Coastal Research Library

Volume 22

Series editor
Charles W. Finkl
Coastal Education and Research Foundation (CERF)
Fletcher, NC, USA

Department of Geosciences
Florida Atlantic University
Boca Raton, FL, USA

The aim of this book series is to disseminate information to the coastal research community. The Series covers all aspects of coastal research including but not limited to relevant aspects of geological sciences, biology (incl. ecology and coastal marine ecosystems), geomorphology (physical geography), climate, littoral oceanography, coastal hydraulics, environmental (resource) management, engineering, and remote sensing. Policy, coastal law, and relevant issues such as conflict resolution and risk management would also be covered by the Series. The scope of the Series is broad and with a unique cross-disciplinary nature. The Series would tend to focus on topics that are of current interest and which carry some import as opposed to traditional titles that are esoteric and non-controversial. Monographs as well as contributed volumes are welcomed.

More information about this series at http://www.springer.com/series/8795

Marcos R. Rossi-Santos • Charles W. Finkl
Editors

Advances in Marine Vertebrate Research in Latin America

Technological Innovation and Conservation

Springer

Editors
Marcos R. Rossi-Santos
Laboratório de Ecologia Acústica e Comportamento Animal/Acoustic Ecology and Animal Behavior Laboratory
Centro de Ciências Agrárias, Ambientais e Biológicas - Universidade Federal do Recôncavo da Bahia (UFRB)
Cruz das Almas, Bahia, Brazil

Programa de Pós-Graduação em Ecologia e Biomonitoramento
Universidade Federal da Bahia (UFBA)
Salvador, Bahia, Brazil

Charles W. Finkl
Coastal Education and Research Foundation (CERF)
Fletcher, NC, USA

Department of Geosciences
Florida Atlantic University
Boca Raton, FL, USA

ISSN 2211-0577 ISSN 2211-0585 (electronic)
Coastal Research Library
ISBN 978-3-319-56984-0 ISBN 978-3-319-56985-7 (eBook)
DOI 10.1007/978-3-319-56985-7

Library of Congress Control Number: 2017946079

Printed on acid-free paper

This Springer imprint is published by Springer Nature
The registered company is Springer International Publishing AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

This volume in the Coastal Research Library (CRL) gathers the most recent research findings on the ecology and conservation of marine vertebrates in Latin America, making use of advanced technological methods to show readers the diversity of the marine research that has been conducted in these countries over the last decades. The book brings together authors from more than 25 institutions of different countries developing the most diverse research aiming at ocean conservation through the ecology of different vertebrate animals, such as whales, dolphins, manatees, turtles, seabirds, and fish.

This eclectic collection is broad in scope but provides detailed summaries of new methods that are deployed in the study of marine environmental conservation. Key issues revolve around the development and application of educational methodologies in the field of marine vertebrate research, which provide a rational basis for better management of marine environments using modern techniques associated with GIS, satellite tracking, aerial systems, bioacoustics, biogeochemistry, genetics, underwater videography, species photoidentification, molecular biology, trophic ecological methods, ethological methods, arts awareness, and behavioral ecology, among others. Discussion and elucidation of these kinds of techniques are aimed at university-level students and postgraduate researchers. The scope of this volume includes whales, sharks, rays, dolphins, tropical fishes, turtles, and manatees as well as aspects of Latin American marine ecosystem conservation.

The 17 chapters in this book are organized in three parts, with Part I focusing on the historical development of aquatic mammal research in Latin America, Part II dealing about technological innovation for marine vertebrate research in Latin America, and Part III bringing studies on the conservation ecology of marine vertebrate research in Latin America.

Part I includes three chapters, the first being "Mastozoology History and Perspectives in Latin America: Marine and Freshwater Mammals in Spotlight," where Paulo Simões-Lopes introduces the historical context of the first studies in Latin America as well as the potential perspectives for the future of this field. In Chap. 2, "Long-Term Monitoring of Dolphins in a Large Estuarine System of

Southeastern Brazil," Emygdio Monteiro Filho, Lucimary Deconto, Caio Louzada, Rebeca Wanderley, Daniela Godoy, and Eric Medeiros describe one of the first in situ long-term studies for a marine vertebrate species (the Guiana dolphin) in Latin America. Chapter 3, "An Integrated Framework to Assess the Carrying Capacity of Whale-Watching Tourism in Praia do Forte, Northeastern Brazil," by Luena Fernandes and Marcos Rossi-Santos, represents an important effort to understand the whale-watching operation toward its sustainability in Brazilian waters.

Part II contains six chapters that generally deal with technological innovation for marine vertebrate research. In Chap. 4, "Land-Based Studies of Aquatic Mammals in Latin America: Understanding Behavior for Conservation," Maria Morete, Daniela Abras, and Cristiane Martins relate their use of theodolites to monitor whale behavior from land stations and use the acquired information to support conservation actions. Chapter 5, "Marine Mammal Bioacoustics Using Towed Array Systems in the Western South Atlantic Ocean," by Artur Andriolo, Franciele de Castro, Thiago Amorim, Gustavo Miranda, Juliana Di Tulio, Juliana Moron, Bruna Ribeiro, Gabriela Ramos, and Raíssa Mendes, presents the advanced technique of acoustic towed arrays to monitor marine mammals in oceanic waters. Also about acoustic approaches, Mariana Melcón, Vanesa Reyes, and Miguel Iñíguez in Chap. 6, "Bioacoustic Techniques Applied to Odontocete Conservation and Management in Argentina," discuss on the application of such methods in Argentinean waters. In order to contribute with the present knowledge of the marine turtle species of Latin America, Maria Angela Marcovaldi, Guy Marcovaldi, Alexsandro Santos, Paulo Lara, and Milagros López-Mendilaharsu, in Chap. 7, "Novel Research Techniques Provide New Insights to the Sea Turtle Life Cycle," bring an interesting view of their pioneering study and rewarded research program in Brazil. In Chap. 8, "Using Opportunistic Platforms to Study Dolphin Occurrence and Distribution in the North Coast of Bahia State, Northeastern Brazil," Mateus Carvalho, Marcos Rossi-Santos, Elitieri Santos-Neto, and Clarêncio Baracho describe the important findings of dolphin occurrence, with the use of tourism boats as a research platform, minimizing costs for the marine fauna monitoring. Chapter 9, "Using Chemical Elements to the Study of Trophic and Spatial Ecology in Marine Mammals of the Southwestern Atlantic Ocean," by Elisa Seyboth, Silvina Botta, and Eduardo Secchi, contributes with biochemistry methods to study the trophic ecology of marine mammals as well as their conservation.

Part III consists of seven chapters that deal with the conservation ecology of marine vertebrate research in Latin America. In Chap. 10, "Elasmobranchs Consumption in Brazil: Impacts and Consequences," Hugo Bornatowski, Raul Braga, and Rodrigo Barreto tell readers about the increasing consumption of sharks and rays and what this implies for marine ecology and conservation. Chapter 11, "West Indian Manatee (*Trichechus manatus*) in South America: Distribution, Ecology and Health Assessment," by Ana C. O. de Meirelles, Vitor L. Carvalho, and Miriam Marmontel, constitutes a great overview of the research with this endangered marine vertebrate species, enriching the species diversity of this volume. Representing some of the advanced research conducted in Central America, Chap. 12, "Ecology and Conservation of Cetaceans of Costa Rica and Panama," by Laura

May-Collado, Marisol Amador-Caballero, José Julio Casas, Mónica Gamboa-Poveda, Frank Garita-Alpízar, Tim Gerrodette, Rocío González-Barrientos Gabriela Hernández-Mora, Daniel Palacios, José Palacios-Alfaro, Betzi Pérez, Kristen Rasmussen, Lissette Trejos, and Javier Rodríguez-Fonseca, presents the state of art of the cetacean research in these two countries. Another high topic is debated in Chap. 13, "Anthropogenic Noise and Guiana Dolphins (*Sotalia guianensis*) in Brazil: Ecological and Conservation Concerns," by Fábio de Sousa Pais, Rafaela Cardoso, Leonardo Wedekin, Dalila Martins, Flavio Silva, Emygdio Monteiro Filho, and Marcos Rossi-Santos, discussing the occurrence of human disturbance on the daily life of a marine top predator. Another great contribution to enlarge the vertebrate diversity of this book is presented in Chap. 14, "The Atlantic Goliath Grouper: Conservation Strategies for a Critically Endangered Species in Brazil," by Maurício Hostim-Silva, Áthila Bertoncini, Maíra Borgonha, Jonas Leite, Matheus Freitas, Felippe Daros, Leonardo Bueno, Ana Paula Farro, and Christopher Koenig, bringing the efforts for the conservation of one of the most endangered fish species of the world. In Chap. 15, "Spreading Message in a Noisy World: Song Behavior and Acoustic Ecology in Humpback Whales (*Megaptera novaeangliae*), from the Southwestern Atlantic Ocean," Marcos Rossi-Santos presents the results of a long-term study of one of the most complex singers in the animal world. Chapter 16, "Conservation Advances for the Southern Right Whales in Brazil," by Karina Groch, relates the victories and challenges of the efforts to understand and conserve whales in Latin America since the 1980s. The last Chap. 17, "Behavior and Ecology of Endangered Species Living Together: Long-Term Monitoring of Resident Sympatric Dolphin Populations in South Brazil," by Marta Cremer, Annelise Holz, Camila Sartori, Beatriz Schulze, Renan Paitach, and Paulo Simões-Lopes, brings the unique research that studies Franciscana dolphins in the wild along to Guiana dolphins, in an important Brazilian bay ecosystem.

With this book, we would like to present to the world the efforts from Latin American researchers in the search for high technological methods to achieve enhanced results in the marine ecology and conservation science, and we hope that it may be taken as an example for the future generations of investigators in the developing countries worldwide. Come and join us in this amazing journey!

Praia do Forte, BA, Brazil — Marcos R. Rossi-Santos
Fletcher, NC, USA — Charles W. Finkl

Contents

About the Editors

Marcos R. Rossi-Santos is a biologist, with a MSc in Zoology from the Universidade Federal do Paraná and PhD in Animal Behavior from the Universidade Federal do Rio Grande do Norte. He has been investigating the ecology and conservation of aquatic mammals and other vertebrates for the past 23 years, developing a broad experience about behavioral ecology and anthropogenic impacts on natural ecosystems, mainly through the acoustic studies. Along this time, he has collaborated with many Brazilian research institutions, exploring different areas such as the Brazilian coast and islands, Amazon, Galapagos Islands, and South Georgia Island, in Antarctica. He is a professor at the Universidade Federal do Recôncavo da Bahia, Brazil, coordinating the Acoustic Ecology and Animal Behavior Laboratory, and also associated with the Graduation Program in Ecology of the Universidade Federal da Bahia.

Charles W. Finkl has edited and/or contributed to more than eight volumes in the Encyclopedia of Earth Sciences Series. For the past 33 years, he has been the executive director of the Coastal Education and Research Foundation (CERF) and Editor-in-Chief of the international *Journal of Coastal Research*. In addition to these duties, he is Professor Emeritus at Florida Atlantic University in Boca Raton, Florida, USA. He is a graduate of the University of Western Australia (Perth) and previously worked for a wholly owned Australian subsidiary of the International Nickel Company of Canada (INCO). During his career, he acquired field experience in Australia; the Caribbean; South America; SW Pacific islands; Southern Africa; Western Europe; and the Pacific Northwest, Midwest, and Southeast USA.