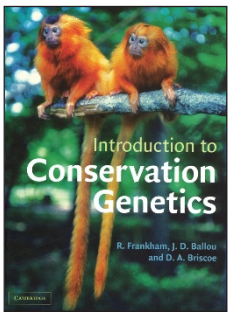
Catching the (genetic) drift



Introduction to Conservation Genetics

by Richard Frankham, Jonathan D Ballou & David A Briscoe

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Reviewed by David A Galbraith

Conservation biology has been aptly described as a 'crisis discipline.' If conservation biology is a response to a global crisis, then conservation genetics—the application of the concepts, cases and techniques of evolutionary and population biology in the fight to save biological diversity—is among the more intensive aspects of the response.

Although its conceptual roots are older, conservation biology as a discipline is less than three decades old, and conservation genetics is, in some ways, even younger. Few book-length treatments have attempted to encapsulate the entire field. The first introductory text in the field appeared in 1994. Several journals provide coverage of conservation genetics, notably *Conservation Biology* and *Molecular Ecology*, and *Conservation Genetics* has existed since 2000.

All attempts at an introduction to conservation biology have to bridge the long-standing gap between the whole-organism approach of population ecology and the intensive molecular approach that typifies contemporary conservation genetics. It is a difficult balance to strike in a way that neither 'dumbs down' the genetics nor trivializes the immense body of ecological knowledge underlying conservation biology.

In *Introduction to Conservation Genetics*, Frankham, Ballou and Briscoe set out to achieve that balance. Although this volume is, in principle, intended as a text for a senior undergraduate or graduate course, it is also a self-teaching guide to the whole field. It is unique in several ways. The first third of this book provides a basic introduction to population genetics and evolutionary biology. Beginning with the fundamental concepts of inbreeding and extinction, it builds the reader's knowledge base in mendelian and quantitative genetics as well as population genetics, evolution and gene flow. After reviewing evolution in large populations, the authors focus on the conventional heart of conservation biology—evolution in small populations—by chapter eight. They then move through treatments of the intensity of natural selection among varying characters and, by chapter ten, examine the crucial relationship between small population size and loss of genetic diversity.

Thus, the first ten chapters of the book build the conceptual basis for understanding genetic diversity within and among populations. Although they could have assumed that a reader had such knowledge, by laying the groundwork for conservation genetics, Frankham, Ballou and Briscoe ensure that this is a strong and fairly self-contained self-teaching guide.

As one might expect, this book considers the problems of very small population size and inbreeding on diversity within populations. The mechanics of inbreeding depression, population fragmentation and genetic viability of populations all receive chapter-length treatment.

The middle of the book deals with the importance of taxonomic uncertainty and the definition of management units in conservation, two issues of great theoretical and practical importance. Also considered are the diversity of species concepts, an overview of the construction of phylogenetic trees and practical conservation issues ranging from wild populations to the intensive management of wildlife under regimes of captive breeding.

The first two-thirds of this text presents a logical progression from concepts of population biology, evolution and genetics to the effects of inbreeding and genetic drift on diversity. The final third is somewhat different, presenting varying concepts and practical issues that do not necessarily follow an obvious topical progression. After dealing with genetic management of captive populations in detail and the difficult topic of adaptation to captive conditions, the text considers the use of molecular genetic methodologies in a variety of contexts, ranging from gene flow and migration to sex determination and parentage analysis. The final chapter takes us into population viability analysis, the intensive application of population genetic principles to estimate extinction probabilities.

As an introduction intended for a broad audience, this text is an indication of the maturity of the field of conservation genetics (for one thing, it is refreshing to see a treatment of basic concepts in genetics without resort to examples illustrated with domesticated animals or humans). The cases that illustrate concepts in this text are well distributed globally and also are a reasonable reflection of the taxonomic scope of conservation genetics: the lion's share of studies have been conducted on charismatic vertebrates, although there are cases drawn from plants and other organisms. The bias towards endangered birds and mammals may be the result of greater difficulty in securing funding for work on less attractive organisms. Although conservation genetics is key to understanding and protecting biodiversity, it is more expensive than other conservation techniques.

This text is clearly not a bench guide and does not present practical protocols for either molecular or computational methods. The methods central to the development of conservation genetics are rightly treated as tools, rather than the story.

Introduction to Conservation Genetics maintains a careful balance between concepts necessary to understand what conservation genetics is about and practical examples of those concepts. Although the orientation in this text is toward the practical use of genetic information in the protection and recovery of populations at risk of extinction, the text also provides some orientation to the practice of conservation genetics, especially in chapter one. Beyond this introduction, it is largely up to the student to integrate the large amount of theoretical and practical material covered in this text to derive a sense of how this knowledge is applied. ■

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