

# Islands in the Sand

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Ecology and Management of Nearshore  
Hardbottom Reefs of East Florida

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# Foreword

Almost everyone loves the shore. This margin between our own familiar ground and the vast ocean wilderness can both comfort and excite us. Many of us recall serenely filling our senses with surf tumbling onto a beach, only to have that peace punctuated by delight—a sudden and beautiful visage from the sea, a shadow in a wave, a leap and a splash, or a lingering presence offering detailed wonder. That nature and we share more than coincidence of space in this coastal ecosystem. We share a need for it.

This book is about a vital but underappreciated natural feature—Florida’s near-shore reefs—oases of life that the authors refer to as “Islands in the Sand.” “Underappreciated?” you question. Yes, vastly so. Still, we enjoy these reefs immensely. We prosper from their flora and fauna, and are treated to the landscapes they present at low tide, and through our dive mask. Our profits from nearshore reef services occupy many levels, including the all-important economic benefit measured by dollars. Yet, although we gain from these lovely, diverse, accessible patches of hard sea-bottom, we fail to appreciate the full depth of these shallow reefs. That is to say, we fall short of understanding them, of grasping the habitat’s worth and significance, and of knowing outright how our actions can threaten it.

The authors of this book, who are experts across multiple fields, have prepared a detailed ecological description of Florida’s coastal reefs. It is a portrayal that is both academic and easily absorbed, and is essential for coastal managers, scientists, or anyone wanting to deepen their coastal relationship. This book catalogs features of nearshore reefs—their dynamic cycles of ecological change, their function as hotspots for biodiversity, their role in the lives of rare species, and in our own lives.

Especially now, our aptitude for the mutual relationship we have with nearshore reefs is crucial to their pulse of persistence. Over eons, these reefs of the surf zone blossomed and withered to the beat of storms and natural sand movement, periodically harboring unique lives lived in haste, and marine animals in formative stages or just passing through. But as our coast has become more crowded, this habitat has suffered from our insistence on permanence within such a dynamic system. Where beach sands once came and went, we construct buildings on dangerous ground requiring defense against change. This messy and expensive coastal battle often

involves pumping sand to artificially replace what the sea consumes, and as an unintended consequence of this engineering, reefs, which contributed to the original value of the real estate, are kept smothered.

The paradox of habitat affinity and habitat harm is precisely why this book is essential. The affinity is self-evident. To visit a Florida beach adorned by nearshore reef at low tide is to experience uniquely accessible nature—life-filled tide pools that tempt the curiosity of children and bring out blissful biophilia in us all. But understanding the potential harm to our nearshore reefs requires insight into how this habitat functions. To the extent that this knowledge leads to watchful stewardship and temperance of our coastal actions, we will keep our mutually beneficial relationship with coastal reefs. On this journey, this book will be our guide.

Blair Witherington, Ph.D., Floridana Beach, Florida, USA

*Florida's Living Beaches and Our Sea Turtles*

# Preface

The management of coastal resources is increasingly focused on ecosystem approaches that not only consider primary habitats of concern but their connectivity to adjacent systems. Amidst the cross-shelf mosaic of habitats of mainland Florida's east coast, estuaries with mangroves and seagrasses share many flows, including energy and propagules, with reefs and pelagic waters offshore. Along the highly dynamic land-ocean margin, nearshore hardbottom habitats at 0–4 m depths exist as reef patches for over a thousand documented organisms, amidst long stretches of sand. This volume is the first to describe the fundamentals of the biological, physical, ecological, and management attributes of east Florida's nearshore reefs. Since many coastal residents interact with these reefs and have many questions, we have also tried to make this book accessible to laypersons (e.g., the imagery, a Glossary for technical terms, and book structure) to make these habitats more understandable.

We introduce nearshore hardbottom habitats from southern St. Johns County to northern Miami-Dade County and foundational ecological concepts in Chap. 1. In Chap. 2, we discuss the geology and distribution of nearshore hardbottom reefs and the associated oceanographic setting in the region in which they occur. In Chap. 3 through 6, we synthesize the peer-reviewed scientific and gray literatures, and provide unpublished data based on decades of experience with these reefs among the co-authors. We describe the known species groups, their latitudinal and depth distributions, reproduction, trophic functions, and connectivity for algae and cyanobacteria (Chap. 3), invertebrates (Chap. 4), fishes (Chap. 5), and sea turtles (Chap. 6).

In Chap. 7, we integrate assemblage-scale ecological perspectives among these flora and fauna. We discuss the potential roles of disturbance and latitude in affecting abundance and distribution with respect to habitat use, and populations and energetic connectivity along the east Florida coast. In Chap. 8, the responses of these organisms to varying degrees of natural and anthropogenic disturbances are examined. We then discuss approaches for minimizing impacts to nearshore hardbottom reefs during large fill projects, with a focus on artificial reef mitigation. In Chap. 9, we summarize research findings for each major taxonomic group, nearshore hardbottom reef ecology, and management with a focus on future research opportunities across all issues.

In examining these diverse nearshore hardbottom reef issues, we hope to provide a useful reference for coastal researchers, managers, and educators, as well as anyone else interested in these habitats and their connectivity to the sea and land. We hope this book inspires increased research on these systems and improved science-based conservation of the marine biodiversity of coastal Florida and other regions with nearshore hardbottom reefs.

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