

*A Functional Biology
of Parasitism*

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A Functional Biology of Parasitism

Gerald W. Esch and Jacqueline C. Fernández

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A Functional Biology of Parasitism

Ecological and evolutionary implications

Gerald W. Esch and
Jacqueline C. Fernández

*Department of Biology
Wake Forest University
Winston-Salem
North Carolina, USA*



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To Ann and Steve, and our parents.

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Functional Biology Series:

Foreword

Series Editor: Peter Calow, Department of Zoology,
University of Sheffield, England

The main aim of this series will be to illustrate and to explain the way organisms 'make a living' in nature. At the heart of this — their *functional biology* — is the way organisms acquire and then make use of resources in metabolism, movement, growth, reproduction, and so on. These processes will form the fundamental framework of all the books in the series. Each book will concentrate on a particular taxon (species, family, class or even phylum) and will bring together information on the form, physiology, ecology and evolutionary biology of the group. The aim will be not only to describe *how* organisms work, but also to consider *why* they have come to work in that way. By concentration on taxa which are well known, it is hoped that the series will not only illustrate the success of selection, but also show the constraints imposed upon it by the physiological, morphological and developmental limitations of the groups.

Another important feature of the series will be its *organismic orientation*. Each book will emphasize the importance of functional *integration* in the day-to-day lives and the evolution of organisms. This is crucial since, though it may be true that organisms can be considered as collections of gene-determined traits, they nevertheless interact with their environment as integrated wholes and it is in this context that individual traits have been subjected to natural selection and have evolved.

The key features of the series are, therefore:

1. Its emphasis on whole organisms as integrated, resource-using systems.
2. Its interest in the way selection and constraints have moulded the evolution of adaptations in particular taxonomic groups.
3. Its bringing together of physiological, morphological, ecological and evolutionary information.

P. Calow

Preface

It has been interesting to watch the way in which parasitology has evolved as a discipline. When the senior author began his professional career, the ‘hot’ areas were biochemistry and physiology. Then, it shifted to fine structure. After electron microscopy reached its pinnacle, attention was re-focussed on immunology. Seemingly, the emphasis has now moved to molecular biology at the one extreme and modern epidemiology at the other. Over a period of time, it appears that each one of these areas has ‘pulsed’ for a while and then settled somewhat. As trendy as parasitology appears to have been through the years, there also has been a cadre of parasitologists who have worked on the ecological aspects of parasitism. Interest in this approach was small initially, but it has grown considerably over the past three decades.

Workers in ecological parasitology have adopted many of the ‘tools’ and approaches taken by those working on free-living populations and communities. Always, however, these investigators have had to contend with the one problem not faced by those using free-living systems – the habitats in which their study organisms reside during most of their lifetimes are alive and potentially capable of mounting a powerful defence.

There are several, very good, general parasitology texts currently available. In addition, a number of specialized volumes also have been published recently on topics ranging from the molecular biology of parasitism to the community ecology of parasites. Many of these volumes have been well received if their reviews are any indication. Sixteen years ago, C.R. Kennedy wrote a book entitled *Ecological Parasitology*. For students and faculty working on the ecology of host–parasite systems, it was required reading. Peter Price’s volume *The Evolutionary Biology of*

Parasitism, was published 5 years after Kennedy's and it too was a significant contribution. Then, in 1982, Klaus Rohde's *The Ecology of Marine Parasites* was published and was well received. Unfortunately, nothing of a broad scope has been published on the ecological aspects of parasitism in more recent years. This area has emerged as an exciting field for a growing number of parasitologists. In part because so little of a broad sweep has been written recently, and because of the substantial increase in literature in ecological parasitology, we undertook the task of writing this book. The primary aim is to provide a functional view of parasitism within an ecological context. Most of the effort was directed at endoparasitic helminths, primarily because most of the literature pertains to this group of organisms.

The book was written with the assumption that an undergraduate or a graduate student could handle both the ecology and the parasitology without an extensive background in either discipline. This is why, for example, life cycles of most of the parasites mentioned are illustrated in brief, without extensive elaboration on the details of morphology, intrahost migration, etc. We also believe the information in the book will be useful to the practising ecologist or parasitologist, regardless of their background or training. The book was written so that the teacher of parasitology could perhaps use the information as the basis for a section on ecology in a course in general parasitology.

There are several people whom we would like to thank most sincerely for their help along the way. There is Tim Goater who began the project with us, but had to pull out because of the pressure of teaching in his new and exciting job at Malaspina College in British Columbia. We want to thank Scott and Liz Snyder, Eric Wetzel, and Mohamed Abdel-Meguid for reading the various chapters and offering us the benefit of their very constructive criticisms. Dr. John Aho provided several comments for the section dealing with the population genetics of host-parasite systems. Next, we thank Zella Johnson and Cindy Davis for their secretarial help, especially when it came to securing all those permissions to reproduce from authors and publishers. The information contained in Table 7.1 was assembled by Dale Edwards as part of an 'open book' question for his preliminary examination for the PhD degree here at Wake Forest and we thank him for this special effort. Kym C. Jacobson was most helpful in preparing the photographs and we are grateful. Finally, we want to thank Phillippa MacBain and Helena Watson at Chapman & Hall for their assistance and especially Peter Calow for agreeing that the idea for such an approach was appropriate for his Functional Biology series.

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