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## Book Reviews

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*Genetics and Conservation of Rare Plants*. Edited by D. A. FALK and K. E. HOLSINGER. Oxford University Press. 1992. 283 pages. £35. ISBN 019 506 429 1.

Flowering plants are becoming extinct at an alarming rate. Indeed, the authors claim that by the year 2000 nearly 700 more will have been lost for ever, a rate of extinction that is many hundreds, even thousands of times the norm. The implications of such losses for the natural world are immense, since plants are the primary producers of energy in almost all ecosystems: for every species of plant that is lost, as many as 35 other species of organisms that depend upon it may also be lost. Something must be done about this appalling state of affairs before it is too late, but the task of conserving the endangered plants of the world is immense. This book helps one to come to terms with the problem at a scientific level.

As the Editors point out in their Preface, the conservation of biological diversity must be guided by an understanding of the biology of the species and ecosystems under threat. The scientific community must, therefore, provide the very best data and models to guide decision making in the allocation of resources. 'Scientific research is not a luxury; it is the foundation of good conservation. We cannot conserve what we do not understand.' They go on to remind us, however, that the practice of conservation takes place in a context of limited resources. In consequence, conservationists must frequently make pragmatic decisions based upon, at best, a limited understanding of that which they wish to protect. The result, in the case of plants where information is often borrowed and extrapolated from animal models, is that mistakes are often made with a concomitant waste of money and time and loss of scientific credibility.

Flowering plant conservation, the subject of this book, must now be guided, most importantly, by advances in the knowledge emanating from the fields of genetics and population biology. The purpose of the book, therefore, is to present to the reader current scientific understanding in these fields and its relationship to flowering plant conservation strategies, now and in the future. It is thus a milestone publication that will go a long way to introducing to plant conservation biology the scientific rigour that it has

sometimes lacked in the past. The book is based upon the proceedings of a conference on 'The Genetics and Conservation of Rare Plants' co-ordinated by the Center for Plant Conservation at the Missouri Botanical Garden, St Louis in 1989. It therefore has a botanic garden bias. Also, it suffers slightly from some of the problems that bedevil all such ventures, most notably unevenness in the style and quality of the different chapters. The Editors, however, have done an excellent job in guiding their authors, such that the overall quality is very high and the coverage very good indeed. The latter attribute derives from the fact that the Editors solicited, after the conference, additional papers in key areas of research that were not represented at the meeting itself. The result is a seminal volume that will have a major influence in shaping plant conservation strategies long into the future. One major reason for this is that the Editors and authors have ensured that this volume does not merely deal with theoretical matters, but extends theory into the practical business of conserving real plants.

The book is divided into several parts. The first deals with the genetics of rare plant species. Barrett and Koln discuss the genetic and evolutionary consequences of small population size, while Huenneke goes on to analyse the ecological implications of genetic diversity in plant populations, pointing out most notably that loss of diversity is a consequence of population failure rather than its cause. Next, Menges explores the ways in which the demographic techniques employed in animal conservation may be modified to aid the conservation of rare plant populations. Finally, Bawa and Ashton focus on the conservation of rare trees in tropical rainforests, suggesting that conservation theory developed through studies of temperate zone species does not necessarily apply in the tropics, where by far the largest range of species now facing extinction is actually situated. The major problem may be the low density of populations of endangered species, which has significant consequences for the area of land required for effective conservation policies.

The second section addresses the principles that underlie one crucial aspect of the development of conservation programmes, namely the conservation of genetic diversity. Hamrick and colleagues first

review the correlations between specific traits (life history characteristics) and allozyme diversity and explore their implications for conservation biology. Karron then relates patterns in genetic variation to the breeding systems of rare plants. Finally, Brown and Briggs, drawing on their Australian experience, address the thorny problem of how to sample wild populations (i.e. *in situ*) in order to 'capture' the appropriate genetic diversity required for *ex situ* conservation. The result is a set of simple guidelines for the selection of populations for sampling and selection.

The third section deals with the management and evaluation of *ex situ* conservation collections. Schaal and colleagues compare the methods available for assessing genetic variation, including: morphological examination, which is cheap and easy, but does not distinguish easily between genetic and phenotypic differences; allozyme electrophoresis, widely used by population biologists and offering deep insights into genetic variation, but which suffers from the fact that it is limited to genes encoding soluble enzymes; and DNA techniques which allow direct examination of the genome, but are sometimes, as yet, difficult to interpret and expensive to use. Eberhart and colleagues finally discuss methods for maintaining *ex situ* conservation collections of seeds, which usually contain a broader genetic spread than would be possible with collections of plants, including both conventional and low-temperature approaches. The importance of regular viability testing in such collections is stressed.

In the final section the theoretical knowledge and understanding summarized in the earlier papers is interpreted for the practice of conservation. This is a most valuable part of the book for those grappling on a day-to-day basis with the daunting task of attempting to stem the tide of destruction and extinction of plant species. Millar and Libby first deal with the issue of the conservation of widespread species, usually more diverse than rare endemics. Their five-point programme, combining *in situ* and *ex situ* strategies with reintroduction and habitat management, is a most useful contribution. Reisenberg then examines three case histories of rare plants in which hybridization plays a significant role in species biology. Studies of case histories are always rewarding, not least in this chapter.

Zoos, despite their recent bad press, have long played a significant role in animal conservation through captive breeding programmes. As a director of a botanic garden I am of course interested in such a role for botanic gardens. This issue is successfully addressed here by Templeton, who reviews the successes and failures of the approach to animal conservation and the lessons to be learned for plant conservation.

The last two papers are by the Editors. Holsinger and Gottlieb first seek to summarize and review the

scientific evidence and theory from the rest of the book, placing it in the context of conservation practice. They then present a set of recommendations for biologically sound conservation programmes. The reader may not agree with all of their recommendations, but that they are set out in a lucid and logical way is a most valuable aid to clear thought on the matter. Finally, Don Falk, the Senior Editor, brings together those two factors that are all too often considered in isolation, namely biological and economic considerations. The models he offers provide much food for thought on what will become an ever-increasing component of conservation practice.

It is customary to hide at the end of a volume those bits that are of least interest to the reader. The present volume is the exception that proves this rule. The appendix, entitled 'Genetic Sampling Guide-lines for Conservation Collections of Endangered Plants', represents a major contribution to conservation practice and provides, for the first time, a set of sensible and logical rules to be followed by those who intend 'to capture a representative sample of the genetic diversity in a target species as they establish living collections of rare plants'. This section is already the most thumbed part of my copy of the book, as I suspect it will be for most people who obtain a copy.

And there is still more to come! In addition to a useful index, the bibliography of 850 entries represents, as the editors state, 'the most extensive compilation of research and writing on rare and endangered plants that has ever been published... an invaluable resource for conservationists, ecologists, evolutionists and geneticists'. The appendix and bibliography alone are worth the £35 that this book costs. It is a must for all interested in plant conservation.

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*Human Cytogenetics: A Practical Approach, Volume 1: Constitutional Analysis* (second edition). Edited by D. E. ROONEY and B. H. CZEPULKOWSKI. IRL Press at Oxford University Press. 1992. 274 pages. Paper £22.50. ISBN 0 19 963287 1. Spiralbound £30. ISBN 0 19 963288 X.

The undoubted success of the first edition of this volume in the 'Practical Approach' series made it inevitable that a second edition would follow. That success reflects the wide experience of the editors in the practicalities of human cytogenetics, and their excellent choice of expert contributors, which has been maintained in the expanded and updated second edition.

The most obvious change is the removal of the chapter on 'Diagnosis of malignancy from chromosome preparations' and its development into a second