Molecular Genetic Approaches in Conservation

Edited by

THOMAS B. SMITH
San Francisco State University
Department of Biology

and

ROBERT K. WAYNE
University of California, Los Angeles
Department of Biology

New York    Oxford
OXFORD UNIVERSITY PRESS
1996
Contents

1. An Overview of the Issues, 3
   GEORGINA M. MACE, THOMAS B. SMITH, MICHAEL W. BRUFORD, AND ROBERT K. WAYNE

1 APPROACHES

   STEPHEN R. PALUMBI AND C. SCOTT BAKER

3. Application of Anonymous Nuclear Loci to Conservation Biology, 38
   STEPHEN A. KARL

4. The Use of Random Amplified Polymorphic DNA (RAPD) in Conservation Genetics, 54
   PETER FRITSCH AND LOREN H. RIESEBERG

5. The Utility of Paternally Inherited Nuclear Genes in Conservation Genetics, 74
   PRISCILLA K. TUCKER AND BARBARA L. LUNDRIGAN
6. Applications of Allozyme Electrophoresis in Conservation Biology, 87
   PAUL L. LEBERG

7. Regional Approaches to Conservation Biology: RFLPs, DNA Sequence, and Caribbean Birds, 104
   ELDREDGE BERMINGHAM, GILLES SEUTIN, AND ROBERT E. RICKLEFS

8. The Use of Mitochondrial DNA Control Region Sequencing in Conservation Genetics, 125
   PIERRE TABERLET

9. Chloroplast DNA Sequencing to Resolve Plant Phylogenies Between Closely Related Taxa, 143
   LUDOVIC GIELLY AND PIERRE TABERLET

10. Reconstructing Population History Using PCR–Restriction Site Data, 154
    NICHOLAS GEORGIADIS

11. The Use of PCR-Based Single-Stranded Conformation Polymorphism Analysis (PCR-SSCP) in Conservation Genetics, 167
    DEREK J. GIRMAN

12. Application of Chloroplast DNA Restriction Site Studies for Conservation Genetics, 183
    JAVIER FRANCISCO-ORTEGA, ROBERT K. JANSEN, ROBERTA J. MASON-GAMER, AND ROBERT S. WALLACE

13. A PCR Approach to Detection of Malaria in Hawaiian Birds, 202
    REBECCA L. CANN, ROBERT A. FELDMAN, LEILA AGULLANA, AND LEONARD A. FREED

14. Polymorphism of Genes in the Major Histocompatibility Complex (MHC): Implications for Conservation Genetics of Vertebrates, 214
    SCOTT V. EDWARDS AND WAYNE K. POTTS

15. DNA Multilocus Fingerprinting Using Simple Repeat Motif Oligonucleotides, 238
    KORNELIA RASSMANN, HANS ZISCHLER, AND DIETHARD TAUTZ

16. Minisatellite Analysis in Conservation Genetics, 251
    TERRY BURKE, OLIVIER HANOTTE, AND IRIS VAN PIJLEN

17. Microsatellites and Their Application to Conservation Genetics, 278
    MICHAEL W. BRUFORD, DAVID J. CHEESMAN, TREVOR COOTE, HARRIET A.A. GREEN, SUSAN A. HAINES, COLLEEN O'RYAN, AND TIMOTHY R. WILLIAMS

18. Noninvasive Genotyping for Vertebrate Conservation, 298
    PHILLIP A. MORIN AND DAVID S. WOODRUFF

19. Future Applications of PCR to Conservation Biology, 314
    DEIDRE CARTER, REBECCA REYNOLDS, NICOLA FILDES, AND THOMAS J. WHITE

II ANALYSIS

20. Estimation of Effective Population Size and Migration Parameters from Genetic Data, 329
    JOSEPH E. NEIGEL
21. Simulation Models of Bottleneck Events in Natural Populations, 347
   JOHN HALLEY AND A. RUS HOELZEL

22. Assessing Relatedness and Evolutionary Divergence: Why the
    Genetic Evidence Alone Is Insufficient, 365
   RICHARD A. NICHOLS

III CASE STUDIES

23. Molecular Genetics and the Conservation of Salmonid Biodiversity:
    Oncorhynchus at the Edge of Their Range, 383
   JENNIFER L. NIELSEN

24. Population Genetics of Kenyan Impalas—Consequences for
    Conservation, 399
   PETER ARCTANDER, PIETER W. KAT, BO T. SIMONSEN, AND HANS R. SIEGISMUND

25. Paternity Studies in Animal Populations, 413
   PATRICIA G. PARKER, T.A. WAITE, AND T. PEARE

26. Genetic Structure of Natural Taxus Populations in Western North
    America, 424
   STANLEY SCHER

27. Applications of Genetics to the Conservation and Management of
    Australian Fauna: Four Case Studies from Queensland, 442
   CRAIG MORITZ, JESSICA WORTHINGTON WILMER, LISA POPE,
   WILLIAM B. SHERWIN, ANDREA C. TAYLOR, AND COLIN J. LIMPUS

IV PERSPECTIVE

28. Conservation Genetics and Molecular Techniques: A Perspective, 459
   PHILIP W. HEDRICK

Index, 478