BOOK REVIEW

Conservation and the Genetics of Populations

Fred W. Allendorf and Gordon Luikart, 2007
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I AM sure many readers have experienced the excruciating situation of being involved in a conservation project that makes no effort to include a genetic component in the methodology. This is often due to a lack of understanding by managers compounded by an inability of biologists to remedy this situation by demonstrating the importance of genetics to the desired conservation outcome. The authors of *Conservation and the Genetics of Populations* have aimed their text at "broadly trained biologists" to enable an understanding and application of genetic principles to conservation problems. If successful this would go a long way to alleviating this problem.

The text is divided into three parts: Introduction, Mechanisms of Evolutionary Change, and Genetics and Conservation. Beginning with a brief summary of current theory regarding why and what should be conserved and the role of genetics in this, Part one proceeds with a brief explanation of the link between the phenotype and the genotype. This is followed by an explanation of the sources of genetic variation between individuals and a brief description of the different techniques available for visualizing alleles. While these descriptions are brief, they are current and include microarrays which are more familiar to biomedicos than to most biologists.

I will mention here that many of the hand drawn figures are very poor. The most important animal to modern genetic techniques, *Thermus aquaticus*, is not drawn to a standard it deserves even if it is a single cell.

Part two, Mechanisms of Evolutionary Change, starts at first principles with the Hardy-Weinberg model and continues with the standard methods for estimating population genetic parameters through the measurement of allele frequencies. A sensible addition to this section is a brief mention of the limitations of F_{ST} when variation within subpopulations is high or there is a need to consider the genealogy of alleles. Methods of AMOVA and Nei's D statistic are mentioned with references provided for others.

Having established the sources of genetic variation and models for describing and measuring variation, Part three, Genetics and Conservation, is concerned with population dynamics that have implications for conservation. Inbreeding depression, metapopulation theory and hybridization are included, with concluding chapters on breeding programmes and genetic identification as solutions to these former impacts.

Working with plants I am always mindful of whether a text gives equal coverage to both plants and animals and it is clear the authors have attempted to do this. There are several botanical examples in the text and also in the informative guest boxes. However, I remained skeptical after reading Part three. To test the authors aims and to satisfy myself there was enough botanical detail I ran through a quick hypothetical project based on my research looking at genetic spatial analysis of grass under variable fire regimes in northern Australia. I looked to the text to find what type of marker I could use, the techniques for visualization and analysis and how I would sample to find potential variation. Starting at the index I quickly found my way to isolation by distance, chose PCR of microsatellites in cpDNA and being a little worried about single allele measurements was directed to multivariate approaches of AMOVA and coalescent theory. I decided a metapopulation model was appropriate for my work and was ready to go. Apart from one thing. I remain a little confused regarding the actual description and measurement of my target populations. What will I measure in large contiguous stands of grass hummocks where it is not possible to identify an individual? How will I determine the age, breeding mode or carrying capacity? It is now I feel the text is biased toward animal based discrete, including captive, populations and is therefore of less use for some broader ecological genetics subjects. However, I would rate the text as a success in getting me most of the way through my hypothetical project.

Hypotheticals aside the style is clear and easy to read despite a few too many editing errors. The questions at the end of each chapter have been added with an eye on the student market, but are also useful to keep the non-student reader honest. Answers to questions are on the accompanying website, but are not accessible to the reader without prior arrangement with the publisher. The website also provides access to data and Excel based programmes for practice analysis. I have a problem with the archival stability of websites and this was demonstrated by one of the three programmes offered having a broken link.

The inclusion of a list of symbols and adequate glossary helps in understanding the text. I particularly liked the authors humorous approach to mathematics in the appendix which outlines all the current relevant statistical topics of frequentist, likelihood and Bayesian methods.

In conclusion, I think the authors aims will be met through aiding broadly trained biologists to understand, plan for and importantly, convey the importance of a genetic component in a conservation plan. The book does not claim to equip the reader to conceive and undertake a genetic project, but it will allow a conservation project manager to ask the right questions and employ a geneticist who can.

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Conservation of Wildlife Populations: Demography, Genetics and Management

L. Scott Mills, 2006
Blackwell Publ., Oxford, UK
Paperback, 420 pages
ISBN: 9781405121460
RRP: AUD $90.95

AND

Wildlife Damage Control

J. Hone, 2007
CSIRO Publ., Collingwood, Vic.
Hardback, 192 Pages
ISBN: 9780643069596
RRP: AUD $89.95

SIMON WATSON[1]

EFFECTIVE wildlife management needs to be based on the application of sound scientific principles and concepts. Both of these books provide a framework for the application of concepts and principles to wildlife management problems and attempt to bridge the gap between research and its application in management. *Conservation of Wildlife Populations*, by L. Scott Mills, explains theories, concepts and principles developed in the field of population biology, and their management applications. It encompasses population ecology, demography and population genetics. *Wildlife Damage Control*, by Jim Hone, identifies and explains the application of principles involved in assessing and controlling damage caused by wildlife.

While each text has a different focus, they have similar goals. Both authors provide direction to wildlife managers by developing a framework for science-based wildlife management. Both books outline how to identify management problems, and how to identify and apply information required to solve the problem. The bulk of each book discusses the benefits of employing particular techniques to gather and interpret information, and how they can direct management actions. The frameworks developed here can act as a basis for current and future wildlife managers to build upon when developing strategies. Both books highlight the application of concepts and principles to management, rather than an in-depth analysis of the concepts and principles themselves.

Conservation of Wildlife Populations is divided into three main parts. Part one provides a background to applied population biology and incorporates explanation of human population dynamics, study design and the interpretation of population biology data, the use of genetic concepts and tools, and estimates of population vital rates. Part two is an explanation of population processes and their use in population-projection models. It contains an explanation of techniques used to describe and project population growth and how population processes influence population growth. Topics discussed include density dependence, age and sex-specific differences, predation, genetic variation and dynamics of multiple populations. Part three focuses on the application of the knowledge of population processes discussed in the previous chapters to problems of declining, small, or harvestable populations. It addresses population decline due to human perturbations, predicting the dynamics of small and declining populations, applying focal species approaches, and understanding the population biology of harvested species. Each chapter contains excellent examples of how the different concepts have been applied.

Scott Mills keeps the text interesting by using quotes at the beginning of each chapter and, in conjunction with the many examples, it felt more like reading a story than a scientific text. Quotes were from people that might be expected, like E. O. Wilson and Charles Darwin, but also from people such as humourist Gary Larson, which makes the book entertaining. Further, the quotes assist the reader's understanding by providing an analogy of a concept in a different setting.

Conservation of Wildlife Populations is not an exhaustive dissertation on population ecology but emphasizes gathering and interpreting information in order to understand population processes and make informed management decisions. Scott Mills acknowledges that he largely presents "rules of thumb", which ". . . represent simple answers to complex questions . . .". He argues that, while acknowledging that ecological processes are complex, we should "embrace uncertainty" and be honest about what we do not know; but we must not use the lack of full scientific certainty as an excuse for inaction. This book highlights the importance of research, but also the critical importance of constantly improving, refining and developing wildlife population management techniques and principles that can be applied across a variety of management scenarios.

Wildlife Damage Control, by Hone, can be viewed as two separate parts. The first part includes three chapters: a broad introduction to the principles and outline of the book, an explanation of the patterns and processes in wildlife damage, and generalities regarding controlling damage. The second part of the book comprises four chapters, each addressing management in relation to a specific field; biodiversity

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conservation, production, human and animal health and recreation. These chapters tend to read like stand alone reviews; they provide excellent content, but hinder the flow of the book.

Wildlife Damage Control encompasses a broad array of research principles. In contrast to much other work on "problem wildlife", this text focuses primarily on controlling the damage from pests rather than controlling pest populations. Hone suggests a framework for management research that focuses on analysing pest density in relation to response variables (i.e., yield), and also the level of control in relation to the response variable. It is within this alternative research paradigm that the strength of the book lies. While reviewing this book I read other works on controlling pest populations, but rarely were principles of control in relation to damage caused by wildlife presented as concisely and comprehensively as here.

Wildlife Damage Control includes some complex concepts and I found Hone's writing style difficult to read; thus it took some time to grasp how to apply some of the concepts. Many examples were used, which were very useful in conveying the relevance and management implications of differing principles. As well as the examples discussed in the text, Hone reeled off further examples that were only minimally explored or not explored at all. This "roll-call" of examples seemed to be an attempt to stress the importance of a particular concept's place in the field, but it added little to the understanding. References were sometimes included as an example of an alternative approach but were then not explored. More time explaining the benefits of a particular approach and the pitfalls of others would have been appreciated. Extra examples could be listed at the end of the chapter for further reading.

Mathematical modelling and statistics are used throughout both books. The formulae and descriptions of models could be quite daunting for readers that do not have a strong modelling background, but the concepts will still be evident. I found that my understanding of many of the modelling principles was greatly improved through the explanations and worked examples, particularly in *Conservation of Wildlife Populations*.

Both texts will prove useful for a range of people involved in wildlife management. *Conservation of Wildlife Populations* is an excellent book for those involved in the development of wildlife conservation strategies. It would be very useful for final year undergraduate and honours students, but also for academics and expert advisors who seek to provide theoretical and research frameworks for wildlife conservation. I also consider this book to be excellent for wildlife managers who require a strong knowledge of the population processes of populations they are managing. Application of the principles and concepts in this text is essential for improvement and development of wildlife population management. *Wildlife Damage Control* is relevant to a wide range of people in many industries. It is also likely to be most useful for final year undergraduate and honours students as well as academics and expert advisors, but will also prove useful for wildlife managers. This book will assist those wishing to control wildlife damage in a range of environments, from agricultural systems to urban environments and conservation reserves. Hone has written the book for a broad audience and has largely succeeded. Scott Mills has written a book with a narrower audience, but he has created an invaluable text for anyone making decisions on the strategic management of wildlife populations.