

Oxford Series in Ecology and Evolution

Evolution of Social Insect Colonies

**Sex Allocation and
Kin Selection**

**Ross H. Crozier
and Pekka Pamilo**

Evolution Of Social Insect Colonies Sex Allocation And Kin Selection

AW Rasmussen



Evolution Of Social Insect Colonies Sex Allocation And Kin Selection:

Evolution of Social Insect Colonies Rossiter Henry Crozier, Pekka Pamilo, 1996 This book is about the genetics and behaviour of individuals within colonies of social insects bees wasps ants and termites Colonial living is characterized by division of labour and finely coordinated organization by reproductive function being limited to certain individuals by cooperative brood care and by the presence of non reproductive workers Within a colony however many events are the result of conflicts between individuals seeking to maximize their own interests Ever since Darwin this interplay of cooperation and conflict has raised many important questions in evolutionary biology especially about how cooperative behaviour is maintained in the absence of direct reproduction by workers How is the heritable component of this behaviour passed on Crozier and Pamilo's contribution is to analyse the genetic basis of the patterns of reproduction and resource allocation found in social insect colonies This is done more comprehensively and with greater depth and insight than in any previous study and is a significant step forward in the fields of population genetics and social evolution *Evolution of Social Insect Colonies* Rossiter Henry Crozier, 1996 This study analyzes the genetic basis of the patterns of reproduction and resource allocation found in the colonies of bees wasps ants and termites The authors aim is to provide new insights for entomologists and researchers in the fields of social evolution and population genetics

Sex Allocation Stuart West, 2009-09-28 Recent decades have witnessed an explosion of theoretical and empirical studies of sex allocation transforming how we understand the allocation of resources to male and female reproduction in vertebrates invertebrates protozoa and plants In this landmark book Stuart West synthesizes the vast literature on sex allocation providing the conceptual framework the field has been lacking and demonstrating how sex allocation studies can shed light on broader questions in evolutionary and behavioral biology West clarifies fundamental misconceptions in the application of theory to empirical data He examines the field's successes and failures and describes the research areas where much important work is yet to be done West reveals how a shared underlying theoretical framework unites findings of sex ratio variation across a huge range of life forms from malarial parasites and hermaphroditic worms to sex changing fish and mammals He shows how research on sex allocation has been central to many critical questions and controversies in evolutionary and behavioral biology and he argues that sex allocation research serves as a key testing ground for different theoretical approaches and can help resolve debates about social evolution parent offspring conflict genomic conflict and levels of selection Certain to become the defining book on the subject for the next generation of researchers Sex Allocation explains why the study of sex allocation provides an ideal model system for advancing our understanding of the constraints on adaptation among all living things in the natural world

Social Evolution in Ants Andrew F.G. Bourke, Nigel R. Franks, 1995-11-05 Biologists have long been intrigued and confounded by the complex issues in the evolution and ecology of the social behaviour of insects The self sacrifice of sterile workers in ant colonies has been particularly difficult for evolutionary biologists to explain This text presents an overview of the current

state of scientific knowledge about social evolution in ants and shows how studies on ants have contributed to an understanding of many fundamental topics in behavioural ecology and evolutionary biology *Animal Behaviour: Evolution and Mechanisms* Nils Anthes, Peter M. Kappeler, Ralph Bergmüller, Wolf Blanckenhorn, H. Jane Brockmann, Claudia Fichtel, Lutz Fromhage, Joachim Frommen, Wolfgang Goymann, Juergen Heinze, Katharina Hirschenhauser, Heribert Hofer, Sylvia Kaiser, Bart Kempenaers, Gerald Kerth, Judith Ingrid Korb, Kurt M. Kotrschal, Cornelia Kraus, Martha Manser, Nico Michiels, Robin F. A. Moritz, Mario Pahl, Dustin Penn, Norbert Sachser, Martin Schaefer, Carel P. van Schaik, Jutta M. Schneider, Isabella Schreiber, Michael Taborsky, Jürgen Tautz, Fritz Trillmich, Shaowu Zhang, 2010-04-03 This up to date review examines key areas of animal behaviour including communication cognition conflict cooperation sexual selection and behavioural variation Various tests are covered including recent empirical examples **The Evolution of Social Wasps** James H. Hunt, 2007-03-27 Social behavior occurs in some of the smallest animals as well as some the largest and the transition from solitary life to sociality is an unsolved evolutionary mystery In *The Evolution of Social Wasps* James H Hunt examines social behavior in a single lineage of insects wasps of the family Vespidae He presents empirical knowledge of social wasps from two approaches one that focuses on phylogeny and life history and one that focuses on individual ontogeny colony development and population dynamics He also provides an extensive summary of the existing literature while demonstrating how it can be clouded by theory Hunt's fresh approach to the conflicting literature on sociality highlights how oft repeated models can become fixed in the thinking of the scientific community Instead Hunt presents a mechanistic scenario for the evolution of sociality in wasps that changes our perspective on kin selection the paradigm that has dominated thinking about social evolution since the 1970s This innovative new model integrates life history nutrition fitness and ecology in which social insect biologists will find a rich storehouse of ideas and information and behavioral ecologists will find a bracing challenge to long accepted models Engagingly written bold and provocative *The Evolution of Social Wasps* marks a milestone in our understanding of one of life's major evolutionary transitions the origin of social behavior

Information Processing in Social Insects Claire Detrain, Jean L. Deneubourg, Jacques M. Pasteels, 2012-12-06 Claire Detrain Jean Louis Deneubourg and Jacques Pasteels Studies on insects have been pioneering in major fields of modern biology In the 1970 s research on pheromonal communication in insects gave birth to the discipline of chemical ecology and provided a scientific frame to extend this approach to other animal groups In the 1980 s the theory of kin selection which was initially formulated by Hamilton to explain the rise of eusociality in insects exploded into a field of research on its own and found applications in the understanding of community structures including vertebrate ones In the same manner recent studies which decipher the collective behaviour of insect societies might be now setting the stage for the elucidation of information processing in animals Classically problem solving is assumed to rely on the knowledge of a central unit which must take decisions and collect all pertinent information However an alternative method is extensively used in nature

problems can be collectively solved through the behaviour of individuals which interact with each other and with the environment The management of information which is a major issue of animal behaviour is interesting to study in a social life context as it raises additional questions about conflict cooperation trade offs Insect societies have proven particularly open to experimental analysis one can easily assemble or disassemble them and place them in controllable situations in the laboratory

Evolutionary Ecology of Social and Sexual Systems J. Emmett Duffy, Martin Thiel, 2007-09-06

Understanding of animal social and sexual evolution has seen a renaissance in recent years with discoveries of frequent infidelity in apparently monogamous species the importance of sperm competition active female mate choice and eusocial behavior in animals outside the traditional social insect groups Each of these findings has raised new questions and suggested new answers about the evolution of behavioral interactions among animals This volume synthesizes recent research on the sexual and social biology of the Crustacea one of the dominant invertebrate groups on earth Its staggering diversity includes ecologically important inhabitants of nearly every environment from deep sea trenches through headwater streams to desert soils The wide range of crustacean phenotypes and environments is accompanied by a comparable diversity of behavioral and social systems including the elaborate courtship and wildly exaggerated morphologies of fiddler crabs the mysterious queuing behavior of migrating spiny lobsters and even eusociality in coral reef shrimps This diversity makes crustaceans particularly valuable for exploring the comparative evolution of sexual and social systems Despite exciting recent advances however general recognition of the value of Crustacea as models has lagged behind that of the better studied insects and vertebrates This book synthesizes the state of the field in crustacean behavior and sociobiology and places it in a conceptually based comparative framework that will be valuable to active researchers and students in animal behavior ecology and evolutionary biology It brings together a group of internationally recognized and rising experts in fields related to crustacean behavioral ecology ranging from physiology and functional morphology through mating and social behavior to ecology and phylogeny Each chapter makes connections to other non crustacean taxa and the volume closes with a summary section that synthesizes the contributions discusses anthropogenic impacts highlights unanswered questions and provides a vision for profitable future research

Evolutionary Biomechanics Graham K. Taylor, Adrian L. R. Thomas, 2014

This title discusses the study of evolution through the analysis of biomechanical systems Instead of reviewing the entire breadth of the biomechanical literature a few key examples are explored in depth as vehicles for discussing fundamental concepts analytical techniques and evolutionary theory

Cheating Monkeys and Citizen Bees Lee Dugatkin, 1999-02-12

Cooperation is the fabric that keeps society together Civilization could not have been achieved and will not be sustained without it But what is it How and why does it work Could the secret of enhancing human cooperation lie in an investigation of the animal kingdom In Cheating Monkeys and Citizen Bees evolution and animal behavior expert Professor Lee Dugatkin known throughout the academic community for his ingenious animal behavior experiments reports from the cutting edge of scientific research on

the startling evolutionary truth about cooperation and how it works He explains the four paths to cooperation that we share with animals and provides the experimentally verified definitions of a behavior no one thought science could ever explain The first path is through our families and demonstrates that blood really is thicker than water the second shows why it makes biological sense to do unto others as they do unto you the third reveals the dynamics of a kind of selfish teamwork and the last and grandest path is to complete altruism Dugatkin illustrates his argument with marvelous behaviour in the natural world baby sitting mongooses and squirrels that willingly martyr themselves to save relatives fish that switch sexes in order to share reproductive duties and vampire bats that regurgitate blood for their hungry mates With these colorful insights into the natural world Dugatkin shows that what comes naturally to animals can teach us about the instincts that underlie the complex web of human social networks We can use our understanding of these instincts to encourage purposeful human cooperation even in situations where animals would not naturally band together Those readers with an interest in ecology evolutionary biology psychology even anthropology will find *Cheating Monkeys and Citizen Bees* an essential handbook of the dynamics of cooperation And everyone will find it to be a lucid introduction to the surprising evolutionary history of how we came to behave in the ways that we do of how nature came to be less brutal than we tend to think

Living in Groups Jens

Krause, Graeme D. Ruxton, 2002-10-10 Shoals swarms flocks herds group formation is a widespread phenomenon in animal populations It raises several interesting questions for behavioral ecologists Why do animals form and live in groups and what factors influence the ways in which they do this What are the costs and benefits to an animal of group living How are these influenced by ecological factors The authors familiarize the reader with cutting edge ideas on the ecology and evolution of group living animals and detail fascinating case studies demonstrating them in action

Animal Signals John Maynard

Smith, Dr. David Harper, 2003-11-06 Why are animal signals reliable This is the central problem for evolutionary biologists interested in signals Of course not all signals are reliable but most are otherwise receivers of signals would ignore them A number of theoretical answers have been proposed and empirical studies made but there still remains a considerable amount of confusion The authors one a theoretician the other a fieldworker introduce a sense of order to this chaos A significant cause of confusion has been the tendency for different researchers to use either the same term with different meanings or different terms with the same meaning The authors attempt to clarify these differences A second cause of confusion has arisen because many biologists continue to assume that there is only one correct explanation for signal reliability The authors argue that the reliability of signals is maintained in several ways relevant in different circumstances and that biologists must learn to distinguish between them In this book they explain the different theories give examples of signalling systems to which one or another theory applies and point to the many areas where further work both theoretical and empirical is required

The Structure and Dynamics of Geographic Ranges Kevin J. Gaston, 2003 A synthesis of present understanding of the structure of the geographic ranges of species which is a core issue in ecology and biogeography with implications for

many of the environmental issues presently facing humankind *Competition Theory in Ecology* Peter A. Abrams, 2022 This novel textbook addresses the shortcomings of current competition theory and suggests a more useful approach that can provide a basis for future models that have far greater predictive ability in both ecology and evolution **Evolutionary Ecology** Anne E. Magurran, 2005-08-25 This book celebrates the guppy's unique contribution to evolutionary ecology Ever since Caryl Haskins described guppy populations as a natural experiment because of the way predation pressure varies over a small geographical area generations of researchers have been drawn to Trinidad to investigate evolution in the wild The species continues to provide classic examples of natural selection in action and elegantly illustrates how ecology evolution and behaviour are interlinked Anne Magurran's account of the evolutionary ecology of the guppy integrates historical breakthroughs with new research in this fast moving field She reveals how guppies provided some of the first evidence of sperm competition and sexual selection and how they continue to inform scientific thought on mating systems and cryptic choice The consequences of variation in predation risk as well as a host of other biotic and abiotic factors are described and evaluated at all life stages from conception to death The book discusses behavioural responses to ecological conditions alongside life history patterns It examines the potential for ecological speciation and discusses new research into how reproductive isolating mechanisms become established in promiscuous mating systems Conservation issues are also considered both in terms of protecting the irreplaceable Trinidadian guppy system and in the context of invasion ecology This timely synthesis of research into a species that has raised key questions in evolutionary ecology will be of great interest to graduate level students as well as professional researchers in the fields of behavioural ecology and evolutionary biology

Stochastic Population Dynamics in Ecology and Conservation Russell Lande, Steinar Engen, Bernt-Erik Sæther, 2003 All populations fluctuate stochastically creating a risk of extinction that does not exist in deterministic models with fundamental consequences for both pure and applied ecology This book provides the most comprehensive introduction to stochastic population dynamics combining classical background material with a variety of modern approaches including new and previously unpublished results by the authors illustrated with examples from bird and mammal populations and insect communities Demographic and environmental stochasticity are introduced with statistical methods for estimating them from field data The long run growth rate of a population is explained and extended to include age structure with both demographic and environmental stochasticity Diffusion approximations facilitate the analysis of extinction dynamics and the duration of the final decline Methods are developed for estimating delayed density dependence from population time series using life history data Metapopulation viability and the spatial scale of population fluctuations and extinction risk are analyzed Stochastic dynamics and statistical uncertainty in population parameters are incorporated in Population Viability Analysis and strategies for sustainable harvesting Statistics of species diversity measures and species abundance distributions are described with implications for rapid assessments of biodiversity and methods are developed for partitioning species

diversity into additive components Analysis of the stochastic dynamics of a tropical butterfly community in space and time indicates that most of the variance in the species abundance distribution is due to ecological heterogeneity among species so that real communities are far from neutral

Beyond Equilibria Hamish G. Spencer, Sesquicentennial Distinguished Professor Hamish G Spencer, 2025-03-20 Aimed at a broad audience of graduate students and researchers in ecology and evolution this novel creates a persuasive argument that an explicit consideration of history will often lead to a deeper more nuanced understanding of almost every eco evolutionary system

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

Energetic Food Webs John C. Moore, Peter C. de Ruiter, 2012-05-31 In ecosystems with many species food webs form highly complex networks of resource consumer interactions At the same time the food web as itself needs sufficient resources to develop and survive So in fact food web ecology is about how natural resources form the basis of biological communities in terms of species richness and abundances as well as how species are organised in communities on the basis of the resource availability and use The central theme of this book is that patterns in the utilisation of energy result from the trophic interactions among species and that these patterns form the basis of ecosystem stability The authors integrate the latest work on community dynamics ecosystem energetics and stability and in so doing attempt to dispel the categorisation of the field into the separate subdisciplines of population community and ecosystem ecology Energetic Food Webs represents the first attempt to bridge the gap between the energetic and species approaches to ecology

Aboveground-Belowground Linkages Richard D. Bardgett, David A. Wardle, 2010-07-29 Aboveground Belowground Linkages provides the most up to date and comprehensive synthesis of recent advances in our understanding of the roles that interactions between aboveground and belowground communities play in regulating the structure and function of terrestrial

ecosystems and their responses to global change It charts the historical development of this field of ecology and evaluates what can be learned from the recent proliferation of studies on the ecological and biogeochemical significance of aboveground belowground linkages The book is structured around four key topics biotic interactions in the soil plant community effects the role of aboveground consumers and the influence of species gains and losses A concluding chapter draws together this information and identifies a number of cross cutting themes including consideration of aboveground belowground feedbacks that occur at different spatial and temporal scales the consequences of these feedbacks for ecosystem processes and how aboveground belowground interactions link to human induced global change

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