

Scientific Foundations of Zoos and Aquariums

In the modern era, zoos and aquariums fight species extinction, educate communities, and advance learning of animal behavior. This book features first-person stories and scientific reviews exploring the groundbreaking projects run by these institutions. Large-scale conservation initiatives that benefit multiple species are detailed in Part I, including critical habitat protection, evidence-based techniques to grow animal populations, and the design of community education projects. Part II documents how zoos use science to improve the health and welfare of animals in captivity and to make difficult management decisions. Part III saving species includes personal tales of efforts to preserve wild populations through rehabilitation, captive breeding, reintroduction, and public outreach. Part IV details several scientific discoveries about animals that would have been impossible without the support of zoos and aquariums. The book is for animal scientists, zoo professionals, educators, and researchers worldwide, as well as students of zookeeping and conservation.

ALLISON B. KAUFMAN is a research scientist with the Department of Ecology and Evolutionary Biology at the University of Connecticut, and Adjunct Professor in the Department of Psychology at the University of Connecticut at Avery Point.

MEREDITH J. BASHAW is a professor in the Department of Psychology at Franklin & Marshall College.

TERRY L. MAPLE is the Smithgall–Watts Professor Emeritus at the Georgia Institute of Technology and Professor-in-Residence at Jacksonville Zoo and Gardens. He was previously CEO of Zoo Atlanta and the Palm Beach Zoo, and the elected President of the Association of Zoos and Aquariums.

Cambridge University Press

978-1-107-19919-4 — Scientific Foundations of Zoos and Aquariums

Edited by Allison B. Kaufman , Meredith J. Bashaw , Terry L. Maple

Frontmatter

[More Information](#)

Scientific Foundations of Zoos and Aquariums

Their Role in Conservation and Research

Edited by

ALLISON B. KAUFMAN

University of Connecticut

MEREDITH J. BASHAW

Franklin & Marshall College

TERRY L. MAPLE

Jacksonville Zoo and Gardens



CAMBRIDGE
UNIVERSITY PRESS

Cambridge University Press
978-1-107-19919-4 — Scientific Foundations of Zoos and Aquariums
Edited by Allison B. Kaufman , Meredith J. Bashaw , Terry L. Maple
Frontmatter
[More Information](#)

CAMBRIDGE UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

One Liberty Plaza, 20th Floor, New York, NY 10006, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre,
New Delhi – 110025, India

79 Anson Road, #06-04/06, Singapore 079906

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning, and research at the highest international levels of excellence.

www.cambridge.org

Information on this title: www.cambridge.org/9781107199194

DOI: 10.1017/9781108183147

© Cambridge University Press 2019

This publication is in copyright. Subject to statutory exception and to the provisions of relevant collective licensing agreements, no reproduction of any part may take place without the written permission of Cambridge University Press.

First published 2019

Printed in the United Kingdom by TJ International Ltd. Padstow Cornwall

A catalogue record for this publication is available from the British Library.

Library of Congress Cataloging-in-Publication Data

Names: Kaufman, Allison (Allison B.), editor. | Bashaw, Meredith J., 1976- editor. | Maple, Terry L., editor.

Title: Scientific foundations of zoos and aquariums : their role in conservation and research / edited by Allison B. Kaufman, Meredith J. Bashaw, Terry L. Maple.

Description: Cambridge, United Kingdom ; New York, NY : Cambridge University Press, 2019. | Includes bibliographical references.

Identifiers: LCCN 2018027879 | ISBN 9781107199194 (hardback) | ISBN 9781316648650 (pbk.)

Subjects: LCSH: Zoos. | Aquariums. | Zoology--Research. | Wildlife conservation.

Classification: LCC QL76 .S35 2019 | DDC 590.73--dc23

LC record available at <https://lccn.loc.gov/2018027879>

ISBN 978-1-107-19919-4 Hardback

ISBN 978-1-316-64865-0 Paperback

Cambridge University Press has no responsibility for the persistence or accuracy of URLs for external or third-party internet websites referred to in this publication and does not guarantee that any content on such websites is, or will remain, accurate or appropriate.

In Memoriam

During the development of this book the field of zoo/aquarium research lost two guiding lights. Their work has shaped zoos and aquariums around the world and has touched everything discussed in this volume.

We are fortunate to be able to include the words of Michael Hutchins in this volume and have chosen to feature his contribution as our book's Introduction.

Conversely, this book will always seem just a bit incomplete without the words of Stan Kuczaj.

Perhaps it's odd to dedicate a book to a bunch of seals – particularly ones I only worked with for a day or two a week for just five years, and more than twenty years ago. But impact isn't always proportionate to time, and it seems just yesterday that I spent an entire lifetime in their company.

For the gang at the New Jersey State Aquarium's Seal Shores, 1997–2002, without whom it never would have occurred to me to study marine mammals under human care.

For Kara, Kija, Gunther, Luke, Mysti, Asia, Sirrus, and Squeegie.

– ABK

For my parents, Nancy and Walter Bashaw, who dragged me to more zoos than I could count as a child and were still surprised when I built my career in one.

With love and thanks.

– MJB

For my wife, Addie, who has shared the ups and downs of my dual career for more than fifty years; a toast to many more with gratitude and affection.

– TLM

Contents

List of Contributors	page xiii
Acknowledgments	xvii
Introduction: Research in Zoos and Aquariums: Purpose, Justification, Utility, and Welfare	
MICHAEL HUTCHINS, ROBERT J. WIESE, AND BRANDIE SMITH	1
PART I PROGRAMS AND INITIATIVES	
1 Evolving Approaches to Zoo-Based Conservation	45
CORINNE J. KENDALL AND RICHARD A. BERGL	
2 Protecting an Underwater Rainforest: Freshwater Science in the Southeastern United States	64
ANNA L. GEORGE, JOSHUA R. ENNEN, AND BERNARD R. KUHAJDA	
3 Headstarting as a Conservation Strategy for Threatened and Endangered Species	91
PATRICK THOMAS, DONAL M. BOYER, DAVID A. OEHLER, SCOTT SILVER, AND LOU PERROTTI	
4 Strategic Gene Banking for Conservation: The Ins and Outs of a Living Bank	112
REBECCA J. HOBBS, JUSTINE K. O'BRIEN, AND REBECCA E. SPINDLER	

X CONTENTS

5	The Environmental Education Program at São Paulo Zoo (Brazil): Perspectives and Experiences for Wildlife Conservation	147
	KÁTIA GISELE DE OLIVEIRA RANCURA, CAMILA MARTINS, AND JOÃO BATISTA DA CRUZ	
6	Conservation and Education through Dolphin Research and Eco-Tourism	171
	KATHLEEN DUDZINSKI AND MARYELLEN MATELESKA	
	PART II CAPTIVE CARE AND MANAGEMENT	189
7	Lear's Macaw (<i>Anodorhynchus leari</i>) <i>Ex Situ</i> Breeding Program at São Paulo Zoo	191
	FERNANDA JUNQUEIRA VAZ GUIDA, REGIANE VIEIRA DE PAIVA MORAIS, AND ANGÉLICA MIDORI SUGIEDA	
8	Measuring Welfare through Behavioral Observation and Adjusting It with Dynamic Environments	212
	JASON V. WATTERS, BETHANY L. KREBS, AND ERIDIA PACHECO	
9	Empowering Zoo Animals	241
	STEPHANIE M. ALLARD AND MEREDITH J. BASHAW	
10	Transforming the Nutrition of Zoo Primates (or How We Became Known as Loris Man and That Evil Banana Woman)	274
	AMY PLOWMAN AND FRANCIS CABANA	
11	Tough Questions, Complex Answers: American Zookeeper Responses in a Nationwide Survey about Culling	304
	DAVID M. POWELL AND MATT ARDAIOLO	

PART III	SAVING SPECIES	325	
12	Fly Away Home: A Collaborative Program to Return Rehabilitated Black Cockatoos to the Wild in Western Australia	327	
	ANNA LE SOUËF, SIMONE VITALI, RICK DAWSON, JILL M. SHEPHARD, AND KRISTIN S. WARREN		
13	Back into European Wildlife: The Reintroduction of the Northern Bald Ibis (<i>Geronticus eremita</i>)	339	
	JOHANNES FRITZ, MARKUS UNSÖLD, AND BERNHARD VÖLKL		
14	The Thin Green Line: Medical Considerations in Fighting the Extinction of the Houston Toad	367	
	LAUREN L. HOWARD AND PAUL S. CRUMP		
15	Condor Conservation Comes Home to Roost: The Santa Barbara Zoo's Story	400	
	ESTELLE A. SANDHAUS AND RICH BLOCK		
16	Saving the Black-Footed Ferret from Extinction: In Theory and Practice	440	
	RACHEL SANTYMIRE		
	PART IV	BASIC RESEARCH	475
17	"Largest Breeding Colony Outside of Australia": Linking Koala <i>Ex Situ</i> and <i>In Situ</i> Research	477	
	JENNIFER R. TOBEY		
18	Comparative Cognition Research in Zoos	490	
	BONNIE M. PERDUE		

xii CONTENTS

19 Learning about Dolphins: An Era of Discovery in Managed Care	511
HOLLI C. ESKELINEN, JILL L. RICHARDSON, AND KELLEY A. WINSHIP	
20 Contributions of Zoo-Based Reproductive Research to Marine Animal Conservation	543
JUSTINE K. O'BRIEN, KAREN J. STEINMAN, GISELE A. MONTANO, AND TODD R. ROBECK	
21 Studying Play in Zoos and Aquariums	558
SABRINA I. C. A. BRANDO AND GORDON M. BURGHARDT	
22 Krogh's Principle and Why the Modern Zoo Is Important to Academic Research	586
JOSEPH R. MENDELSON III, GORDON W. SCHUETT, AND DWIGHT P. LAWSON	
23 Does Research Have a Place in the Zoological Garden?	618
TERRY L. MAPLE AND SALLY L. SHERWEN	
Conclusion: Cultivating Science in World Zoos and Aquariums	646
MEREDITH J. BASHAW AND TERRY L. MAPLE	
Appendix	662
Index	663
Colour plate section to be found between pages 366 and 367	

Contributors

Stephanie M. Allard

Detroit Zoological Society

Matt Ardaiole

Denver Zoo

Meredith J. Bashaw

Franklin & Marshall College

João Batista da Cruz

São Paulo Zoo

Richard A. Bergl

North Carolina Zoo

Rich Block

Santa Barbara Zoo

Donal M. Boyer

Wildlife Conservation Society, Bronx Zoo

Sabrina I. C. A. Brando

World Association of Zoos and Aquariums

Gordon M. Burghardt

University of Tennessee

Francis Cabana

Wildlife Reserves Singapore

Paul S. Crump

Texas Parks and Wildlife

Rick Dawson

Nature Protection Branch, Department of Biodiversity, Conservation
and Attractions, Western Australia

Kathleen Dudzinski

Dolphin Communication Project

xiv CONTRIBUTORS

Joshua R. Ennen

Tennessee Aquarium

Holli C. Eskelinen

Dolphins Plus Marine Mammal Responder and Rosenstiel School of
Marine and Atmospheric Science, University of Miami

Johannes Fritz

Waldrappteam

Anna L. George

Tennessee Aquarium

Fernanda Junqueira Vaz Guida

São Paulo Zoo

Rebecca J. Hobbs

Taronga Conservation Society Australia

Lauren L. Howard

San Diego Zoo Global

Michael Hutchins

American Bird Conservancy

Corinne J. Kendall

North Carolina Zoo

Bethany L. Krebs

San Francisco Zoological Society

Bernard R. Kuhajda

Tennessee Aquarium

Dwight P. Lawson

Oklahoma City Zoo and Botanical Garden

Anna Le Souëf

Perth Zoo and School of Veterinary and Life Sciences, Murdoch
University

Terry L. Maple

Georgia Institute of Technology and Jacksonville Zoo and Gardens

Camila Martins

São Paulo Zoo

MaryEllen Mateleska

Mystic Aquarium

Joseph R. Mendelson III

Zoo Atlanta and Georgia Institute of Technology

Angélica Midori Sugieda

São Paulo Zoo

Gisele A. Montano

SeaWorld and Busch Gardens Species Preservation Laboratory

Justine K. O'Brien

SeaWorld and Busch Gardens Species Preservation Laboratory and
Taronga Conservation Society Australia

David A. Oehler

Wildlife Conservation Society, Bronx Zoo

Kátia Gisele de Oliveira Rancura

São Paulo Zoo

Eridia Pacheco

San Francisco Zoological Society and University of California at Davis

Bonnie M. Perdue

Agnes Scott College

Lou Perrotti

Roger Williams Park Zoo

Amy Plowman

Whitley Wildlife Conservation Trust

David M. Powell

Saint Louis Zoo

Jill L. Richardson

Rosenstiel School of Marine and Atmospheric Science, University of
Miami and Dolphins Plus Marine Mammal Responder

Todd R. Robeck

SeaWorld and Busch Gardens Species Preservation Laboratory

Estelle A. Sandhaus

Santa Barbara Zoo

Rachel Santymire

Lincoln Park Zoo

Gordon W. Schuett

Georgia State University and Chiricahua Desert Museum

xvi CONTRIBUTORS

Jill M. Shephard

School of Veterinary and Life Sciences, Murdoch University,
Western Australia

Sally L. Sherwen

University of Melbourne and Zoos Victoria

Scott Silver

Wildlife Conservation Society, Queens Zoo

Brandie Smith

Smithsonian National Zoological Park

Rebecca E. Spindler

Bush Heritage Australia

Karen J. Steinman

SeaWorld and Busch Gardens Species Preservation Laboratory

Patrick Thomas

Wildlife Conservation Society, Bronx Zoo

Jennifer R. Tobey

San Diego Zoo Global

Markus Unsöld

Waldrappteam, Bavarian State Collection of Zoology

Regiane Vieira de Paiva Morais

São Paulo Zoo

Simone Vitali

Perth Zoo

Bernhard Völkl

Waldrappteam

Kristin S. Warren

School of Veterinary and Life Sciences, Murdoch University, Western
Australia

Jason V. Watters

San Francisco Zoological Society and University of California at Davis

Robert J. Wiese

San Diego Zoo Global

Kelley A. Winship

Dolphins Plus Marine Mammal Responder and Rosenstiel School of
Marine and Atmospheric Science, University of Miami

Acknowledgments

First and foremost, many thanks to all the wonderful people at Cambridge University Press who have helped us along the way. Particular thanks to Dominic Lewis, without whom we could not have made this book a reality, and Aleksandra Serocka, editorial assistant extraordinaire.

Additional thanks to James Kaufman, Genet Tulgetske, Mike Allen, Fred Bercovitch, Megan Knowles, the Franklin & Marshall Psychology Department, Lexi Moore, and Lorie Rybiski.

And gratitude to all of our students and collaborators whose interests expanded our own horizons and contributed to a lifetime of memories and adventures with charismatic megafauna.