

Preface

A science for everybody – but not an easy science

This book is about the distribution and abundance of different types of organism, and about the physical, chemical but especially the biological features and interactions that determine these distributions and abundances.

Unlike some other sciences, the subject matter of ecology is apparent to everybody: most people have observed and pondered nature, and in this sense most people are ecologists of sorts. But ecology is not an easy science. It must deal explicitly with three levels of the biological hierarchy – the organisms, the populations of organisms, and the communities of populations – and, as we shall see, it ignores at its peril the details of the biology of individuals, or the pervading influences of historical, evolutionary and geological events. It feeds on advances in our knowledge of biochemistry, behavior, climatology, plate tectonics and so on, but it feeds back to our understanding of vast areas of biology too. If, as T. H. Dobzhansky said, 'Nothing in biology makes sense, except in the light of evolution', then, equally, very little in evolution, and hence in biology as a whole, makes sense except in the light of ecology.

Ecology has the distinction of being peculiarly confronted with uniqueness: millions of different species, countless billions of genetically distinct individuals, all living and interacting in a varied and ever-changing world. The challenge of ecology is to develop an understanding of very basic and apparent problems, in a way that recognizes this uniqueness and complexity, but seeks patterns and predictions within this complexity rather than being swamped by it. As L. C. Birch has pointed out, Whitehead's recipe for science is never more apposite than when applied to ecology: seek simplicity, but distrust it.

Nineteen years on: applied ecology has come of age

This fourth edition comes fully 9 years after its immediate predecessor and 19 years after the first edition. Much has changed – in ecology, in the world around us, and even (strange to report!) in we authors. The Preface to the first edition began: 'As the cave painting on the front cover of this book implies, ecology, if not the oldest profession, is probably the oldest science', followed by a justification that argued that the most primitive humans had to understand, as a matter of necessity, the dynamics of the environment in which they lived. Nineteen years on, we have tried to capture in our cover design both how much and how little has changed. The cave painting has given way to its modern equivalent: urban graffiti. As a species, we are still driven to broadcast our feelings graphically and publicly for others to see. But simple, factual depictions have given way to urgent statements of frustration and aggression. The human subjects are no longer mere participants but either perpetrators or victims.

Of course, it has taken more than 19 years to move from man-the-cave-painter to man-the-graffiti-artist. But 19 years ago it seemed acceptable for ecologists to hold a comfortable, objective, not to say aloof position, in which the animals and plants around us were simply material for which we sought a scientific understanding. Now, we must accept the immediacy of the environmental problems that threaten us and the responsibility of ecologists to come in from the sidelines and play their full part in addressing these problems. Applying ecological principles is not only a practical necessity, but also as scientifically challenging as deriving those principles in the first place, and we have included three new 'applied' chapters in this edition, organized around the

three sections of the book: applications at the level of individual organisms and of single-species populations, of species interactions, and of whole communities and ecosystems. But we remain wedded to the belief that environmental action can only ever be as sound as the ecological principles on which it is based. Hence, while the remaining chapters are still largely about the principles themselves rather than their application, we believe that the whole of this book is aimed at improving preparedness for addressing the environmental problems of the new millennium.

Ecology's ecological niche

We would be poor ecologists indeed if we did not believe that the principles of ecology apply to all facets of the world around us and all aspects of human endeavor. So, when we wrote the first edition of *Ecology*, it was a generalist book, designed to overcome the opposition of all competing textbooks. Much more recently, we have been persuaded to use our 'big book' as a springboard to produce a smaller, less demanding text, *Essentials of Ecology* (also published by Blackwell Publishing!), aimed especially at the first year of a degree program and at those who may, at that stage, be taking the only ecology course they will ever take.

This, in turn, has allowed us to engineer a certain amount of 'niche differentiation'. With the first years covered by *Essentials*, we have been freer to attempt to make this fourth edition an up-to-date guide to ecology *now* (or, at least, when it was written). To this end, the results from around 800 studies have been newly incorporated into the text, most of them published since the third edition. None the less, we have shortened the text by around 15%, mindful that for many, previous editions have become increasingly overwhelming, and that, clichéd as it may be, less is often more. We have also consciously attempted, while including so much modern work, to avoid bandwagons that seem likely to have run into the buffers by the time many will be using the book. Of course, we may also, sadly, have excluded bandwagons that go on to fulfil their promise.

Having said this, we hope, still, that this edition will be of value to all those whose degree program includes ecology and all who are, in some way, practicing ecologists. Certain aspects of the subject, particularly the mathematical ones, will prove difficult for some, but our coverage is designed to ensure that wherever our readers' strengths lie – in the field or laboratory, in theory or in practice – a balanced and up-to-date view should emerge.

Different chapters of this book contain different proportions of descriptive natural history, physiology, behavior, rigorous laboratory and field experimentation, careful field monitoring and censusing, and mathematical modeling (a form of simplicity that it is essential to seek but equally essential to distrust). These varying proportions to some extent reflect the progress made in different areas. They also reflect intrinsic differences in various aspects of ecology. Whatever progress is made, ecology will

remain a meeting-ground for the naturalist, the experimentalist, the field biologist and the mathematical modeler. We believe that all ecologists should to some extent try to combine all these facets.

Technical and pedagogical features

One technical feature we have retained in the book is the incorporation of marginal es as signposts throughout the text. These, we hope, will serve a number of purposes. In the first place, they constitute a series of subheadings highlighting the detailed structure of the text. However, because they are numerous and often informative in their own right, they can also be read in sequence along with the conventional subheadings, as an outline of each chapter. They should act too as a revision aid for students – indeed, they are similar to the annotations that students themselves often add to their textbooks. Finally, because the marginal notes generally summarize the take-home message of the paragraph or paragraphs that they accompany, they can act as a continuous assessment of comprehension: if you can see that the signpost is the take-home message of what you have just read, then you have understood. For this edition, though, we have also added a brief summary to each chapter, that, we hope, may allow readers to either orient and prepare themselves before they embark on the chapter or to remind themselves where they have just been.

So: to summarize and, to a degree, reiterate some key features of this fourth edition, they are:

- marginal notes throughout the text
- summaries of all chapters
- around 800 newly-incorporated studies
- three new chapters on applied ecology
- a reduction in overall length of around 15%
- a dedicated website (www.blackwellpublishing.com/begon), twinned with that for *Essentials of Ecology*, including interactive mathematical models, an extensive glossary, copies of artwork in the text, and links to other ecological sites
- an up-dating and redrawing of all artwork, which is also available to teachers on a CD-ROM for ease of incorporation into lecture material.

Acknowledgements

Finally, perhaps the most profound alteration to the construction of this book in its fourth edition is that the revision has been the work of two rather than three of us. John Harper has very reasonably decided that the attractions of retirement and grandfatherhood outweigh those of textbook co-authorship. For the two of us who remain, there is just one benefit: it allows us to record publicly not only what a great pleasure it has been to have

collaborated with John over so many years, but also just how much we learnt from him. We cannot promise to have absorbed or, to be frank, to have accepted, every one of his views; and we hope in particular, in this fourth edition, that we have not strayed too far from the paths through which he has guided us. But if readers recognize any attempts to stimulate and inspire rather than simply to inform, to question rather than to accept, to respect our readers rather than to patronize them, and to avoid unquestioning obedience to current reputation while acknowledging our debt to the masters of the past, then they will have identified John's intellectual legacy still firmly imprinted on the text.

In previous editions we thanked the great many friends and colleagues who helped us by commenting on various drafts of the text. The effects of their contributions are still strongly evident in the present edition. This fourth edition was also read by a series of reviewers, to whom we are deeply grateful. Several remained anonymous and so we cannot thank them by name,

but we are delighted to be able to acknowledge the help of Jonathan Anderson, Mike Bonsall, Angela Douglas, Chris Elphick, Valerie Eviner, Andy Foggo, Jerry Franklin, Kevin Gaston, Charles Godfray, Sue Hartley, Marcel Holyoak, Jim Hone, Peter Hudson, Johannes Knops, Xavier Lambin, Svata Louda, Peter Morin, Steve Ormerod, Richard Sibly, Andrew Watkinson, Jacob Weiner, and David Wharton. At Blackwell, and in the production stage, we were particularly helped and encouraged by Jane Andrew, Elizabeth Frank, Rosie Hayden, Delia Sandford and Nancy Whilton.

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Mike Begon
Colin Townsend