

PREFACE TO SECOND EDITION

The first edition of this book was published in 1999. In the 9 years since then, many changes have occurred in the worlds of ecology and entomology. First, and very sadly, the author of the foreword of our first edition, Professor Sir Richard Southwood, died in 2005. Dick was an eminent taxonomist, a classical ecologist and population dynamist, a great diplomat and leader, and a guiding light to many students, academics, and authors alike.

Second, major advances have been made in our understanding of the ecology and evolution of insects, especially in the fields of molecular evolution and systematics. We have completely rewritten much of this second edition to take account of recent changes in these fields. For example, who would have thought back in 1999 that the comfortable and to many, satisfying, place in the Arthropoda occupied by the insects would be considered very different less than a decade later? When the first edition was published, the Insecta sat neatly in the Hexapoda as part of the subphylum Uniramia, along with their clear close relatives the Myriapoda (surely, insects are just millipedes or centipedes with fewer legs?). However, techniques in molecular biology have revealed previously unrecognized relationships among taxa, details about evolutionary pathways, and resulting taxonomic associations that have overthrown our long-accepted comforts. As we explain in detail in Chapter 1, the Insecta now belong in the major group known as the Pan-Crustacea along with the true Crustacea as a sister group. The unfortunate Myriapods appear to be closely related to no-one.

The past decade has seen almost universal acceptance by the scientific community of the role that humans are playing in global climate change and

our second edition reflects that acceptance. For ecologists, climate change represents one of the most important topics for debate and research that has arisen this century. Entomologists, too, have a clear role to play in predicting changes in the distribution and abundance of plant pests and disease vectors. As air currents, precipitation, and temperature change, many insect species will be lost from current geographic areas and gained in others. In Chapter 2, we describe how speckled wood butterflies are moving northwards in the UK while skipper butterflies are moving northward in the USA. What about insect diversity? Despite uncertainty about the future climate, there is concern among some scientists that biodiversity losses could be serious (see Chapter 10). Changing distributions of pest species are already apparent. The western corn rootworm and the Colorado potato beetle are moving further and further into northern Europe (see Chapter 12), while remote areas in Alaska are experiencing range expansions of agricultural and forest pests.

There have also been major advances in the applied entomological fields of disease epidemiology and pest management since the first edition of this book. Emerging diseases vectored by insects such as West Nile virus have gained prominence, whereas old ones, such as malaria and barley yellow dwarf virus, have become even more deleterious despite many attempts at control. Chapter 11 describes in detail how both plant and animal (including human) diseases have continued to proliferate because of the actions of insects as vectors or predispositioning agents, and how keen efforts are being made to reduce or even prevent disease incidence by insect population management. Newer techniques in vector

management are based largely in molecular biology. An example is the manipulation of the mosquito genome to render it immune to the malarial protozoa *Plasmodium*, thus removing the ability of mosquitoes to vector the pathogenic agent. Similarly, modern crop pest management is becoming more and more reliant on genetic techniques. While continuing to refine and improve the efficiency of traditional methods in biological and chemical control, pest managers are now increasingly exploring ways to manipulate crop genomes to outwit insect pests. Chapter 12 discusses the pros and cons of genetic modification of crops to express genes of the highly efficient insecticidal bacterium, *Bacillus thuringiensis*. Like it or not, this technology has a vital role to play in the future of global food production.

The power of evolution by natural selection continues to structure much of what we see in the biological world, and we now know considerably more about its strengths and limitations than we did a decade ago. As we discuss in Chapter 6, it seems that that precise matching of insect herbivore and plant phylogenies might be rarer than we once thought. At the same time, students of insect evolution continue to provide us with wonderful new discoveries (or old discoveries recently brought to the notice of authors such as ourselves). One of the most exciting new inclusions in the second edition of this book is the story of the barnacle predator, *Oedoporena*, described in Chapter 6. This insect has managed to get its own back on what we are now told are its closest relatives, the Crustacea. While not being marine in the true sense of the term, the larvae of this insect are able to kill and eat a truly marine animal, when said animal has the audacity to try to invade a realm of the insects, in this case, the littoral zone of the North American intertidal.

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