

PARASITOID POPULATION BIOLOGY



Edited by
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Parasitoid Population Biology

Michael E. Hochberg, Anthony R. Ives



Parasitoid Population Biology:

Parasitoid Population Biology Michael E. Hochberg, Anthony R. Ives, 2021-05-11 Extraordinary in the diversity of their lifestyles insect parasitoids have become extremely important study organisms in the field of population biology and they are the most frequently used agents in the biological control of insect pests This book presents the ideas of seventeen international specialists providing the reader not only with an overview but also with lively discussions of the most salient questions pertaining to the field today and prescriptions for avenues of future research After a general introduction the book divides into three main sections population dynamics population diversity and population applications The first section covers gaps in our knowledge in parasitoid behavior parasitoid persistence and how space and landscape affect dynamics The contributions on population diversity consider how evolution has molded parasitoid populations and communities The final section calls for novel approaches toward resolving the enigma of success in biological control and questions why parasitoids have been largely neglected in conservation biology Parasitoid Population Biology will likely be an important influence on research well into the twenty first century and will provoke discussion amongst parasitoid biologists and population biologists In addition to the editors the contributors are Carlos Bernstein Jacques Brodeur Jerome Casas H C J Godfray Susan Harrison Alan Hastings Bradford A Hawkins George E Heimpel Marcel Holyoak Nick Mills Bernard D Roitberg Jens Roland Michael R Strand Teja Tscharntke and Minus van Baalen

Population Biology Alan Hastings, 1996-12-13 Population biology has been investigated quantitatively for many decades resulting in a rich body of scientific literature Ecologists often avoid this literature put off by its apparently formidable mathematics This textbook provides an introduction to the biology and ecology of populations by emphasizing the roles of simple mathematical models in explaining the growth and behavior of populations The author only assumes acquaintance with elementary calculus and provides tutorial explanations where needed to develop mathematical concepts Examples problems extensive marginal notes and numerous graphs enhance the book's value to students in classes ranging from population biology and population ecology to mathematical biology and mathematical ecology The book will also be useful as a supplement to introductory courses in ecology

Encapsulation and host-parasitoid population biology H C J. Godfray, M P. Hassell, 1991

Consumer-resource Dynamics William W. Murdoch, Cheryl J. Briggs, Roger M. Nisbet, 2003-05-26 Despite often violent fluctuations in nature species extinction is rare California red scale a potentially devastating pest of citrus has been suppressed for fifty years in California to extremely low yet stable densities by its controlling parasitoid Some larch budmoth populations undergo extreme cycles others never cycle In *Consumer Resource Dynamics* William Murdoch Cheryl Briggs and Roger Nisbet use these and numerous other biological examples to lay the groundwork for a unifying theory applicable to predator prey parasitoid host and other consumer resource interactions Throughout the focus is on how the properties of real organisms affect population dynamics The core of the book synthesizes and extends the authors own models involving insect parasitoids and their hosts and explores in depth

how consumer species compete for a dynamic resource The emerging general consumer resource theory accounts for how consumers respond to differences among individuals in the resource population From here the authors move to other models of consumer resource dynamics and population dynamics in general Consideration of empirical examples key concepts and a necessary review of simple models is followed by examination of spatial processes affecting dynamics and of implications for biological control of pest organisms The book establishes the coherence and broad applicability of consumer resource theory and connects it to single species dynamics It closes by stressing the theory's value as a hierarchy of models that allows both generality and testability in the field

Parasitoids H. C. J. Godfray, 1994-01-16 Parasitoids lay their eggs on or in the bodies of other species of insect and the parasitoid larvae develop by feeding on the host causing its eventual death Known for a long time to applied biologists for their importance in regulating the population densities of economic pests parasitoids have recently proven to be valuable tools in testing many aspects of evolutionary theory This book synthesizes the work of both schools of parasitoid biology and asks how a consideration of evolutionary biology can help us understand the behavior ecology and diversity of the approximately one to two million species of parasitoid found on earth After a general introduction to parasitoid natural history and taxonomy the first part of the book treats the different components of the reproductive strategy of parasitoids searching for a host host selection clutch size and the sex ratio Subsequent chapters discuss pathogens and non Mendelian genetic elements that affect sexual reproduction evolutionary aspects of the physiological interactions between parasitoid and host mating strategies life history theory and community ecology A special effort is made to discuss the theoretical background to the subject but without the use of mathematics

Behavioral Ecology of Insect Parasitoids Eric Wajnberg, Carlos Bernstein, Jacques van Alphen, 2008-04-30 Written by a team of leading international specialists Behavioral Ecology of Insect Parasitoids examines the optimal behaviors that parasitoids exhibit in order to maximize long term offspring production It is an essential reference for research scientists and students studying these fascinating insects or for anyone involved in using parasitoids in biological control programs Reviews topical issues including cutting edge research on parasitoid decision making and the implications for biological control Explores applications in other fields provides information on the latest research methods and includes helpful case studies and statistical tools Creates a deeper understanding of the link between behavioural strategies and host mortality resulting in more efficient selective pest management programs Overall this is a fascinating volume that provides a significant contribution to the literature on parasitoid insects It goes a long way toward providing insights into numerous aspects of parasitoid behavior and will stimulate a diversity of future projects something that should be the goal of any such text I highly recommend Wajnberg et al for all of those working on the biology or evolution of parasitoids Palaios 2009

Applied Population Biology S.K. Jain, L.W. Botsford, 2007-07-23 An increasing variety of biological problems involving resource management conservation and environmental quality have been dealt with using the principles of population biology defined

to include population dynamics genetics and certain aspects of community ecology There appears to be a mixed record of successes and failures and almost no critical synthesis or reviews that have attempted to discuss the reasons and ways in which population biology with its remarkable theoretical as well as experimental advances could find more useful application in agriculture forestry fishery medicine and resource and environmental management This book provides examples of state of the art applications by a distinguished group of researchers in several fields The diversity of topics richly illustrates the scientific and economic breadth of their discussions as well as epistemological and comparative analyses by the authors and editors Several principles and common themes are emphasized and both strengths and potential sources of uncertainty in applications are discussed This volume will hopefully stimulate new interdisciplinary avenues of problem solving research

Pattern and Process in Host-Parasitoid Interactions Bradford A. Hawkins, 1994-07-28 How is the staggering biodiversity of the parasitoid insects maintained This book first published in 1994 explores patterns in host parasitoid interactions including parasitoid community richness the importance of parasitoids as mortality factors and their impact on host densities as determined by the outcomes of parasitoid introductions for biological control It documents general patterns using data sets generated from the global literature and evaluates potential underlying biological ecological and evolutionary mechanisms A theme running throughout the book is the importance of host refuges as a major constraint on host parasitoid interactions Much can be learnt from the analysis of broad patterns a few simple rules can go a long way in explaining the major components of these interactions This book will be an invaluable resource for researchers interested in community ecology population biology entomology and biological control *Parasitoid Community Ecology* Bradford A.

Hawkins, William Sheehan, 1994 The study of parasitoid communities has direct relevance to general ecological theory and to the applied practice of biological control Yet despite the existence of a large and active international research community involved in the study of parasitoids until now no books devoted to the theme of parasitoid community ecology have been available Here with a healthy mix of general discussions and specific examples such as tortricids and weevils the authors constructively review and evaluate our understanding of these often very complex systems The book emphasizes basic science linking the discussion to wider areas such as population dynamics food webs competition and community structure The more applied end of the subject is covered in a section exclusively devoted to biological control This book the first to deal entirely with ecological aspects of parasitoid biology offers summaries of the state of the field by leading researchers and identifies critical areas in need of further investigation Students researchers and teachers in the field of ecology animal behavior entomology forestry and agriculture will all want to have a copy of the book on their shelves **The Spatial and**

Temporal Dynamics of Host-Parasitoid Interactions Michael Hassell, 2000-06-08 This book examines our current understanding of the population dynamics of one kind of interaction that between insect parasitoids and their hosts Parasitoids are amongst the most abundant of all animals and make up about 10% or more of metazoan species Almost no

insect species escape their attack Host parasitoid interactions were first modelled over fifty years ago but for many years there was little good empirical information on the important factors that affect host and parasitoid populations The models were very simple and their predictions rather divorced from the complexity of what was visible in the field Now better data is available on many components of host parasitoid systems from field observations and laboratory and field experiments and this allows a much closer correspondence between models and data In particular the past twenty years have seen major advances in our understanding of how host parasitoid interactions are influenced by spatial processes by age structure effects and by competition from additional host and parasitoid species The result is a body of theory that makes direct contact with real systems in the field and provides us with a detailed understanding of what underpins a whole area of population dynamics In this book Michael P Hassell pulls the theory and field data together to present an elegant illustration of the way in which ecological studies advance

Chemical Ecology of Insect Parasitoids Eric Wajnberg, Stefano Colazza, 2013-03-15 Insect parasitoids are a fascinating group of animals in many respects Perhaps the most fascinating point is that these insects in the course of the evolutionary time have developed an impressive way to use chemical compounds to dialogue with the different protagonists of their environment i e conspecifics their hosts and the plants on which their hosts are living Unravelling the evolutionary meaning of such chemical communication networks can give new insights into the ecology of these insects and especially on how to improve their use for the control of noxious pests in biological control programmes Chemical Ecology of Insect Parasitoids is a timely publication with organised chapters to present the most important knowledge and discoveries that have taken place over the last decade and their potential use in pest control strategy Specific relevant case studies are presented to enhance the reader s experience Suited to graduate students and professional researchers and practitioners in pest management entomology evolutionary biology behavioural ecology and chemical ecology this book is essential for anyone needing information on this important group of insects

The Braconid and Ichneumonid Parasitoid Wasps Donald L. J. Quicke, 2015-01-20 The Ichneumonoidea is a vast and important superfamily of parasitic wasps with some 60 000 described species and estimated numbers far higher especially for small bodied tropical taxa The superfamily comprises two cosmopolitan families Braconidae and Ichneumonidae that have largely attracted separate groups of researchers and this to a considerable extent has meant that understanding of their adaptive features has often been considered in isolation This book considers both families highlighting similarities and differences in their adaptations The classification of the whole of the Ichneumonoidea along with most other insect orders has been plagued by typology whereby undue importance has been attributed to particular characters in defining groups Typology is a common disease of traditional taxonomy such that until recently quite a lot of taxa have been associated with the wrong higher clades The sheer size of the group and until the last 30 or so years lack of accessible identification materials has been a further impediment to research on all but a handful of lab rat species usually cultured initially because of their potential in biological

control New evidence largely in the form of molecular data have shown that many morphological behavioural physiological and anatomical characters associated with basic life history features specifically whether wasps are ecto or endoparasitic or idiobiont or koinobiont can be grossly misleading in terms of the phylogeny they suggest This book shows how with better supported phylogenetic hypotheses entomologists can understand far more about the ways natural selection is acting upon them This new book also focuses on this superfamily with which the author has great familiarity and provides a detailed coverage of each subfamily emphasising anatomy taxonomy and systematics biology as well as pointing out the importance and research potential of each group Fossil taxa are included and it also has sections on biogeography global species richness culturing and rearing and preparing specimens for taxonomic study The book highlights areas where research might be particularly rewarding and suggests systems groups that need investigation The author provides a large compendium of references to original research on each group This book is an essential workmate for all postgraduates and researchers working on ichneumonoid or other parasitic wasps worldwide It will stand as a reference book for a good number of years and while rapid advances in various fields such as genomics and host physiological interactions will lead to new information as an overall synthesis of the current state it will stay relevant for a long time Biology, Ecology and Systematics of

Australian Scelio Paul Dangerfield, Andrew Austin, Graeme Baker, 2001-12-01 Parasitic wasps of the genus Scelio play an important role in the regulation of orthopteran populations and are implicated in suppressing numbers of numerous pest locusts and grasshoppers This landmark volume provides a full taxonomic treatment of the sixty species of Scelio found on the Australian continent and reviews in detail the biology and ecology and host relationships of Scelio on a worldwide basis Taking an international perspective the text outlines our current knowledge on topics such as host finding population biology and methods and techniques for collection and study in the field The use of Scelio as biological control agents is discussed and comprehensive checklists document the recorded host relationships of each known species worldwide There is a full taxonomic revision of all Australian species of Scelio half of which are newly described Each species description is complemented with high quality line drawings micrographs and distribution maps In addition an illustrated key to species enables easy identification of species by non taxonomists Biology Ecology and Systematics of Australian Scelio provides wasp taxonomists researchers of orthoptera and biological control workers with a basis for detailed studies elsewhere on this economically important group of insects *Sperm Competition and Its Evolutionary Consequences in the Insects* Leigh W.

Simmons, 2001-11-11 One hundred years after Darwin considered how sexual selection shapes the behavioral and morphological characteristics of males for acquiring mates Parker realized that sexual selection continues after mating through sperm competition Because females often mate with multiple males before producing offspring selection favors adaptations that allow males to preempt sperm from previous males and to prevent their own sperm from preemption by future males Since the 1970s this area of research has seen exponential growth and biologists now recognize sperm

competition as an evolutionary force that drives such adaptations as mate guarding genital morphology and ejaculate chemistry across all animal taxa The insects have been critical to this research and they still offer the greatest potential to reveal fully the evolutionary consequences of sperm competition This book analyzes and extends thirty years of theoretical and empirical work on insect sperm competition It considers both male and female interests in sperm utilization and the sexual conflict that can arise when these differ It covers the mechanics of sperm transfer and utilization morphology physiology and behavior Sperm competition is shown to have dramatic effects on adaptation in the context of reproduction as well as far reaching ramifications on life history evolution and speciation Written by a top researcher in the field this comprehensive up to date review of the evolutionary causes and consequences of sperm competition in the insects will prove an invaluable reference for students and established researchers in behavioral ecology and evolutionary biology

Animal Contests Ian C. W. Hardy, Mark Briffa, 2013-05-30 Contests are an important aspect of the lives of diverse animals from sea anemones competing for space on a rocky shore to fallow deer stags contending for access to females Why do animals fight What determines when fights stop and which contestant wins Addressing fundamental questions on contest behaviour this volume presents theoretical and empirical perspectives across a range of species The historical development of contest research the evolutionary theory of both dyadic and multiparty contests and approaches to experimental design and data analysis are discussed in the first chapters This is followed by reviews of research in key animal taxa from the use of aerial displays and assessment rules in butterflies and the developmental biology of weapons in beetles through to interstate warfare in humans The final chapter considers future directions and applications of contest research making this a comprehensive resource for both graduate students and researchers in the field

Ecological Engineering for Pest Management Geoff M Gurr, Steve D Wratten, Miguel A Altieri, 2004-08-03 Ecological engineering is about manipulating farm habitats making them less favourable for pests and more attractive to beneficial insects Though they have received far less research attention and funding ecological approaches may be safer and more sustainable than their controversial cousin genetic engineering This book brings together contributions from international workers leading the fast moving field of habitat manipulation reviewing the field and paving the way towards the development and application of new pest management approaches Chapters explore the frontiers of ecological engineering methods including molecular approaches high tech marking and remote sensing They also review the theoretical aspects of this field and how ecological engineering may interact with genetic engineering The technologies presented offer opportunities to reduce crop losses to insects while reducing the use of pesticides and providing potentially valuable habitat for wildlife conservation With contributions from the USA UK Germany Switzerland Australia New Zealand Kenya and Israel this book provides comprehensive coverage of international progress towards sustainable pest management

Natural Enemies Ann E. Hajek, 2004-02-12 Introductory text covering biological control of arthropods vertebrates weeds and plant pathogens by natural enemies

Theoretical

Approaches to Biological Control Bradford A. Hawkins, Howard V. Cornell, 2008-10-14 Biological control is the suppression of pest populations using predators parasitoids and pathogens Historically biological control has largely been on a trial and error basis and has failed more often than it has succeeded However by developing theories based upon fundamental population principles and the biological characteristics of the pest and agent we can gain a much better understanding of when and how to use biological control This book gathers together recent theoretical developments and provides a balanced guide to the important issues that need to be considered in applying ecological theory to biological control It will be a source of productive and stimulating thought for all those interested in pest management theoretical ecology and population biology

Insects as Natural Enemies Mark Jervis, 2005-05-25 Over the past three decades there has been a dramatic increase in theoretical and practical studies on insect natural enemies The appeal of insect predators and parasitoids in particular as research animals derives from the relative ease with which many species may be cultured and experimented with in the laboratory the simple life cycles of most parasitoids and the increasing demand for biological pest control There is now a massive literature on insect natural enemies so there is a great need for a general text that the enquiring student or research worker can use in deciding on approaches and techniques that are appropriate to the study and evaluation of such insects This book fulfils that demand A considerably updated and expanded version of a previous best seller it is an account of major aspects of the biology of predators and parasitoids punctuated with information and advice on which experiments or observations to conduct and how to carry them out Guidance is provided where necessary on the literature that may need to be consulted on particular topics While researchers can now refer to several books on parasitoids and predators *Insects as Natural Enemies* is unique in emphasising practicalities It is aimed at students and professional working in universities and both government and commercial institutes in the fields of pest management agriculture horticulture and forestry

Insects as Natural Enemies Mark A. Jervis, 2007-09-07 Over the past three decades there has been a dramatic increase in theoretical and practical studies on insect natural enemies This considerably updated and expanded version of a previous best seller is an account of major aspects of the biology of predators and parasitoids punctuated with information and advice on which experiments or observations to conduct and how to carry them out It emphasizes practicalities and also provides guidance on further literature

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Parasitoid Population Biology Introduction

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