

Contents

<i>Preface</i>	<i>v</i>
<i>Contributors</i>	<i>xv</i>

PART I DNA BARCODING THEORY AND PRACTICE

1	Creating Virtuous Cycles for DNA Barcoding: A Case Study in Science Innovation, Entrepreneurship, and Diplomacy	7
	<i>David E. Schindel and Roderic M. P. Page</i>	
2	Species Diagnosis and DNA Taxonomy	33
	<i>Dirk Abrens</i>	
3	Delimiting Species with Single-Locus DNA Sequences	53
	<i>Nicolas Hubert, Jarrett D. Phillips, and Robert H. Hanner</i>	
4	DNA Barcoding in Species Delimitation: From Genetic Distances to Integrative Taxonomy	77
	<i>Aurélien Miralles, Nicolas Puillandre, and Miguel Vences</i>	
5	DNA Barcodes in Taxonomic Descriptions	105
	<i>Andrew V. Z. Brower and Robert DeSalle</i>	

PART II DNA MANIPULATION AND SEQUENCING

6	Simple, Robust Invertebrate DNA Barcoding: Chelex-Based DNA Extraction and Optimized COI Amplification	119
	<i>Jennifer Hackett, Sharon Pepenella, Cristina Fernandez Marco, Louise Bodt, Lina Ruiz Grajales, Jeffry Petracca, Justin Burke, Allison Mayle, Bruce Nash, and David A. Micklos</i>	
7	Cost-Effective DNA Extraction for DNA Barcoding Diverse Biological Samples	129
	<i>Oliver Hyman, Amanda Cass, Ray Enke, Amanda Storm, and Bruce Nash</i>	
8	DNA Sequencing Technologies and DNA Barcoding	139
	<i>Anisha David, J. Deepa Arul Priya, and Akash Gautam</i>	
9	DNA Barcoding and Metabarcoding Protocols for Species Identification	155
	<i>Kyleen E. Elwick, Natalie Damaso, and James M. Robertson</i>	
10	Environmental DNA Isolation, Validation, and Preservation Methods	171
	<i>Seth W. Cunningham, Michael Tessler, Jicayla Johnson-Rosemond, Iesha S. Whittaker, and Mercer R. Brugler</i>	

PART III SPECIALIZED DNA BARCODING METHODS

11	Single-Molecule FRET-Based Multiplexed Detection	183
	<i>Srishty Sethi, Kalani M. Wijesinghe, and Soma Dhakal</i>	

12	DNA Barcodes Using a Dual Nanopore Device.....	197
	<i>Swarnadeep Seth and Aniket Bhattacharya</i>	
13	ddRAD Sequencing and DNA Barcoding.....	213
	<i>Vladislav Ivanov, Kyung Min Lee, and Marko Mutanen</i>	
14	Scalable, Cost-Effective, and Decentralized DNA Barcoding with Oxford Nanopore Sequencing	223
	<i>Amrita Srivathsan and Rudolf Meier</i>	
15	Generating 2D Barcode for DNA Barcode Sequences	239
	<i>Rui Liu, Yujun Wang, Xinjing Yao, and Chang Liu</i>	
16	Analyses of Nuclear Reads Obtained Using Genome Skimming	247
	<i>Siavash Mirarab and Vineet Bafna</i>	
17	Recent Advances in Closed-Tube Barcoding for FastFish-ID	267
	<i>J. Aquiles Sanchez, John E. Rice, and Lawrence J. Wangh</i>	

PART IV ANALYZING DNA BARCODE DATA

18	iTaxoTools 1.0: Improved DNA Barcode Exploration with TaxI2	281
	<i>Miguel Vences, Stefanos Patmanidis, Alexander Fedosov, Aurélien Miralles, and Nicolas Puillandre</i>	
19	DNA Barcode-Based Species Diagnosis with MolD	297
	<i>Alexander Fedosov, Nicolas Puillandre, Frank Fischell, Stefanos Patmanidis, Aurélien Miralles, and Miguel Vences</i>	
20	Species Delimitation and Exploration of Species Partitions with ASAP and LIMES	313
	<i>Nicolas Puillandre, Aurélien Miralles, Sophie Brouillet, Alexander Fedosov, Frank Fischell, Stefanos Patmanidis, and Miguel Vences</i>	
21	Characteristic Attribute Organization System (CAOS): Identifying Classification Rules Based on Phylogenetically Organized Sequences	335
	<i>Vivek Ramanan and Indra Neil Sarkar</i>	
22	CAOS-R: Character-Based Barcoding	347
	<i>Tjard Bergmann</i>	
23	Classification of DNA Sequence Based on a Non-gradient Algorithm: Pseudoinverse Learners	359
	<i>Mohammed A. B. Mahmoud</i>	
24	A Measure of the DNA Barcode Gap for Applied and Basic Research.....	375
	<i>Jarrett D. Phillips, Cortland K. Griswold, Robert G. Young, Nicolas Hubert, and Robert H. Hanner</i>	
25	Guidelines for the Analysis of DNA Barcoding/Metabarcoding Sequencing Data and Interpretation of Publicly Available Databases	391
	<i>Natalie Damaso, Kyleen E. Elwick, and James M. Robertson</i>	

26	BOLD v4: A Centralized Bioinformatics Platform for DNA-Based Biodiversity Data	403
	<i>Sujeewan Ratnasingham, Catherine Wei, Dean Chan, Jireh Agda, Josh Agda, Lilianna Ballesteros-Mejia, Hamza Ait Boutou, Zak Mohammad El Bastami, Eddie Ma, Ramya Manjunath, Dana Rea, Chris Ho, Angela Telfer, Jaclyn McKeowan, Miduna Rabulan, Claudia Steinke, Justin Dorsheimer, Megan Milton, and Paul D. N. Hebert</i>	
PART V GENERATING A SUCCESSFUL DNA BARCODE PROJECT		
27	Mega-Barcoding Projects: Delivering National DNA Barcoding Initiatives for Plants	445
	<i>Brandon S. Whitley, Zhao Li, Laura Jones, and Natasha de Vere</i>	
28	MetaZooGene Atlas and Database: Reference Sequences for Marine Ecosystems	475
	<i>Todd D. O'Brien, Leocadio Blanco-Bercial, Jennifer M. Questel, Paola G. Batta-Lona, and Ann Bucklin</i>	
29	Principles for Constructing DNA Barcode Reference Libraries	491
	<i>Rodger Gwiazdowski</i>	
30	Recent Applications of FastFish-ID	503
	<i>Lawrence J. Wangh, John E. Rice, and J. Aquiles Sanchez</i>	
PART VI DNA BARCODING, TEACHING AND CITIZEN SCIENCE		
31	A Rapid, Equipment-Free DNA Isolation Method for DNA Barcoding	517
	<i>Sharon Pepenella, Jennifer Hackett, Cristina Fernandez-Marco, Jeffry Petracca, Christine Marizzi, Bruce Nash, and David A. Micklos</i>	
32	Engaging Students and Teachers as Community Scientists in DNA Barcoding Initiatives	525
	<i>Latasha Wright, Jeanne Garbarino, and Christine Marizzi</i>	
33	DNA Barcoding for an Undergraduate Class	537
	<i>Maria Shumskaya</i>	
34	Analysis of DNA Barcodes Using <i>DNA Subway</i>	551
	<i>Jason Williams, Bruce Nash, Cornel Ghiban, Mohammed Khalfan, Uwe Hilgert, Susan Lauter, Chun-hua Yang, and David Andrew Micklos</i>	
35	A Glossary of DNA Barcoding Terms	561
	<i>Miguel Vences, Aurélien Miralles, and Robert DeSalle</i>	
	<i>Index</i>	573