



# **Microsatellites**

*Evolution and Applications*

*Edited by*  
**David B. Goldstein & Christian Schlötterer**

# Microsatellites Evolution And Applications

**D. B. Goldstein**



## **Microsatellites Evolution And Applications:**

*Microsatellites* David B. Goldstein, 1999 Microsatellites are short stretches of repeated DNA found in most genomes that show exceptional variability in humans and most other species This variability has made microsatellites the genetic marker of choice for most applications including genetic mapping and studies of the evolutionary connections between species and populations This book brings together an international group of scientists currently working in microsatellites Their contributions provide a detailed description of microsatellite biology focusing on their mutation properties generation decay and possible functional roles They introduce the theoretical models that underpin the most popular methods for analysing the information that microsatellites can yield including methods for estimating coalescent times population divergences and migration Finally the book describes the various ways in which the potential of microsatellites is being harnessed in a range of applications including medical genetics forensics genetic mapping the analysis of human evolution and conservation genetics

**Microsatellites** D. B. Goldstein, 2000 Microsatellites and other simple sequences genomic context and mutational mechanisms functional roles microsatellites and minisatellites Minisatellites and mutation process in tandemly repetitive DNA Mechanistic basis for microsatellites instability Microsatellites evolution inference from population data A comparative approach to the study of microsatellites evolution Trinucleotide expansion mutations cause diseases which do not conform to classical mendelian expectations Mutation and migration in models of microsatellite evolution The coalescent and microsatellites variability estimating the age of mutations using variation at linked markers Statistics of microsatellites loci estimation of mutation rate and pattern of population expansion Using microsatellites to measure the fitness consequences of inbreeding and outbreeding Microsatellites in conservation genetics Microsatellites and the reconstruction of the history of human populations Forensic applications of microsatellites markers Tracking linkage disequilibrium in admixed populations with MALD using microsatellites loci Microsatellites markers in complex disease mapping disease associated regions within the human major histocompatibility complex Microsatellites a neutral marker to infer selective sweeps Y chromosome microsatellite haplotypes and the history of samoyed speaking populations in north west Siberia Microsatellite analysis of human tumours

**Microsatellites** D. B. Goldstein, 2000 Microsatellites and other simple sequences genomic context and mutational mechanisms functional roles microsatellites and minisatellites Minisatellites and mutation process in tandemly repetitive DNA Mechanistic basis for microsatellites instability Microsatellites evolution inference from population data A comparative approach to the study of microsatellites evolution Trinucleotide expansion mutations cause diseases which do not conform to classical mendelian expectations Mutation and migration in models of microsatellite evolution The coalescent and microsatellites variability estimating the age of mutations using variation at linked markers Statistics of microsatellites loci estimation of mutation rate and pattern of population expansion Using microsatellites to measure the fitness consequences of inbreeding and outbreeding Microsatellites in conservation genetics Microsatellites and the

reconstruction of the history of human populations Forensic applications of microsatellites markers Tracking linkage disequilibrium in admixed populations with MALD using microsatellites loci Microsatellites markers in complex disease mapping disease associated regions within the human major histocompatibility complex Microsatellites a neutral marker to infer selective sweeps Y chromosome microsatellite haplotypes and the history of samoyed speaking populations in north west Siberia Microsatellite analysis of human tumours Molecular Methods in Ecology Allan Baker, 2009-04-01 The incorporation of molecular methods in ecological research has added an exciting new dimension to conventional studies and opened windows into previously intractable areas of research at the interface between ecology and genetics Using these new methods it has now become routine to use genetic markers to study ecological phenomena from molecular sexing of individuals and parentage of offspring through to population structure of species and phylogenetic relationships of taxa These methods have stimulated an explosion of empirical and analytical developments in molecular ecology which have in turn increasingly attracted students and professional biologists eager to employ them in their studies Molecular Methods in Ecology traces the development of molecular ecology by reviewing basic molecular biological techniques and earlier methods such as protein electrophoresis DNA DNA hybridisation restriction analysis of DNA and DNA fingerprinting Later chapters review methods using newer classes of markers such as microsatellites introns MHC SSRs and AFLP markers in plants and molecular sexing in animals The strengths and limitations of methods are discussed and guidance is provided in selecting the most appropriate methods for particular problems in ecology This book will provide both postgraduates and researchers with a guide to choosing and employing appropriate methodologies for successful research in the field of molecular ecology Provides up to date summaries of the latest molecular approaches in this rapidly expanding field Gives guidance on the appropriate choice of methods for particular problems in ecology and their strengths and limitations Provides brief laboratory protocols for each molecular method and summaries of software available for analysis of data in molecular ecology Outlines examples of the latest research results from studies of both plants and animals integrated within the framework of molecular ecology Molecular Ecology and Evolution: Approaches and Applications B. Schierwater, B. Streit, G.P. Wagner, R. DeSalle, 2013-06-29 The past 25 years have witnessed a revolution in the way ecologists and evolutionary biologists approach their disciplines Modern molecular techniques are now reshaping the spectrum of questions that can be addressed while studying the mechanisms and consequences of the ecology and evolution of living organisms Molecular Ecology and Evolution Approaches and Applications describes from a molecular perspective several methodological and technical approaches used in the fields of ecology evolution population biology molecular systematics conservation genetics and development Modern techniques are introduced and older more classic ones refined The advantages limitations and potentials of each are discussed in detail and thereby illustrate the widening range of cross field research and applications which this modern technology is stimulating This book will serve as an important textbook for graduate and advanced

undergraduate students and as a key reference work for researchers

### **Genetic Dissection of Complex Traits** D.C.

Rao, C. Charles Gu, 2008-04-23 The field of genetics is rapidly evolving and new medical breakthroughs are occurring as a result of advances in knowledge of genetics This series continually publishes important reviews of the broadest interest to geneticists and their colleagues in affiliated disciplines Five sections on the latest advances in complex traits Methods for testing with ethical legal and social implications Hot topics include discussions on systems biology approach to drug discovery using comparative genomics for detecting human disease genes computationally intensive challenges and more

Bioinformatics in Aquaculture Zhanjiang (John) Liu, 2017-04-17 Bioinformatics derives knowledge from computer analysis of biological data In particular genomic and transcriptomic datasets are processed analysed and whenever possible associated with experimental results from various sources to draw structural organizational and functional information relevant to biology Research in bioinformatics includes method development for storage retrieval and analysis of the data Bioinformatics in Aquaculture provides the most up to date reviews of next generation sequencing technologies their applications in aquaculture and principles and methodologies for the analysis of genomic and transcriptomic large datasets using bioinformatic methods algorithm and databases The book is unique in providing guidance for the best software packages suitable for various analysis providing detailed examples of using bioinformatic software and command lines in the context of real world experiments This book is a vital tool for all those working in genomics molecular biology biochemistry and genetics related to aquaculture and computational and biological sciences

**Molecular Approaches to Ecology and Evolution** R. deSalle, B. Schierwater, 2012-12-06 Four years ago we edited a volume of 36 papers entitled Molecular Approaches to Ecology and Evolution Schierwater et al 1994 in which we attempted to put together a diverse array of papers that demonstrated the impact that the technological revolution of molecular biology has had on the field of evolutionary biology and ecology The present volume borrows from that theme but attempts to focus more sharply on the impact that molecular biology has had on our understanding of different hierarchical levels important in evolutionary and ecological studies Because DNA sequence variation is at the heart of every paper in the present volume we feel it necessary to examine how DNA has affected study at various levels of biological organization The majority of the chapters in the present volume follow themes established in the earlier volume all chapters by authors in the previous volume are either fully updated or entirely new and expand into areas that we felt were important for a more complete understanding of the impact of DNA technology on ecology and evolution The collection of papers in this volume cover a diverse array of ecological and evolutionary questions and demonstrates the breadth of coverage molecular technology has imparted on modern evolutionary biology There are also a broad range of hierarchical questions approached by the 17 papers in this volume

*Molecular Tools for Screening Biodiversity* A. Karp, Peter G. Isaac, D.S. Ingram, 1998 The conservation of natural genetic variation is important not only for ethical and aesthetic reasons but to ensure that the Earth's living resources may be used

even more efficiently and sustainably in agriculture forestry food production and other industries In the past ten years there have been many advances in molecular biology that have provided a suite of powerful tools with enormous potential for the screening and evaluation of biodiversity Molecular Tools for Screening Biodiversity was compiled in order to provide a comprehensive description and assessment of these tools The book describes detailed laboratory protocols and analysis techniques and discusses how the techniques can best be employed to tackle different diversity problems Also detailed case studies of techniques used in animals and plants which address different biodiversity problems are included The book is divided into five parts Molecular Tools for Screening Biodiversity is aimed at investigators with interests in conservation population biology taxonomy evolution molecular systematics and the industrial applications of plant and animal diversity

*The Implicit Genome* Lynn Helena Caporale, 2006-02-02 For over half a century we have been in the thrall of the double helical structure of DNA which in an instant revealed that information can be transferred between generations by a simple rule A pairs with T G pairs with C In its beautiful simplicity this structure along with the table of codons worked out in the following decade had entranced us into believing that we can fully understand the information content of a DNA sequence simply by treating it as text that is read in a linear fashion While we have learned much based on this assumption there is much we have missed Far from a passive tape running through a reader genomes contain information that appears in new forms which create regions with distinct behavior Some are gene rich some mobile some full of repeats and duplications some sticking together across long evolutionary distances some readily breaking apart in tumor cells Even protein coding regions can carry additional information taking advantage of the flexible coding options provided by the degeneracy of the genetic code The chapters in this volume touch on one or more of three interconnected themes information can be implied rather than explicit in a genome information can lead to focused and or regulated changes in nucleotide sequences information that affects the probability of distinct classes of mutation has implications for evolutionary theory

*Molecular Evolution* Roderick D.M. Page, Edward C. Holmes, 2009-07-14 The study of evolution at the molecular level has given the subject of evolutionary biology a new significance Phylogenetic trees of gene sequences are a powerful tool for recovering evolutionary relationships among species and can be used to answer a broad range of evolutionary and ecological questions They are also beginning to permeate the medical sciences In this book the authors approach the study of molecular evolution with the phylogenetic tree as a central metaphor This will equip students and professionals with the ability to see both the evolutionary relevance of molecular data and the significance evolutionary theory has for molecular studies The book is accessible yet sufficiently detailed and explicit so that the student can learn the mechanics of the procedures discussed The book is intended for senior undergraduate and graduate students taking courses in molecular evolution phylogenetic reconstruction It will also be a useful supplement for students taking wider courses in evolution as well as a valuable resource for professionals First student textbook of phylogenetic reconstruction which uses the tree as a central metaphor of

evolution Chapter summaries and annotated suggestions for further reading Worked examples facilitate understanding of some of the more complex issues Emphasis on clarity and accessibility Advances in Molecular Ecology Gary R. Carvalho,1998 Each contributor to this publication was asked to examine how molecular genetic tools have contributed to their specific areas of consideration To increase the practical utility of the book a summary of software that is available for the analysis of data in molecular ecology is included **Microsatellite Markers** Ibrokhim Y. Abdurakhmonov,2016-11-30 Microsatellite or so called simple sequence repeat SSR markers have been one of the most reliable molecular markers derived from the DNA molecule which were widely and successfully used for more than 25 years in the genetic studies of environmental agricultural and biomedical sciences The objective of this Microsatellite Markers book is to rehighlight and provide some updates on previous and recent utilization of microsatellite markers for various applications in agriculture and medicine which void emerging opinion on full death of microsatellites as useful genetic markers Chapters presented here demonstrate the future benefit of SSRs in many genetic studies as well as disease diagnosis and prognosis **Genes in the Environment** Rosie S. Hails,John E. Beringer,H. Charles J. Godfray,2001-08 Genes in the Environment presents the recent research in the exciting and rapidly developing field of molecular genetic and modelling techniques These techniques central to ecology provide valuable new tools for addressing complex ecological questions and considerable insights into our understanding of the dynamics of populations and communities A diverse range of topics is covered including community dynamics in soils and water gene flow and spatial dynamics and the evolution of the pathogenic and symbiotic relationships Organisms studied range from bacteria viruses and fungi to insects plants and fish *International Review of Cell and Molecular Biology* Kwang W. Jeon,2009-02-24 International Review of Cell Molecular Biology presents current advances and comprehensive reviews in cell biology both plant and animal Articles address structure and control of gene expression nucleocytoplasmic interactions control of cell development and differentiation and cell transformation and growth Authored by some of the foremost scientists in the field Provides up to date information and directions for future research Valuable reference material for advanced undergraduates graduate students and professional scientists Modern Approaches to the Study of Crustacea Elva Escobar-Briones,Fernando Alvarez,2012-12-06 This volume is organized in four sections physiology ecology conservation and biodiversity and systematics and evolution Composed of 46 chapters and written by 100 authors from 17 countries this volume reflects the truly international nature of the Crustacean Society It will be a staple for all researchers and scientists in the field Rotifera X Alois Herzig,Ramesh D. Gulati,Christian D. Jersabek,Linda May,2006-02-27 This volume reflects the latest developments in the research of a global community of rotifer researchers who came together at Illmitz Austria in 2003 Contributions are manifold and span fields from phylogeny and evolution of the phylum Rotifera to practical aspects of aquaculture and ecotoxicology Major issues include phylogeny and evolution genetics and molecular ecology new aspects of rotifer anatomy through the application of confocal laser scanning microscopy

anhydrobiosis long term studies in lakes and rivers population dynamics and community ecology trophic relationships between copepods and rotifers alongside biodiversity studies based on classical taxonomic concepts and molecular approaches Although primarily focussed on one taxonomic group the scientific outcome of this meeting is of relevance to the study of other aquatic microinvertebrates as well Intraspecific Genetic Diversity Yuri Petrovich Altukhov, 2005-11-24 Population and evolutionary genetics have been quickly developing elds of biological research over the past decades This book compiles our current understanding of genetic processes in natural populations In addition the book provides the author s original ideas and concepts based on the data obtained by himself and his close coworkers The author introduces his pioneering concept of population genetic stability and much of the book is concerned with the factors and conditions of such stability Why does genetic stability matter so much Altukhov argues that the sustainable use of natural resources including genetic resources of populations critically depends on the maintenance of their stability The preservation of well adapted genetic characteristics from one generation to the next is essential for this stability Traditionally population genetics has been cursed evolution and the role of evolutionary factors in shaping genetic structures of populations While the idea of a population as a dynamic unit of evolution has been widely accepted the significance of genetic stability and its implications for the long term survival of populations and species have not been fully appreciated **Yeasts in Food and Beverages** Graham H. Fleet, 2006-01-10 Yeasts play a key role in the production of many foods and beverages This role now extends beyond their widely recognized contributions to the production of alcoholic beverages and bread to include the production of many food ingredients and additives novel uses as probiotic and biocontrol agents their significant role as spoilage organisms and their potential impact on food safety Drawing upon the expertise of leading yeast researchers this book provides a comprehensive account of the ecology physiology biochemistry molecular biology and genomics of the diverse range of yeast species associated with the production of foods and beverages Opuntia spp.: Chemistry, Bioactivity and Industrial Applications Mohamed Fawzy Ramadan, Tamer E. Moussa Ayoub, Sascha Rohn, 2021-09-27 The Opuntia fruits commonly known as cactus pears or prickly pears have been suggested by the Food and Agriculture Organization to be a promising and strategic crop in regions suffering from lack of water In Mexico India South Africa and the Mediterranean the Opuntia fruits have become popular due to their nutritive value and health promoting benefits including antioxidant antiulcerogenic and antiatherogenic traits and protective effects against LDL oxidation Additionally readily absorbable sugars high vitamin C and mineral content and a pleasant flavour make Opuntia tailor made for novel foods Due to their ecological advantages high functional value and health related traits Opuntia fruits can be highly exploited in different food processing applications For instance Opuntia cactus fruits are used for the preparation of juices and marmalades Opuntia cactus plants are used to feed animals in African and Latin American countries Peruvian farmers cultivate Opuntia cactus for growing the cochineal *Dactylopius coccus* insect and producing the natural dye carmine and the commercial production of food and non food



products from *Opuntia* has been established in Mexico USA and several Mediterranean countries *Opuntia* spp Chemistry Bioactivity and Industrial Applications creates a multidisciplinary forum of discussion on *Opuntia* cactus with special emphasis on its horticulture post harvest marketability chemistry functionality health promoting properties technology and processing The text includes detailed discussion of the impact of traditional and innovative processing on the recovery of high added value compounds from *Opuntia* spp by products Later chapters explore the potential applications of *Opuntia* spp in food cosmetics and pharmaceutical products

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