

# Evolutionary Ecology

*The Trinidadian Guppy*

Anne E. Magurran



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# Evolutionary Ecology The Trinidadian Guppy

**Carin Magnhagen, Victoria A.  
Braithwaite, Elisabet Forsgren, B. G.  
Kapoor**



## **Evolutionary Ecology The Trinidadian Guppy:**

*Evolutionary Ecology* Anne E. Magurran, 2005 The Trinidadian guppy represents a uniquely tractable vertebrate system which has raised key questions in evolutionary ecology and supplied many of the answers This work discusses this study and incorporates significant new findings and insights Evolutionary Ecology of Host-parasite Interactions in the Trinidadian Guppy (Poecilia Reticulata) Felipe Pérez Jvostov, 2015 Some of the most extraordinary examples of adaptive evolution are the result of the interactions between hosts and their parasites Although this so called arms race between host defense and parasite virulence can have direct implications for host fecundity and survival current research shows that parasitic infections can also change host behavioral and physiological traits Hosts face multiple threats at any give time Other natural enemies like predators and competitors can also reduce host survival Thus host parasite adaptations may not only influence non host species but may simultaneously be influenced by their interaction with other natural enemies The role of parasites in modulating multi species interactions has received increased attention recently yet the majority of examples come from single case studies The aim of this dissertation is to fill this gap by using a model organism in evolutionary biology the Trinidadian guppy First I start by broadly differentiating between generalist and specialist parasites and review the mechanisms by which both can influence non host species at ecological and evolutionary time scales This distinction has been extensively studied in relation to the evolution of virulence but its ecological relevance has been largely neglected Second I consider how the particular interactions between guppies and their specialist ectoparasite Gyrodactylus are influenced by guppy adaptation to predation high vs low across multiple rivers in Trinidad I found strong and repeatable differences between guppies from different rivers and their capacity to limit Gyrodactylus infections but found no differences between predation environments Nonetheless a consistent reduction in the growth of guppies exposed to Gyrodactylus was evident potentially due to the energetic cost associated with the activation and maintenance of an immune response to fight Gyrodactylus infections These results suggest a divergence in guppy Gyrodactylus coevolutionary trajectories among rivers higher resistance and higher virulence vs lower resistance and lower virulence and highlight that population evolutionary history i e genetic makeup founder effects genetic bottle necks etc and not predation strongly influence the intensity and direction of host parasite coevolution in this system Finally I explore how Gyrodactylus can modify the interaction between guppies and their natural enemy Rivulus hartii I found that although Gyrodactylus can strongly reduce guppy growth infection does not significantly modify guppy Rivulus interactions particularly because guppies can fine tune their phenotype when simultaneously facing multiple enemies These results demonstrate that hosts have the capacity to mediate and even mitigate any potential ecological effects that parasites could have on the broader community Understanding the mechanisms by which parasites can influence non host species has become a major goal in evolutionary ecology However the complexity of natural communities environmental heterogeneity and host evolutionary history can have strong and many times

unexpected effects on host parasite interactions The results I present here are a vivid example of such a natural community Using a combination of experimental work and field manipulation I demonstrate that Gyrodactylus can have strong effects on host life history traits but that these effects do not necessarily influence non host species largely because of host capacity to limit such effects I believe my work has laid the foundations for future research on the ecological relevance of Gyrodactylus as I was the first to investigate how guppy Gyrodactylus coevolution could potentially influence the coexisting fauna

*Evolutionary Ecology*, 1977      **Ecology and Evolution of Poeciliid Fishes** Jonathan P. Evans, Andrea Pilastro, Ingo Schlupp, 2011-09-26 The history of biology is populated by numerous model species or organisms But few vertebrate groups have aided evolutionary and ecological research more than the live bearing fishes of the family Poeciliidae Found throughout tropical and subtropical waters poeciliids exhibit a fascinating variety of reproductive specializations including viviparity matrotrophy unisexual reproduction and alternative mating strategies making them ideal models for research on patterns and processes in ecology behavior and evolution Ecology and Evolution of Poeciliid Fishes is a much needed overview of the scientific potential and understanding of these live bearing fishes Chapters by leading researchers take up a wide range of topics including the evolution of unisexual reproduction life in extreme environments life history evolution and genetics Designed to provide a single and highly approachable reference Ecology and Evolution of Poeciliid Fishes will appeal to students and specialists interested in all aspects of evolutionary ecology      *Quantitative Ecology and Evolutionary Biology* Otso Ovaskainen, Henrik Johan de Knecht, Maria del Mar Delgado, 2016-09-01 This novel interdisciplinary text achieves an integration of empirical data and theory with the aid of mathematical models and statistical methods The emphasis throughout is on spatial ecology and evolution especially on the interplay between environmental heterogeneity and biological processes The book provides a coherent theme by interlinking the modelling approaches used for different subfields of spatial ecology movement ecology population ecology community ecology and genetics and evolutionary ecology each being represented by a separate chapter Each chapter starts by describing the concept of each modelling approach in its biological context goes on to present the relevant mathematical models and statistical methods and ends with a discussion of the benefits and limitations of each approach The concepts and techniques discussed throughout the book are illustrated throughout with the help of empirical examples This is an advanced text suitable for any biologist interested in the integration of empirical data and theory in spatial ecology evolution through the use of quantitative statistical methods and mathematical models The book will also be of relevance and use as a textbook for graduate level courses in spatial ecology ecological modelling theoretical ecology and statistical ecology      **Evolutionary Biomechanics** Graham K. Taylor, Adrian L. R. Thomas, 2014 Recent research in biomechanics is increasingly revealing a set of special cases where universal physical laws constrain the trajectories and more controversially even the endpoints of the evolutionary process For the first time this book brings together a broad range of examples from the latest research in evolutionary biomechanics to examine this

phenomenon Each chapter follows a similar theme dealing first with the underlying physics and then examining the biological responses to selection Examples of convergent evolution are used to analyse the nature of the trajectories of adaptation during the progressive approach towards a physically defined optimum This advanced textbook is suitable for graduate level students as well as professional researchers in the fields of biomechanics physiology evolutionary biology and palaeontology It will also be of relevance and use to researchers in the physical sciences and engineering

**Reproductive Biology of Teleost Fishes** Robert J. Wootton, Carl Smith, 2014-10-17 Reproductive Biology of Teleost Fishes is the first integrated review of the reproductive biology of the bony fishes which are the most species rich and diversified group of vertebrates Teleosts display remarkable variation in their modes of reproduction and this volume is intended to provide a framework for understanding the remarkable reproductive diversity of this group It describes their reproductive biology using wherever possible phylogenetic analyses and life history theory as a means to interpret the information The book addresses the genetic physiological behavioural ecological evolutionary and applied aspects of teleost reproduction in a comparative framework that emphasises the adaptive basis of reproductive diversity Reproductive Biology of Teleost Fishes provides a comprehensive synthesis of fish reproduction that will be of great interest to life scientists particularly ecologists evolutionary biologists physiologists and advanced undergraduates postgraduates and research workers requiring a comprehensive overview of fish reproduction The book is suitable for courses in fish biology and ecology reproductive physiology and reproductive genetics It also addresses applied questions and will be of value for courses on fisheries science and aquaculture Libraries in all universities and research establishments where biological sciences fisheries science and aquaculture are studied and taught should have several copies of this important book on their shelves

The Evolutionary Biology of Species Timothy G. Barraclough, 2019-06-20 Species are central to understanding the origin and dynamics of biological diversity explaining why lineages split into multiple distinct species is one of the main goals of evolutionary biology However the existence of species is often taken for granted and precisely what is meant by species and whether they really exist as a pattern of nature has rarely been modelled or critically tested This novel book presents a synthetic overview of the evolutionary biology of species describing what species are how they form the consequences of species boundaries and diversity for evolution and patterns of species accumulation over time The central thesis is that species represent more than just a unit of taxonomy they are a model of how diversity is structured as well as how groups of related organisms evolve The author adopts an intentionally broad approach stepping back from the details to consider what species constitute both theoretically and empirically and how we detect them drawing on a wealth of examples from microbes to multicellular organisms

**Conceptual Breakthroughs in Evolutionary Ecology** Laurence Mueller, 2019-11-19 Although biologists recognize evolutionary ecology by name many only have a limited understanding of its conceptual roots and historical development Conceptual Breakthroughs in Evolutionary Ecology fills that knowledge gap in a thought provoking and

readable format Written by a world renowned evolutionary ecologist this book embodies a unique blend of expertise in combining theory and experiment population genetics and ecology Following an easily accessible structure this book encapsulates and chronologizes the history behind evolutionary ecology It also focuses on the integration of age structure and density dependent selection into an understanding of life history evolution Covers over 60 seminal breakthroughs and paradigm shifts in the field of evolutionary biology and ecology Modular format permits ready access to each described subject Historical overview of a field whose concepts are central to all of biology and relevant to a broad audience of biologists science historians and philosophers of science **Fish Behaviour** Carin Magnhagen, Victoria A.

Braithwaite, Elisabet Forsgren, B. G. Kapoor, 2008-01-09 Fishes are by far the most species rich vertebrate taxon and it is also the vertebrate group with the most strikingly diverse repertoire of behaviours and behavioural adaptations As such they provide us with many opportunities to explore the fascinating complexities of animal behaviour Central questions addressed in this book include How do se **Computational Molecular Evolution** Ziheng Yang, 2006-10-05 The field of molecular evolution has experienced explosive growth in recent years due to the rapid accumulation of genetic sequence data continuous improvements to computer hardware and software and the development of sophisticated analytical methods The increasing availability of large genomic data sets requires powerful statistical methods to analyse and interpret them generating both computational and conceptual challenges for the field Computational Molecular Evolution provides an up to date and comprehensive coverage of modern statistical and computational methods used in molecular evolutionary analysis such as maximum likelihood and Bayesian statistics Yang describes the models methods and algorithms that are most useful for analysing the ever increasing supply of molecular sequence data with a view to furthering our understanding of the evolution of genes and genomes The book emphasizes essential concepts rather than mathematical proofs It includes detailed derivations and implementation details as well as numerous illustrations worked examples and exercises It will be of relevance and use to students and professional researchers both empiricists and theoreticians in the fields of molecular phylogenetics evolutionary biology population genetics mathematics statistics and computer science Biologists who have used phylogenetic software programs to analyze their own data will find the book particularly rewarding although it should appeal to anyone seeking an authoritative overview of this exciting area of computational biology The Evolution and Emergence of RNA Viruses Edward C. Holmes, 2009-06-25 RNA viruses provide unique insights into the patterns and processes of evolutionary change in real time The study of viral evolution is especially topical given the growing awareness that emerging and re emerging diseases most of which are caused by RNA viruses represent a major threat to public health However while the study of viral evolution has developed rapidly in the last 30 years relatively little attention has been directed toward linking work on the mechanisms of viral evolution within cells or individual hosts to the epidemiological outcomes of these processes This novel book fills this gap by considering the patterns and processes of viral evolution across

their entire range of spatial and temporal scales The Evolution and Emergence of RNA Viruses provides a comprehensive overview of RNA virus evolution with a particular focus on genomic and phylogenetic approaches This is the first book to link mechanisms of viral evolution with disease dynamics using high profile examples in emergence and evolution such as influenza HIV dengue fever and rabies It also reveals the underlying evolutionary processes by which emerging viruses cross species boundaries and spread in new hosts

**Ecological Speciation** Patrik Nosil, 2012-03-15 It then reviews the three components of ecological speciation and discusses the geography and genomic basis of the process

Biological Invasions and Animal Behaviour Judith S. Weis, Daniel Sol, 2016-10-13 How does behaviour affect biological invasions Can it explain

why some animals are such successful invaders With contributions from experts in the field and covering a broad range of animals this book examines the role of behaviour in biological invasions from the point of view of both invaders and native species The chapters cover theoretical aspects particularly relevant behaviours and well documented case studies showing that behaviour is critical to the success and ecological and socio economic impact of invasive species Its insights suggest methods to prevent and mitigate those impacts and offer unique opportunities to understand the adaptive role of behaviour Offering a comprehensive overview of current understanding on the subject the book is intended for biological invasion researchers and behavioural ecologists as well as ecologists and evolutionary biologists interested in how organisms deal with anthropogenic environmental changes such as climate change and habitat loss

The Evolutionary Strategies that Shape Ecosystems J. Philip Grime, Simon Pierce, 2012-03-26 THE EVOLUTIONARY STRATEGIES THAT SHAPE ECOSYSTEMS

In 1837 a young Charles Darwin took his notebook wrote I think and then sketched a rudimentary stick like tree Each branch of Darwin s tree told a story of survival and adaptation adaptation of animals and plants not just to the environment but also to life with other living things However more than 150 years since Darwin published his singular idea of natural selection the science of ecology has yet to account for how contrasting evolutionary outcomes affect the ability of organisms to coexist in communities and to regulate ecosystem functioning In this book Philip Grime and Simon Pierce explain how evidence from across the world is revealing that beneath the wealth of apparently limitless and bewildering variation in detailed structure and functioning the essential biology of all organisms is subject to the same set of basic interacting constraints on life history and physiology The inescapable resulting predicament during the evolution of every species is that according to habitat each must adopt a predictable compromise with regard to how they use the resources at their disposal in order to survive The compromise involves the investment of resources in either the effort to acquire more resources the tolerance of factors that reduce metabolic performance or reproduction This three way trade off is the irreducible core of the universal adaptive strategy theory which Grime and Pierce use to investigate how two environmental filters selecting respectively for convergence and divergence in organism function determine the identity of organisms in communities and ultimately how different evolutionary strategies affect the functioning of ecosystems This book refl ects an historic phase in

which evolutionary processes are finally moving centre stage in the effort to unify ecological theory and animal plant and microbial ecology have begun to find a common theoretical framework Companion website This book has a companion website [www.wiley.com/go/grimeevolutionarystrategies](http://www.wiley.com/go/grimeevolutionarystrategies) with Figures and Tables from the book for downloading

**Principles of Animal Behavior, 4th Edition** Lee Alan Dugatkin, 2020-01-15 Since the last edition of this definitive textbook was published in 2013 much has happened in the field of animal behavior In this fourth edition Lee Alan Dugatkin draws on cutting edge new work not only to update and expand on the studies presented but also to reinforce the previous editions focus on ultimate and proximate causation as well as the book s unique emphasis on natural selection learning and cultural transmission The result is a state of the art textbook on animal behavior that explains underlying concepts in a way that is both scientifically rigorous and accessible to students Each chapter in the book provides a sound theoretical and conceptual basis upon which the empirical studies rest A completely new feature in this edition are the Cognitive Connection boxes in Chapters 2-17 designed to dig deep into the importance of the cognitive underpinnings to many types of behaviors Each box focuses on a specific issue related to cognition and the particular topic covered in that chapter As Principles of Animal Behavior makes clear the tapestry of animal behavior is created from weaving all of these components into a beautiful whole With Dugatkin s exquisitely illustrated comprehensive and up to date fourth edition we are able to admire that beauty anew

Genotype-by-Environment Interactions and Sexual Selection John Hunt, David J. Hosken, 2014-09-03 Sexual selection is recognized as being responsible for some of the most extravagant morphologies and behaviors in the natural world as well as a driver of some of the most rapid evolution While Charles Darwin s theory is now a fundamental component of modern evolutionary biology the impact of genotype by environment interactions on sexual selection has thus far received little attention This book represents the first comprehensive analysis of the role genotype by environment interactions play in sexual selection and the potential implications that they have for the evolutionary process The Editors have identified 13 topics that currently define the field and shed light on the impacts of these interactions on sexual selection This includes key topics such as resolving the lek paradox and how genotype by environmental interactions can compromise the honesty of sexual signals The volume also outlines key questions that remain unanswered and provides a comprehensive guide to analyzing genotype by environment interactions The mix of theory empirical studies and practical instructions from world leading experts make this book a particularly potent and definitive guide on the topic It will be of interest to evolutionary biologists spanning from genomicists to behaviorists This is a very timely book covering a topic that should change the way we think about sexual selection The contributors are all leaders and the topics should provide guidance to many PhD projects in the years to come GEI is increasingly shown to be important and it seems likely that it is critical in species where sexual selection is operating This book is likely to help revitalize the study of sexual selection Professor Allen Moore The University of Georgia GEIs fascinate evolutionary biologists but the unique consequences for sexually selected traits have been



neglected until now This multi authored book comprehensively explains key theoretical concepts handles practical how to issues and uses classic case studies to illustrate the value of studying GEIs It is a must read for everyone interested in sexual selection Professor Michael Jennions The Australian National University

**Evolutionary Ecology of Neotropical Freshwater Fishes** T.M. Zaret, 2013-11-09 In August of 1980 near the whistlestop of Maltby Surely we would plead the U S A a wealthy Washington Don Stewart and I met in my rented nation can fund our proposal if only as a gesture of house trailer to sketch a proposal to the National support to foreign scientists Somehow however Science Foundation Our goal was simple to re we seemed to miss deadlines fall in between the quest from the Foundation air fare and per diem for cracks and miss the right connections It was not approximately 20 Latin American scientists to at until May 1982 several weeks before the proposed tend a workshop entitled the Systematics and workshop that we realized we could not find any Evolutionary Ecology of Neotropical Freshwater funds for bringing Latin American scientists to the Fishes that would follow the 1982 ASIH Ameri U S The programs for the meeting had been can Society of Ichthyologists and Herpetologists printed the meal coupons banquet tickets and all meeting We had presented an initial outline for our the other amenities that come with a professional proposal to a number of colleagues in June of 1980 meeting were ready but we had no Latin American at the ASIH meeting at Texas Christian University ichthyologists as participants Some abstracts were in Fort Worth Texas The steering committee for being received by the program organizers but the workshop consisting of a dozen senior scien without U S

Adaptation and the Brain Susan D. Healy, 2021-03-09 Why does brain size vary so widely among vertebrate animal species What role has natural selection played in shaping the structure and function of the vertebrate brain This accessible book unravels the myriad adaptive explanations that have built up over decades providing both a review and a critique of the work that has sought to explain which natural selection pressures have led to changes in brain size Debate over the causes of variation in brain size especially within extant humans and during the course of hominid evolution has persisted for at least a couple of centuries However it was not until relatively recently that there has been sufficient data to allow a coherent and taxonomically widespread evolutionary perspective to emerge The comparative approach employed by evolutionary biologists and behavioural ecologists has been particularly enlightening with regard to addressing variation in brain size However the extent to which correlational data currently generated in some profusion can provide a suitable explanation is not yet clear and a constructively critical analysis of the relevant data is now timely Five classes of selection pressure have formed the majority of explanations ecology technology innovation sex and sociality The book starts with a brief description of the difficulties of measuring both brain size and intelligence cognition before addressing the evidence for each of these five factors in turn It argues that although ecology currently provides the most convincing explanation for variation in the size of brain regions none of the factors yet offers a robust and compelling explanation for variation in whole brain size The book concludes by looking forwards suggesting the future steps necessary to reach such an explanation steps that are challenging

but now within reach Adaptation and the Brain is suitable for graduate level students taking courses in animal behaviour and cognition behavioural ecology evolutionary ecology psychology and neuroscience as well as academics and professional researchers in these fields The reader will not require a specific understanding of neuroscience nor of the function of any particular brain region

**Infectious Diseases in Primates** Charles Nunn, Sonia Altizer, 2006-04-27 Recent progress in the field of wildlife disease ecology demonstrates that infectious disease plays a crucial role in the lives of wild animals Parasites and pathogens should be especially important for social animals in which high contact among individuals increases the potential for disease spread As one of the best studied mammalian groups primates offer a unique opportunity to examine how complex behaviours including social organization influence the risk of acquiring infectious diseases and the defences used by animals to avoid infection This book explores the correlates of disease risk in primates including not only social and mating behaviour but also diet habitat use life history geography and phylogeny The authors examine how a core set of host and parasite traits influence patterns of parasitism at three levels of biological organization among individuals among populations and across species A major goal is to synthesize for the first time four disparate areas of research primate behavioural ecology parasite biology wildlife epidemiology and the behavioural and immune defences employed by animals to counter infectious disease Throughout the authors provide an overview of the remarkable diversity of infectious agents found in wild primate populations Additional chapters consider how knowledge of infectious diseases in wild primates can inform efforts focused on primate conservation and human health More generally this book identifies infectious disease as an important frontier in our understanding of primate behaviour and ecology It highlights future challenges for testing the links between host and parasite traits including hypotheses for the effects of disease on primate social and mating systems

## Decoding **Evolutionary Ecology The Trinidadian Guppy**: Revealing the Captivating Potential of Verbal Expression

In an era characterized by interconnectedness and an insatiable thirst for knowledge, the captivating potential of verbal expression has emerged as a formidable force. Its capability to evoke sentiments, stimulate introspection, and incite profound transformations is genuinely awe-inspiring. Within the pages of "**Evolutionary Ecology The Trinidadian Guppy**," a mesmerizing literary creation penned by a celebrated wordsmith, readers attempt an enlightening odyssey, unraveling the intricate significance of language and its enduring effect on our lives. In this appraisal, we shall explore the book's central themes, evaluate its distinctive writing style, and gauge its pervasive influence on the hearts and minds of its readership.

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