

Coastal Research Library

Volume 29

Series Editor

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Christopher Makowski • Charles W. Finkl
Editors

Impacts of Invasive Species on Coastal Environments

Coasts in Crisis



Springer

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Preface

When examining coastal environments throughout the world, there is usually a delicate balance formed among native vegetative and animal species and the environment itself. This equilibrium helps to sustain the ecosystem as a whole and ensures that the biodiversity of a particular coastal region is preserved. However, an unfortunate imbalance is observed in this modern era where bioinvasions of alien species have infiltrated multiple coastal landscapes. This volume in the *Coastal Research Library* (CRL) focuses on the regional and localized impacts that incur to various coastal environments from nonnative, invasive species. The book has been divided into two main parts: Part I – Regional Impacts from Multiple Coastal Invasive Species; and Part II – Localized Effects of Individual Coastal Invasives. These general subject-area parts are then subdivided into chapters that describe, through either generalized overviews or specific case studies, how invasive flora and fauna create destructive cascades within coastal systems that ultimately end with substantial deleterious impacts on environmental quality. While the following collection of topics provides insight into the common threat that is coastal invasive species, it also pushes to the forefront the undeniable influence of human action, whether through urbanization, industrialization, and commercialization, to enable such detrimental bioinvasions. With so many coastal environments already compromised, it is imperative that protection against invasive species is mandated in order to rehabilitate, preserve, and sustain these delicate littoral zones.

Part I contains seven chapters highlighting regional impacts around the world from multiple coastal invasive species. Chapter 1 (Invasive Species Within South Florida Coastal Ecosystems: An Example of a Marginalized Environmental Resource Base), by Christopher Makowski and Charles W. Finkl, discusses how numerous invasive species of vegetation and wildlife have wreaked havoc over the southern Florida peninsula. Descriptions of specific invasive species are given, as well as various countermeasures used in an attempt to neutralize the alien bioinvaders. The authors also explore the notion of humans as the main invasive species in coastal environments. Chapter 2 (Invasive Species in the Sundarbans Coastal Zone (Bangladesh) in Times of Climate Change: Chances and Threats), by

Shafi Noor Islam, Sandra Reinstädler, and Albrecht Gnauck, presents the impacts and threats of multiple invasive species to the Sundarbans deltaic region. These biological invasions are linked to vulnerabilities in mangrove forests and wetlands throughout the Sundarbans Natural World Heritage Site in Bangladesh. Chapter 3 (Threats to Sandy Shore Habitats in Sri Lanka from Invasive Vegetation), by Wasantha Rathnayake, quantifies how native plant diversity is decreasing while invasive weeds are more abundant along the sandy shorelines of Sri Lanka. Chapter 4 (Alien Species and the Impact on Sand Dunes Along the NE Adriatic Coast), by Urban Šilc, Danijela Stešević, Andrej Rozman, Danka Caković, and Filip Kuzmič, continues in a similar vein by examining the results of a multifaceted approach to observe how sand dune plant communities in Montenegro have been affected by invasion of five alien species. Chapter 5 (Manila Bay Ecology and Associated Invasive Species), by Benjamin M. Vallejo Jr., Alexander B. Aloy, Melody Ocampo, Jennifer Conejar-Espedido, and Leanna M. Manubag, takes a look at how the high marine biodiversity of the Philippines' Manila Bay becomes compromised through the biological invasions of fouling organisms. Chapter 6 (Bioinvasion and Environmental Perturbation: Synergistic Impact on Coastal–Mangrove Ecosystems of West Bengal, India), by Susanta Kumar Chakraborty, reports on the prospective consequences of several bioinvasions within the coastal–estuarine network of West Bengal, India, which includes more than 100 deltas in this region. Chapter 7 (Specialized Grooming as a Mechanical Method to Prevent Marine Invasive Species Recruitment and Transport on Ship Hulls), by Kelli Z. Hunsucker, Emily Ralston, Harrison Gardner, and Geoffrey Swain, assesses the ubiquitous impact of biofouling on ship hulls and proposes an innovative countermeasure to thwart invasive species recruitment and transport.

Part II contains seven chapters and focuses on the localized effects generated by an individual invasive species, in particular. Chapter 8 (Feeding Habits of *Pterois volitans*: A Real Threat to Caribbean Coral Reef Biodiversity), by Arturo Acero P., Diana Bustos-Montes, Paula Pabón Quintero, Carlos Julio Polo-Silva, and Adolfo Sanjuan Muñoz, delves into the commercial and ecological threats caused by one invasive marine species, the lionfish, which may single-handedly be responsible for altering the biodiversity of the Caribbean Sea. Chapter 9 (Environmental Impact of Invasion by an African Grass (*Echinochloa pyramidalis*) on Tropical Wetlands: Using Functional Differences as a Control Strategy), by Hugo López Rosas, Eduardo Cejudo, Patricia Moreno-Casasola, Luis Alberto Peralta Peláez, María Elizabeth Hernández, Adolfo Campos Cascaredo, and Gustavo Aguirre León, discusses how one invasive grass species is altering the wetland and dune ecosystems in Mexico by reducing plant biodiversity, changing system hydrology, reducing faunal habitat, and causing vertical accretion of physicochemicals within the soil profiles. The authors also highlight an ongoing control strategy project to curb the bioinvader. Chapter 10 (Environmental Impacts of an Alien Kelp Species (*Undaria pinnatifida*, Laminariales) Along the Patagonian Coasts), by M. Paula Bunicontro, Silvia C. Marcomini, and Graciela N. Casas, focuses on the effects of an invasive kelp species along the Argentinean coast. This submerged aquatic bioinvader not only impacts indigenous populations but may also be responsible for collapsing

commercially important benthic community structures and increasing beach erosion. Chapter 11 (Only the Strictest Rules Apply: Investigating Regulation Compliance of Beaches to Minimize Invasive Dog Impacts on Threatened Shorebird Populations), by Grainne S. Maguire, Kelly K. Miller, and Michael A. Weston, explores an unlikely coastal invasive species in domesticated dogs and how to minimize their impact on threatened populations of shorebirds in southern Australia. Chapter 12 (Evaluating How the Group Size of Domestic, Invasive Dogs Affect Coastal Wildlife Responses: The Case of Flight-Initiation Distance (FID) of Birds on Southern Australian Beaches), by S. Guinness, W.F. Van Dongen, P.-J. Guay, R.W. Robinson, and M.A. Weston, is a follow-up to the previous chapter where the flight-initiation distance (FID), a measure of wariness in shorebirds, was correlated to the group size of invasive dog packs on Australian beaches. Chapter 13 (Impact of Invasive *Nypa Palm* (*Nypa fruticans*) on Mangroves in Coastal Areas of the Niger Delta Region, Nigeria), by Aroloye O. Numbere, investigates one of the major bioinvading threats to mangrove and coastal systems in the Niger Delta area. This alien palm has the potential to adversely change the pedology, hydrology, and overall landscape of the deltaic environment. Chapter 14 (*Acacia* spp.: Invasive Trees Along the Brunei Coast, Borneo), by Shafi Noor Islam, Siti Mazidah Bin Haji Mohamad, and Abul Kalam Azad, probes another invasive flora, this time a non-indigenous genera of tree, that has impacted the forest ecology along the coast of Brunei Darussalam in Borneo.

This volume offers wide-ranging examples of how invasive species impact many diverse coastal environments. Chapters selected for this book selectively show that native populations of plants and animals are under constant threat of bioinvasions along the coasts of the following regions: North and South America, Australia, Southeast Asia, Bangladesh, West Africa, India, Philippines, Sri Lanka, and the Caribbean Sea. The underlining theme of this publication is to create awareness of the global impacts caused by coastal invasive species and to instill a responsibility among people that humans may in fact be the quintessential bioinvader on planet Earth. Only then can people begin to repair the damage they have unleashed in the form of exotic, alien species along the coasts. Through the dissemination of this book, researchers, managers, and the public alike can begin to collectively work together to identify the root of the problem when it comes to invasive species and to no longer put our coasts in crisis.

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