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RARITY

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Contents

Preface	vii
Introduction	ix
1 What is rarity?	1
1.1 The variables used to define rarity	1
1.2 Continuous and discontinuous measures	2
1.3 Scale dependence and independence	9
1.4 Endemism and rarity	11
1.5 Delineating an assemblage	12
1.6 Rarity and vulnerability	15
1.7 The use of 'rarity' in this book	19
2 Abundances and range sizes: measuring rarity	22
2.1 Measures of abundance	22
2.2 Species–abundance distributions	29
2.3 Measures of range size	35
2.4 Species range size distributions	47
2.5 Pseudo-rarity and non-apparent rarity	53
2.6 Phylogenetic relationships	55
2.7 Concluding remarks	56
3 The non-independence of abundance and range size	57
3.1 Levels of resolution	57
3.2 Densities and presence/absence data	61
3.3 Inter-specific abundance and range size	63
3.4 Concluding remarks	77
4 Spatial dynamics	78
4.1 Forms of spatial concordance	78
4.2 What evidence?	79
4.3 Spatial scales	82
4.4 Nested areas	83
4.5 Abundance structure of geographic ranges	86
4.6 Concluding remarks	93
5 Temporal dynamics	
5.1 Temporal concordance	94

vi Contents

5.2	Rarity and persistence	104
5.3	Trajectories to extinction	108
5.4	Ecological success	110
5.5	Concluding remarks	113
6	Causes of rarity	114
6.1	Tackling causation	115
6.2	Environmental factors	117
6.3	Colonization ability	124
6.4	Body size	128
6.5	Historical considerations	134
6.6	Overview	134
7	Conservation and rarity	136
7.1	Rarity and likelihood of extinction	137
7.2	More limitations of rarity	140
7.3	Sites and species	141
7.4	Concluding remarks	152
8	Where next?	153
8.1	Why continue to study rarity?	153
8.2	How to study rarity	155
8.3	Some outstanding issues	159
8.4	Conclusion	162
	References	164
	Author index	193
	Subject index	201

Preface

To say you are writing about rarity is to invite two kinds of response. Either one provokes a discussion of what rarity is, or some comment on the complexity of the subject. The objective of this book is to explore the nature of rarity, its complexity if you like, from one particular perspective on what rarity is. Primarily, it is an opportunity to review, to synthesize, and to question. The book is an attempt to draw together a vast body of literature, to extract from it some general principles, and to raise question marks over areas the foundations of which appear to be either absent or crumbling.

A perusal of prefaces suggests that they often dwell as long upon what a book is not about, as upon what it does concern. True to such a tradition, I should state that this is specifically not a book about conservation, although in some quarters anything about rarity is viewed as something about conservation. Nor does it contain more than a passing reference to the undoubtedly important issues of the role of genetics in rarity.

Examples have been drawn from a wide variety of taxa. They are, nonetheless, somewhat depauperate in cases from marine systems. In part this bias results from the unevenness of my familiarity with the literature, in part it perhaps also reflects differences in the questions asked and approaches to the study of communities and assemblages in terrestrial and marine systems. Undoubtedly there will be instances in which I have missed many of the best examples. One of the problems of writing a volume on rarity is that these examples often come from studies which were not explicitly of this subject.

Some of the viewpoints expressed herein will be found to be at odds with statements I have made in the past. This is, by and large, a product of exposure to a wider range of literature brought about in writing this volume, and by taking a longer and harder look at some topics. I trust the reader will not begrudge such inconsistencies.

While the book is hopefully open to being 'picked at' rather than read from cover to cover, the reader is advised to become acquainted with the opening chapter first. Without an understanding of the way in which several terms are used, most especially 'rarity' itself, much of the rest of the book may be less intelligible. Certainly this will be true of the annotations to some of the figures.

A great many people have facilitated the development of my thoughts on the subject of rarity, and have on occasion kindly sought out or drawn my attention to pieces of information that might otherwise have eluded me. Most especially I would thank Tim Blackburn, Nigel Collar, Phil DeVries, Ian Gauld, Peter Hammond, Bill Kunin, John Lawton, Brian McArdle, Laurence

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Introduction

The rare holds a curious fascination for humankind. From first editions to matchboxes, and from garden gnomes to cars, they are avidly collected and listed, categorized and counted, bought and sold. The stories of the lengths to which ornithologists will go to observe a species new to 'their patch' are apocryphal. Pitifully sad are the lengths to which collectors will go to obtain representatives of a plant the population of which is on the brink of extinction.

This enthusiasm for the rare has led to a widespread perception that they are special in some way which transcends their rarity. Science cannot escape the subjective, and similar feelings commonly surround those plant and animal species fortunate or unfortunate enough to be labelled as rare. But, what is a rare species? Does it really differ from those species which are not rare? If so, in what way? These are some of the questions which in eight chapters this book sets out to address.

In general, the material in the following pages becomes progressively complex through the book. Unsurprisingly, the starting point (Chapter 1) is a consideration of the definition of rarity, and some of the factors which serve to complicate or thwart unambiguous terminology. For reasons discussed in Chapter 1, I have chosen to regard rarity simply as the state of having a low abundance and/or a small range size. Chapter 2 moves on to explore the measurement of rarity on the basis of these two variables. Emphasis is laid on the variety of ways in which abundance and range size can be expressed, and the need to understand the limitations of the different approaches. Our understanding of inter-specific abundance and range size distributions is explored.

Although it is often convenient to treat them separately, abundance and range size are not independent. The objective of Chapter 3 is to explore their relationship. It divides broadly into two parts. The first is concerned with intra-specific interactions, which although not explicitly concerned with rarity provides some background for the second section. This addresses both the patterns of and the explanations for inter-specific interactions.

Chapters 4 and 5 are in some sense a pair, dwelling respectively on the spatial and the temporal dynamics of rarity. There are strong parallels in some of the concerns of both, although the two topics are treated somewhat differently. Chapter 4 asks whether there is any tendency for species which are rare in one area also to be rare in another. Answers depend in part on spatial scale and ultimately necessitate an understanding of the abundance structure of geographic ranges. Chapter 5 asks whether species which are rare at present

are likely to have been rare in the past and will also be rare in the future. As well as leading to issues of scale, this raises matters such as the relationship between rarity and persistence, the population dynamics of rarity, and the trajectories by which species become extinct.

A full understanding of the dynamics of rarity, in time and space, necessitates tackling the rather tortuous subject of what causes species to be rare. This provides the topic of Chapter 6. The central thesis explored is that there is no general theory of the causes of rarity. Rather, rarity is generated by the same processes which act, albeit less severely, upon the abundances and range sizes of common and widespread species. Two broad groups of factors are recognized as generating low abundances and/or small range sizes, environmental variables (abiotic and biotic) and colonization abilities (dispersal and establishment).

The logical conclusion from arguing that there is no general theory of rarity is that there is no panacea for dealing with those species whose rarity is regarded as a problem. Chapter 7 is given over to a consideration of the most important applied aspect of the study of rarity, that of conservation. The conservation of rare species is tied foremost to the view that a central objective of conservation is the prevention or limitation of the extinction of species. Thus, the factors affecting the likelihood of extinction are examined. Accepting its artificiality, a distinction is made between site-based and species-based approaches to conservation, and the role of rare species in each is considered.

Chapter 8 serves as a conclusion in that it draws together some of the common themes of the preceding chapters, and asks the question 'Where next?'. This divides broadly into two sets of issues, how the study of rarity can be improved and the primary issues which remain to be resolved.