisations best qualified to complete such a vast and complex project. This volume (passerines) is the second of two volumes that aim to put all the world's birds into one checklist. (See review of non-passerines Fulton 2015.)

Like the first volume this is structured in a checklist fashion. In order from the beginning: a taxonomic list of families and subfamilies with page numbers linking to their occurrence in the checklist; followed by a list of contributing authors by family; then a purposeful and useful introduction that finally precedes the checklist with the species accounts. The checklist is ended by a section on passerine (songbirds) that have become extinct since 1500, in the same format as the checklist. An extensive bibliography is given with 2470 references and finally the index. At 888 pages, the checklist (species accounts) dominates this tome. When I say tome I do not say it lightly with this volume weighing 4.6 kg, which is 320 g more than volume 1.

The checklist is set-out the same way as volume 1 with illustrations and distribution maps on the right page and the accompanying text on the left as in field guides and handbooks. The text is concise and gives: English and scientific names, a coloured box with the ICUN threat ranking, the corresponding HBW volume and page number, French, German and Spanish names, basic taxonomic notes (includes authority), subspecies and distribution. As with volume 1 the illustrations are clear and well detailed and in full colour. The maps are small, postage-stamp sized, yet clear and colour-coded to address variations such as migrations and breeding ranges. The check list is vast comprising: 1 order, 138 families, 1358 genera, 6592 extant species and 57 extinct species. Illustrations include 446 plates (pages), 12 629 bird illustrations and 6649 distribution maps. The extinct species given at the end are also included through the checklist in their appropriate phylogenetic positions, but without repeating the illustrations and data.

The authors have again supplied a useful yet shorter introduction. They again use an integrative approach seeking to include all varieties of evidence to revise and delimit taxa again

using the Tobias approach to achieve this goal (Tobias *et al.* 2010; del Hoyo and Collar 2014, pp. 30–41). I give a quick explanation of the Tobias approach in my review of volume 1 (Fulton 2015). Such evidence includes geographic range, plumage, internal morphology, ecological characters, behavioural traits, genetic information and vocalisations—a more detailed explanation on how these were used is provided in the introduction.

The audience for this book is obviously broad, from bird enthusiasts to libraries to research institutions, particularly those engaged in systematics and taxonomy. But Professor Nigel Collar, one of this tome's authors, argues it is a 'vital tool for conservationists' (Collar 2016). He argues principally because it is the only checklist with critical independence for deciding what constitutes a species. He is referring to the use by one team of the one method (the Tobias criteria) to delimit species. This is opposed to other taxonomists lumping or splitting species based on the inconsistent use of different criteria.

As with the first volume the most obvious strength of this tome lies in having the world's passerines, up to date and illustrated in colour with maps and taxonomic notes at your fingertips while conveniently presented on facing pages. The illustrations provide the recognisable units with which many readers will identify as they search quickly for taxa. The continued use of the Tobias criteria for delimiting species will be a strength for some and a weakness for others. I suspect that a majority may see it as a strength.

The text aids ornithology by consolidating a great deal of information in one place and then concisely putting that core data conveniently at your finger-tips. Outside the book, but within the scope of the project the latest data can be investigated though the website, which is being constantly updated (see HBW Alive www.hbw.com (del Hoyo *et al.* 2017)). The tome is an important research tool and a useful addition to any biological or ornithological library. Ecologists need to know exactly what taxa they are working with to be able to report their findings. Systematists and taxonomists will draw on it to either support or contrast it to their work.

The organisation of the text (reported above) advances this volume through colour coding and layout with text and illustrations on facing pages. The taxa are numbered making it simple and quick to move from illustration to text or vice versa. Further clear and consistent marking and subheadings within each species' text streamlines the speed with which you can find exactly what you're looking for. The text is appropriately referenced, in Harvard style, to the type publications and by use of superscript numbers for details found in the taxonomic and descriptive notes. Such a high standard of referencing advances the book to the highest level for research. The bibliography in this text contains 2126 citations.

There is little in the way of supplementary material with the extinct species sections and the 12 629 bird illustrations and 6649 maps being its core and of a high standard. This volume is presented in the same way and is the same size as volume 1; it is about quarto-sized, the same size as the original HBW volumes. The paper used in the book was 'sourced from managed sustainable forests'.

This tome's size and content clearly identify it as a serious reference for professionals and libraries, although no doubt there will be many amateur birders who will want it. I would recommend this book to reference libraries especially biological libraries, museum libraries and those people that need a checklist of the world's birds for their work.

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Birds of Europe, North Africa and the Middle East: An Annotated Checklist

By Dominic Mitchell
2017. Lynx Edicions, Barcelona, Spain. 335 pp.
Price Euro €28.00 (~$40 AUD), ISBN 9788494189296

Dominic Mitchell is the founder and managing editor of *Birdwatch*, Britain's leading monthly magazine for keen birders, and managing editor of BirdGuides.com. He has written hundreds of articles and several books on birds, including the *Photographic Handbook of the Rare Birds of Britain and Europe*. Dominic has served on the council of the Ornithological Society of the Middle East, is a member of the Portuguese Rarities Committee and regularly takes tour groups around the Azores and other popular destinations in search of rare birds.

The book intends to provide an up to date systematic list of bird species for the region. The core of the book, the annotated checklist, aims to cover what the author calls the 'greater Western Palearctic'. The region covered sets its southern boundary at 20°N (with exceptions including Cape Verde) and includes the whole Arabian Peninsula and the whole of Iran. To the north it encompasses Franz Josef Land and to the west Iceland and the Azores. Following these geographical limits the

book covers 1148 species with the author stating that this is 129 species more than Cramp (1977–1994), which was a widely adopted authority.

As a checklist the book is set out in minimal fashion, but that is not to say without the necessary detail. It is set out as could be expected with contents, introduction, the systematic list (comprising the bulk) of the book, appendices, references and an index to species. The systematic list gives the species names in Latin and English, taxonomy and distribution. Subspecies are mentioned, but not always named or dealt with in any detail. The IUCN Red List category is given re status, using the well known abbreviations Extinct (EX)… Endangered (EN) etc. The distribution is the most descriptive section giving a very brief world range at the beginning and then detailing the distribution for the region i.e. the greater Western Palearctic. The audience addressed by the book will primarily be a scholarly one, yet, it will attract many from the wider birding community interested in the author's view of the region's avifauna.

The two obvious strengths of this checklist lie in it being up-to-date and with extensive material being published in one place. It is very concise as a checklist needs to be and acknowledges a plethora of experts who contributed one way or another to the wealth of detail within its pages. It aids the scientific disciplines by being up-to-date. But, up-to-date must surely require a website given the rapid flux of lumping and splitting in recent avian taxonomy. In order to be up-to-date, in the book, the author has chosen a conservative and consistent approach by following the authoritative International Ornithological Congress (IOC) World Bird List. The author specifically cites the IOC (ver. 4.4, 2014) (Gill and Donsker 2014), which was followed closely for the scientific and English names of birds.

Since this is a checklist and not a field guide it purpose is to facilitate research and understand and report the extent of the avifauna of a region. Thus it is surely intended to be used in professional systematic and taxonomic research. As such it is too light on taxonomic information. In its own words it provides only 'The briefest summary of taxonomic information'. I would have liked to have seen much more conversation about taxonomic issues particularly where differences of opinion exist. I would have liked to see cladograms showing the distance between taxa, but alas like most of the other texts in this genre these are absent. Nevertheless, the high level of research put into this checklist is more obvious in the distribution sections of the species. Bearing in mind factors such as breeding, vagrancy, endemism, residency and the number of countries (80 by my count) not to mention rivers, lakes, oceans and other important geographical boundaries this is a complicated region.

The writing style, like all checklists, is very condensed, yet it is surprisingly easy to read and understand. The ease of reading functions to make its data more accessible and advance its usefulness. The supplementary material (excluding appendices) includes only a single greyscale map on half a page. This usefully and clearly shows the author's greater Western Palaearctic and labels the countries and seas within.

To some this book will be eagerly sort after, given the 22 years since the final volume of the Handbook of the Birds of Europe, the Middle East and North Africa: the Birds of the Western Palearctic was released (Cramp 1977–1994). I would recommend this book to professionals working with the birds of the greater Western Palearctic and those from the wider birding community who are keen to access the data within its pages.

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Hubbard Brook: The Story of a Forest Ecosystem

By Richard T. Holmes and Gene E. Likens
2016. Published by Yale University Press, New Haven and London. i–xii, 271 pp.
Hardback, US$45.00, ISBN 9780300203646

As emphasised by Lindenmayer *et al.* (2012) and Dickman (2013), the importance of long-term ecological studies should not be underestimated. However, it is only in the last 10 to 20 years that a reasonable number of ecological studies exceeding 20 years in duration have become available for analysis. Without exception each of these has shown significant changes in the temporal and spatial abundances of species, community composition and structure, and ecological processes; changes driven by temporal changes in the physical and biological environment including patterns of rainfall, geochemistry, species irruptions, and stochastic events, such as fire and storm. These are patterns and events that cannot be quantified, much less understood, by shorter term studies. Even with the longest running studies, those exceeding 40 or more years, it is not possible to fully explain the patterns and processes revealed indicating that even longer studies are required. Yet understanding long-term changes in the physical and biological world are necessary for reaching ecological sustainability, effective conservation management, and fully understanding the impacts of humanity on global ecosystems.

It is understandable that there are few long-term ecological studies globally. Initiating long-term research requires more than foresight and opportunity; it requires an institutional and economic commitment that is rarely given. Australia itself has few studies exceeding 10 or 20 years in duration. In a survey of Australian terrestrial ecology studies using seven years duration

as the criterion for long-term, Youngentob *et al.* (2013) identified 85 long-term study sites with a median age of 23 years. Some significant long-term studies were excluded from their survey, but it is unlikely that the number of long-term ecological studies in Australia exceeding 20 years duration is much greater than 50 or 60. Not all of these are ongoing or have the promise from institutions or governments of continuity. Nor have any attempted to comprehensively monitor entire ecosystems, such as has been done at Hubbard Brook in North America.

In many ways, the Hubbard Brook program is unique. In 1955, the United States Department of Agriculture Forest Service set aside the Hubbard Brook Experimental Forest (3037 ha; 222–1015 m a.m.s.l.) in New Hampshire to study the impact of forest management on water yield, quality, and floods. From 1955 to 1963, a network of precipitation and water gauging stations was established (www.hubbardbrook.org/overview/history.shtml; accessed 1 January 2017). In 1963, the Hubbard Brook Ecosystem Study (HBES) was initiated with an agreement for a cooperative research program between the Forest Service and Dartmouth College, with funding provided by the National Science Foundation. Research was to be comprehensive and take a small watershed (catchment) approach, but there were no precedents for the research to follow. As a result, development of the program was initially slow and cautious. Because time was taken for development, the HBES has been a remarkably productive and enduring program with more than 1700 publications and important impacts on forest management and environmental policy at a national level. From its founding in 1963 by Dartmouth Professors Hebert Bormann (terrestrial ecologist), Noye Johnson (geologist), and Gene Likens (aquatic ecologist), and Robert Pierce (soil scientist), Forest Service Project Leader, the HBES now involves tens of scientists from North American universities and government agencies. The HBES set a benchmark for long-term ecological research (LTER) globally. In doing so it has had a profound influence on government policy especially with regard to acid rain and clean air, but also forest management and wildlife conservation. The history of the Hubbard Brook program, the scope and scale of the research undertaken, and the outcomes for ecology, geochemistry, conservation, and policy are the theme of *Hubbard Brook: The Story of a Forest Ecosystem.*

The authors, Richard Holmes and Gene Likens, have a long association with HBES. Likens was one of programs 'founding fathers'; Holmes initiated his bird studies at Hubbard Brook in 1969 six years after the program began. Together they have sought to summarise the 50 plus years of the research conducted as part of the HBES. In doing so, they explain the importance of the research and the value of long-term studies not just to our understanding of the natural world, but to humanity as it struggles to achieve the ecological and economic sustainability critical for the survival of civilization.

Hubbard Brook: The Story of a Forest Ecosystem sets the stage by beginning with a timeline of the major geological, climatic, and biological events, including human settlement of the valley through which Hubbard Brook flows. The authors then lead the reader through the forest describing its flora and fauna and letting visitors experience the changing seasons so characteristic of the American north-east, from the abundance of summer life, through autumn colours, to winter and its snow, to spring when life again blossoms. The first chapters then describe the nature of the research at Hubbard Brook, the breadth of questions asked, and the small watershed design of the studies. Starting from a description of ecosystem processes by Aldo Leopold the program asks 'how do water and nutrients move through a system, what roles do plants and animals have, how do ecosystems change over time, and how are they affected by disturbance, both natural and human-caused?' (p. 9). Throughout the book the authors are careful to describe not just the research, but its ecological foundations and do so in a way understandable to all readers regardless of their scientific literacy. The rationale for taking a small watershed-ecosystem approach to the HBES is explained in the second chapter followed by Part 2, which describes the physical setting, climate, forest, and biota, including how they interact, of the experimental forest.

Part 3 of the book is about understanding the ecosystem structure and function of the forest: How is energy transformed within the forest? How do water, chemicals, and nutrients move within the ecosystem? This section concludes with an account of the discovery of acid rain at Hubbard Brook and its origins in America's industrial heartland. Part 4 reviews major outcomes from long-term studies and experimental manipulations. It begins by considering the impacts of acid rain and other atmospheric pollutants on the forest and its waters. Impacts included acidification of waterways and the loss of aquatic species to the degradation of terrestrial ecosystems affecting biogeochemical cycles, as well as having adverse effects on human health. Next to be considered are the impacts of timber cutting on nutrient cycles, and the quality and quantity of runoff after harvesting. Consideration is then given to how the forest recovers from disturbance, the time scale of recovery, and how the results of these studies can be applied to forest management. Chapter 13 explains the integration between aquatic and terrestrial ecosystems. Chapter 14 asks 'what causes population change in forest birds?' As most birds at Hubbard Brook are migratory, research on avian populations has considered both the effects of events during the non-breeding season on the wintering grounds and those during the breeding season at Hubbard Brook. These first chapters in Part 4 emphasised research at the small watershed scale. The next two chapters take a broader approach. Chapter 15 expands the spatial scale and describes ecological patterns and processes across the entire valley embracing several small watersheds. By exploring the consequences of climate change on the Hubbard Brook ecosystem Chapter 16 expands the temporal scale asking how a changing climate affects forest ecosystems. Part 5 further expands the spatial and temporal scale of the research. Chapter 17 describes the contribution of the HBES to national policies on clean air, forest harvesting, and wildlife conservation. The role of the Hubbard Brook Research Foundation in sustaining the long-term research at Hubbard Brook is explained. The Hubbard Brook program is not just about research and policy, but has a well developed educational component designed to inform professionals, teachers, and students not only about the HBES but about the environment and ecology. Chapter 18 concludes by looking ahead and predicting what the forest ecosystem might look like in the future and what this means to people, their health, and their economic well being. Finally, we return to

the forest and its seasons in 2065, 50 years to the future when global heating will have major impacts on forest ecosystems in New Hampshire and Australia, and Holmes and Likens once again walk us through the forest. It is a different forest from the one we first saw, but the future is credible only because of the duration of the HBES.

I grew up in New York and studied forestry and forest ecology in upstate New York with an environment not dissimilar to New Hampshire and have visited Hubbard Brook. For me *Hubbard Brook: The Story of a Forest Ecosystem* not only evoked memories of my youth, but I found it incredibly informative. I think I learned more about the processes of forest ecosystems from its reading than I had in 60 years of forest research. In large part this was due to the scope of the studies at Hubbard Brook and the way in which the book integrated the outcomes in explaining how all parts of a forest interact. As a zoologist, I had not paid enough attention to biogeochemical cycles and how these interact with forest plants and animals, or how forest plants and animals interact with and affect each other and the forest physical and chemical environment. I wish I had such an account when beginning my studies of forest birds and mammals in 1967 when I arrived in Australia.

The publication of *Hubbard Brook: The Story of a Forest Ecosystem* is timely. The 2016 Forum of the Royal Zoological Society (NSW) focussed on long-term ecological research in Australia. The majority of presenters, regardless of their energy, can no longer be described as young and in an era where Australian governments are emasculating legislation that protects the environment and cutting back on environmental research, it is hard for me to see how many of the long-term projects will continue once the individuals driving existing studies retire. Given the importance of long-term ecological research to the growth of conservation biology as a science and the development of environmental policy, Dickman (2013) argued that '...there is little doubt that long-term ecological work must remain a critical part of national and international research agendas'. Despite Dickman's plea and Lindenmayer *et al.*'s (2012) call for ecologists to promote long-term studies, a Hubbard Brook Ecosystem Study is not in Australia's future and the nation will be poorer for it. I recommend that anyone who hopes to be part of Australia's long-term future read this book. The reading is easy regardless of your scientific training and its message is clear: long-term studies are essential if we are to ensure a sustainable, clean, and biodiverse future for future generations. If you agree, then vote for people who are equally concerned for our environment and the future of Australia – a future that goes past jobs, growth, and profits for the rich and greedy.

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