

## Book reviews

**The Role of Genetics in Conserving Small Populations.** T. E. Tew, T. J. Crawford, J. W. Spencer, D. P. Stevens, M. B. Usher and J. Warren (eds). Joint Nature Conservation Committee, Peterborough. 1997. Pp. 203. Price £40.00, paperback. ISBN 1 86107 438 7.

Conservation is a multidisciplinary science. It requires a sound understanding of genetics, together with ecology, population dynamics, taxonomy, biogeography, ethnobotany and even politics and economics if healthy small, and for that matter large, populations are to survive. The marriage of the schools of genetic and ecological conservation was overdue. That the two schools should work together was promoted by the Convention on Biological Diversity and the realization that biodiversity exists at the population and species, as well as at the habitat and ecosystem, levels. Far too often conservation was previously equated with ecology, ignoring the contribution of genetics, and this text, based on papers given at the British Ecological Society Symposium held in York in September 1995, attempts to redress the balance.

The text is aimed at professional conservationists or advanced level students who desire an introduction to the genetics of conservation, and is well interspersed with case studies and illustrations of the most salient points. The book is composed of twenty-one papers divided between five sections, and is introduced by a foreword and preface. Each section is headed by its own brief introduction which sets the framework for the more specialized accounts to follow.

Section 1, 'Framing the Questions' (or rather a general introduction), contains three papers which provide an excellent overview of the biological consequences of being a small population (loss of adaptability, inbreeding depression, loss of unique ecotypes and disruption of patterns of variability), a review of the history of conservation and genetics, with an introduction to minimum viable population size, and a rather superficial assessment of what genetics a field conservationist needs to understand. Section 2, 'Conservation Implications of Genetic Survey Data', is composed of five case studies showing how genetics (particularly using molecular techniques) can be used to help understand the problems involved when formulating effective conservation strategies for rare or declining plant and animal species. Section 3, 'Genetics and Species Recovery', contains four further case studies, plus a review of the role of *ex situ* management of threatened species in botanic gardens (the latter, although interesting as it stands, sits rather oddly in a text focusing on conservation genetics). Section 4, 'Conservation Genetics and Demography', explores the

interaction between population genetics and population ecology through three papers and three shorter communications. Especially of note in this section is an intriguing paper on how progeny fitness is affected by breeding system in *Primula scotica* and an interesting paper concerning the problems of adopting the latest IUCN threat categories, which require accurate assessment of population size over time, a factor that may be difficult practically to establish. Finally Section 5, 'Summary and Proposals', attempts to draw together the complex strands of the text and provide a series of practical guidelines. Both papers contain concrete proposals that are very well considered and will provide assistance to conservationists in their efforts to conserve native biological diversity more efficiently and effectively.

A point well made in several papers is that British conservation is moving away from the 'stamp collection' approach to conserving species. A true understanding of the genetic principles underlying conservation emphasizes the need to conserve genetic diversity found within taxa.

I liked the strong reliance on practical case studies in the central three sections of the book. The authors of the final two papers must also be commended for the practicality of their approach to providing guidelines for biodiversity conservation. However, I was frustrated that such a heavy reliance was placed on *in situ* conservation, only one paper discusses *ex situ* techniques and there is no clear acknowledgment of the need for a complementary approach to conservation. It is positive that the text gives equal weight to plant and animal conservation, but I would have liked to have seen at least one paper discussing the genetic conservation of a group of British crop relatives or wild species in gene banks. The problem of conserving small populations and the need for a genetic understanding apply here just as well. Based on the title and preface, to be considered comprehensive the text required some discussion of *in vitro* and DNA storage or possibly even a case study of on farm conservation of British vegetable germplasm. It would also have strengthened the text to have some discussion of the need to link conservation to some form of use, not necessarily just crude links to plant breeding but tied to ecotourism and public awareness. My own experience in Turkey has shown that the Mediterranean monk seal is no longer being hunted by fishermen because they see greater income being generated from ecotourists than is lost by the seals eating fish. However, these issues were disappointingly outside the scope of the original conference and this text. Overall the conference proceedings are well written, easily understandable and interesting, and therefore will make a valuable addition to the shelves of

any library or individual interested in plant or animal conservation.

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**Practical Applications of Plant Molecular Biology.**  
 R.J. Henry. Chapman and Hall, London. 1997. Pp. 258.  
 Price £24.99, paperback. ISBN 0 412 73220 3.

Timely is the word that comes first to mind, especially when one is about to teach a new third-year degree module on 'Molecular markers'. Attractive and handy are other suitable adjectives for this compact and user-friendly book. The price is not bad either, and it should have wide appeal right across the scientific community of students, teachers and researchers. The organisation of content and layout are particularly strong points. We start with the main molecular techniques for use in plant identification (chapter 1), and move on to applications in estimating genetic variation (2), applications in plant improvement (3), genetic engineering (4) and end with routine protocols (5). There is a section of appendices which includes some relevant internet addresses (students will love this), classification of flowering plants and much more. The text is lavishly embellished with photos and other illustrations, and the extensive referencing includes many original sources.

Getting into the detail one could quibble about some points. The writing is clear and simple, with short and well connected sentences, but it is clear too that it is written by a seasoned practitioner from the standpoint of total familiarity. In chapter 1 one has a feeling that some students could stumble at the first hurdle by the highly concise way in which the material on techniques is presented. I would have gone for fuller explanations of the PCR reaction, RAPDs and microsatellites, to mention but a few. I wonder too how many people will be able to interpret the photo (Figure 1.2) of a gel illustrating segregation of RFLPs in F2 progeny of an interspecific tomato hybrid, in the absence of any detailed explanation. These things are not easy to understand fully; the style could have been a bit 'softer'. On the other hand, the broad contextual background, and the numerous examples of applications, make it easy to appreciate the main theme of the text and to maintain interest and even to develop enthusiasm.

In chapter 2, on estimating genetic variation, it is pleasing to see coverage of populations of rare or endangered species and to make the link between crop plants and their wild ancestors in the context of biodiversity and genetic resources. It is a good example of seeing the detail while keeping an eye on the broader canvas. There is a useful resource of seventy-eight references to this chapter.

'Molecular Markers in Plant Improvement' (chapter 3) gives a good overview of the subject, but it omits the real challenge of explaining how one makes a marker map, and it deals with QTLs as though everyone is totally familiar with them. What *exactly* is a QTL? This is chickening out, and leaving the student to find another source, from the references, to get to the bottom of mapping and marker-assisted selection. Notwithstanding these criticisms the concepts are clearly conveyed. At the end of the day the teacher can always answer the difficult questions, and deal with physical mapping as well for good measure.

Plant transformation is dealt with in a balanced way, and avoids the diet of over-optimism that we were fed in earlier times. The section on protocols links the laboratory to the wider world and gives a 'feel' for how a gel relates to a particular situation of, say, managing weeds, or identifying the *Cf-9* gene of tomato which confers resistance to the leaf mould pathogen *Cladosporium fulvum*.

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**The Study of Gene Action.** Bruce Wallace and Joseph O. Falkinham III. Cornell University Press, Ithaca. 1997. Pp. 260. Price £13.50, paperback. ISBN 0 8014 8340 9.

I read the first few chapters of this book with pleasure. It gives a good introduction to the development of genetics in the early years of this century. The treatment of the *Drosophila* workers and the questions that interested them seemed to catch the flavour and excitement of that period well. The problems start to come when the authors try to put these historical studies in a modern perspective. One of their underlying themes is that improvements in technology drive science and refine the questions that can be asked. This is a somewhat self-evident thesis, but it could form an excellent basis to re-assess the early work in the light of our current understanding. Unfortunately the authors do not do this. An example is the discussion of E. B. Lewis' 1954 paper on transvection. This is a spectacular piece of work and the insight with which Lewis interpreted his results is probably more striking now, in retrospect, than it was at the time. It would have been really nice to review more recent work on transvection and position effects in general. Instead we are informed, rather feebly, that 'The explanation (for transvection) is not yet known' and treated to the speculation that somatic mis-repair might regenerate a proportion of normal sequence strands. Thirty years ago this might have been an adequate conclusion to a discussion of transvection, today it is not.

The later chapters of the book contain numerous errors and confusions, which I found worrying. I picked up on the ones in *Drosophila* genetics, but there may well be others that I missed. As an example we are told that the

identity of segments and appendages depend upon 'products of the two homeotic genes, *Antennapedia* and *Ultrabithorax*' (p.74), but that is not clear whether the distribution of developmental genes between '46 and 48.4' reflects a real clustering. This misses the whole point. The *Antennapedia* and *bithorax* complexes each consist of a cluster of homeotic genes mapping at 3–47.5 and 3–58.8, respectively. These blocks of genes are functionally related and in the flour beetle, *Tribolium*, form a single cluster. Between them these two complexes carry the homeobox-containing transcription factors that are responsible for the allocation of segment identity, in addition to three other homeobox-containing transcripts. The elucidation of the fine structure of these genetic complexes has been one of the major achievements of molecular genetics. This does not simply 'reflect a bias on the part of molecular geneticists to concentrate their efforts on a well-studied region of a chromosome'.

Chapter 8 is largely concerned with eye development although the fascinating studies on photoreceptor fate that have come out of the Rubin and other laboratories are not mentioned. In figure 8–8 the ommatidia are shown with a small 'hair' at three of the six vertices of each hexagon. In fact, the structures are innervated bristles, there are about 4 to a hexagon and their distribution is rather irregular. These are trivial mistakes, but indicative. The authors go on to describe Lawrence and Green's experiments showing that photoreceptors within an ommatidium are not segregated as a lineage-related group. This is a classic experiment and is reported without errors, but thereafter we are informed that 'comparable noncorrespondence between cell lineages and fates... led developmental geneticists to the 'compartment hypothesis' (Crick and Lawrence, 1976...)'. Hang on, the compartment hypothesis was proposed by Garcia-Bellido in 1975 based largely on earlier work together with Ripoll and Morata. The following discussion of compartments and the illustrative diagrams, I found very confused. The final diagram (8–14) illustrates compartment boundaries in the eye, although based on a diagram from W. Baker (1978) this is a rather unfortunate example. The evidence for lineage restrictions in the eye is, at best, poor. The remainder of chapter 8 discusses Wallace's own work on the patterns of bristle loss in somatic mosaics of *scute*. These results contain some anomalies, but do not represent the serious intellectual challenge that the authors suggest. The independence of the loss of anterior and posterior bristles reflects the fact that specification of the bristle lineage takes place during the last couple of cell divisions, well after the stage that the mosaics are induced.

A glance through the reference list reveals the problem, 70% of those cited are pre-1970. This is fine for a historical review, but this book starts with the thesis that early workers were not stupid, but lacked adequate technologies. I was rather hoping for an insightful analysis of the early problems from the perspective of the end of the century; to be shown how modern technology had

changed our understanding. I was disappointed — the explosion in our understanding in recent years has completely missed the authors. Without the appreciation of modern molecular genetics, I felt their attitude to the early workers was patronising and complacent. This is a shame; this is a book that is just waiting to be written.

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**Sex, Color and Mate Choice in Guppies.** Anne E. Houde. Princeton University Press, Princeton. 1997. Pp. 210. Price £14.95, paperback. ISBN 0 691 02789 7.

The guppy, *Poecilia reticulata*, a viviparous fish from South America, has many features which make it an ideal subject for evolutionary studies. It is small, abundant, has a short generation time, and is easy to catch and to culture and observe in captivity. It is also strikingly sexually dimorphic, and male colour patterns are highly variable within and between populations, making the species particularly amenable to studies of sexual selection under a variety of ecological conditions.

Anne Houde's book is a clearly-written, succinct and timely review of the rapidly expanding literature on sexual selection in guppies. The introductory chapter outlines guppy habitats, principal predators, population genetics, and studies of geographic variation in predation regimes, life history traits, colour patterns and shoaling behaviour, before finishing with a brief overview of sexual selection theory. Chapter 2, on general reproductive biology, contains many priceless practical tips unlikely to be found in published papers. The next four chapters review the results of recent research on sexual selection in guppies, covering mechanisms of sexual selection, male courtship behaviour and female choice. Houde's explanations of sexual selection theories are among the clearest I have read, although occasionally presentation of empirical studies are slightly confusing. For example, it makes little sense to state that repeatability of female preferences was 58% (p.124) when no clues are given about how this is worked out. The book ends with a general summary, including suggestions for future research, and a useful appendix giving a clear exposition of what can and cannot be investigated with different laboratory mate choice experimental designs.

Houde has done an excellent job in both summarizing a fascinating and conceptually rich body of research and in providing numerous practical hints for anyone considering initiating a programme of research with the species. The volume maintains the high standards of the Princeton monographs series in its clear presentation and quality of proof editing, although I think that the statement (p.50) that two strains were judged as 'the least different in

consciousness' (conspicuousness?) is an exception. I strongly recommend this book, not only to those interested in guppies or fish behaviour, but to any evolutionary behavioural ecologist.

As a postscript, I have to say that I am somewhat sceptical of the conclusions of a few of the studies described in this volume. Although these findings are compatible with interesting and fashionable theories, they don't sit comfortably with the general biology of the species, as presented by Houde. She is, however, very circumspect in giving negative opinions and does not

specify any examples of erroneous experimental design, statistical analysis or inference from results. Careful scrutiny of her summary chapter, especially what is not included, is worthwhile. It would be unfair to regard this as a criticism of this excellent book, as such inoffensive reviewing is widespread practise in the discipline.

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## Books received

**Evolutionary Quantitative Genetics.** Derek A. Roff. Chapman and Hall, London. 1997. Pp. 258. Price £39.00, paperback. ISBN 0 412 12971 X.

**Genetic Structure and Local Adaptation in Natural Insect Populations.** Susan Mopper and Sharon Y. Strauss (eds). Chapman and Hall, New York. 1997. Pp. 449. Price £65.00, hardback. ISBN 0 412 08031 1.

**Population Genetics - A Concise Guide.** John H. Gillespie. The Johns Hopkins University Press, Baltimore. 1998. Pp. 174. Price £16.50, paperback. ISBN 0 8018 5755 4.

**Environmental Stress, Adaptation and Evolution.** R. Bijlsma and V. Loeschcke (eds). Birkhäuser Verlag, Basel. 1997. Pp. 325. Price sFr. 148, hardback. ISBN 3 7643 5695 2

**Molecular Tools for Screening Biodiversity.** Angela Karp, Peter G. Isaac and David S. Ingram (eds). Chapman and Hall, London. 1998. Pp. 498. £75.00, hardback. ISBN 0 412 63830 4.