

## Diseases Of Coral

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Marine Disease Ecology  
Infectious Disease Ecology  
Pristine Seas  
A Sea of Glass  
Corals in a Changing World  
Opportunities for Environmental Applications of Marine Biotechnology  
Coral Reefs of the Gulf  
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Life and Death Of Coral Reefs

### Coral Reefs: An Ecosystem in Transition

This book covers in one volume materials scattered in hundreds of research articles, in most cases focusing on specialized aspects of coral biology. In addition to the latest developments in coral evolution and physiology, it presents chapters devoted to novel frontiers in coral reef research. These include the molecular biology of corals and their symbiotic algae, remote sensing of reef systems, ecology of coral disease spread, effects of various scenarios of global climate change, ocean acidification effects of increasing CO<sub>2</sub> levels on coral calcification, and damaged coral reef remediation. Beyond extensive coverage of the above aspects, key issues regarding the coral organism and the reef ecosystem such as calcification, reproduction, modeling, algae, reef invertebrates, competition and fish are re-evaluated in the light of new research and emerging insights. In all chapters novel theories as well as challenges to established paradigms are introduced, evaluated and discussed. This volume is indispensable for all those involved in coral reef management and conservation.

### Diagnosis and Treatment of Aortic Diseases

This book examines how the growing knowledge of the huge range of animal-bacterial interactions, whether in shared ecosystems or intimate symbioses, is fundamentally altering our understanding of animal biology. Individuals from simple invertebrates to human are not solitary, homogenous entities but consist of complex communities of many species that likely evolved during a billion years of coexistence. Defining the individual microbe-host conversations in these consortia, is a challenging but necessary step on the path to understanding the function of the associations as a whole. The hologenome theory of evolution considers the

holobiont with its hologenome as a unit of selection in evolution. This new view may have profound impact on understanding a strictly microbe/symbiont-dependent life style and its evolutionary consequences. It may also affect the way how we approach complex environmental diseases from corals (coral bleaching) to human (inflammatory bowel disease etc). The book is written for scientists as well as medically interested persons in the field of immunobiology, microbiology, evolutionary biology, evolutionary medicine and corals.

### **Coral Bleaching**

### **Aquarium Corals**

This book is an up-to-date summary of all aspects of aortic disease, written by international experts in their fields, covering diagnostic concepts of all aortic diseases, the most modern therapeutic approaches in various aortic syndromes, the pathogenic origin and the most recent molecular and cellular findings that have revolutionized our present knowledge of aortic diseases. The reader will come to understand the aorta as a functional organ with a complex regulatory system rather than just a major arterial vessel, and will have a better understanding of the prognostic impact of various aortic syndromes, and of the most recent therapeutic concepts for chronic as well as acute aortic pathology. As a unique feature of this book, the aorta is placed in the center of systemic illnesses, such as atherosclerosis, diabetes, hypertension, infectious diseases and connective tissue disorders, storage diseases, trauma and toxic factors; this concept aims to attract the attention of both clinical specialties such as cardiology, radiology and cardiovascular surgery and adjacent areas like pathology and clinical genetics. The book portrays the aorta as an integral part of the cardiovascular system and the entire organism and features the complexity and clinical impact of all major aortic diseases.

### **Diseases of Marine Fishes**

During the last decades there has been an increasing evidence of drastic changes in marine ecosystems due to human-induced impacts, especially on benthic ecosystems. The so called "animal forests" are currently showing a dramatic loss of biomass and biodiversity all over the world. These communities are dominated by sessile suspension feeder organisms (such as sponges, corals, gorgonians, bivalves, etc.) that generate three-dimensional structures, similar to the trees in the terrestrial forest. The animal forest provide several ecosystem services such as food, protection and nursery to the associated fauna, playing an important role in the local hydrodynamic and biogeochemical cycles near the sea floor and acting also as carbon sinks. The present book focus its attention on these three dimensional animal structures including, for the first time, all the different types of animal forests of the world in a single volume.

### **Trace Metals and Infectious Diseases**

Over the past four decades, outbreaks of coral diseases have resulted in

considerable loss of live-coral cover throughout the Caribbean region. Despite their long histories and ubiquitous distributions, the etiologies of most coral diseases remain poorly understood. Most researchers have assumed that all coral diseases are the result of infectious and contagious pathogens. Recent evidence has suggested, however, that some coral-disease outbreaks may be the result of immuno-compromised corals that have been subjected to increased environmental stresses, the foremost of which is a warming ocean associated with climate change. The objectives of this study were three-fold, to: (1) test waterborne and direct-contact transmission of Caribbean-coral diseases, (2) determine whether signs of coral diseases cluster, and follow a contagious-disease model, at a spatial scale of

### **Marine Animal Forests**

Coral disease is quickly becoming a crisis to the health and management of the world's coral reefs. There is a great interest from many in preserving coral reefs. Unfortunately, the field of epizootiology is disorganized and lacks a standard vocabulary, methods, and diagnostic techniques, and tropical marine scientists are poorly trained in wildlife pathology, veterinary medicine, and epidemiology. Diseases of Coral will help to rectify this situation.

### **Coral Disease Handbook**

This book opens with case studies of reefs in the Red Sea, Caribbean, Japan, Indian Ocean and the Great Barrier Reef. A section on microbial ecology and physiology describes the symbiotic relations of corals and microbes, and the microbial role in nutrition or bleaching resistance of corals. Coral diseases are covered in the third part. The volume includes 50 color photos of corals and their environments

### **The Relationship Between Climate-driven Ocean Warming and Coral Diseases in the Caribbean**

One of the most dire consequences of global climate change for coral reefs is the increased frequency and severity of mass coral bleaching events. This volume provides information on the causes and consequences of coral bleaching for coral reef ecosystems, from the level of individual colonies to ecosystems and at different spatial scales, as well as a detailed analysis of how it can be detected and quantified. Future scenarios based on modelling efforts and the potential mechanisms of acclimatisation and adaptation are reviewed. The much more severe coral bleaching events experienced on Caribbean coral reefs (compared with those of the Indo-Pacific) are discussed, as are the differences in bleaching susceptibility and recovery that have been observed on smaller geographic scales.

### **The Ecology and Etiology of Newly Emerging Marine Diseases**

Coral reefs are among Earth's most diverse, productive, and beautiful ecosystems, but until recently, their ecology and the means to manage them have been poorly understood and documented. In response to the inadequate information base for coral reefs, this book reviews the ecological and conservation status of coral reefs

of the Western Indian Ocean, bringing together presentations of the region's leading scientists and managers working on coral reefs. *Coral Reefs of the Indian Ocean: Their Ecology and Conservation* starts with a general overview of the biogeography of the region and a historical account of attempts to conserve this ecosystem. It goes on to describe the state of the reefs in each of the countries with coral reefs, and it concludes with a series of management case studies. The book also summarizes most of the existing ecological information on reefs in this region and efforts at management, making it useful for students, teachers, and investigators interested in tropical or marine ecology, conservation biology and management, and environmental sciences.

### **A Research Review of Interventions to Increase the Persistence and Resilience of Coral Reefs**

Coral reefs are critical to ocean and human life because they provide food, living area, storm protection, tourism income, and more. However, human-induced stressors, such as overfishing, sediment, pollution, and habitat destruction have threatened ocean ecosystems globally for decades. In the face of climate change, these ecosystems now face an array of unfamiliar challenges due to destructive rises in ocean temperature, acidity and sea level. These factors lead to an increased frequency of bleaching events, hindered growth, and a decreasing rate of calcification. Research on interventions to combat these relatively new stressors and a reevaluation of longstanding interventions is necessary to understand and protect coral reefs in this changing climate. Previous research on these methods prompts further questions regarding the decision making process for site-specific interventions. *A Decision Framework for Interventions to Increase the Persistence and Resilience of Coral Reefs* builds upon a previous report that reviews the state of research on methods that have been used, tested, or proposed to increase the resilience of coral reefs. This new report aims to help coral managers evaluate the specific needs of their site and navigate the 23 different interventions described in the previous report. A case study of the Caribbean, a region with low coral population plagued by disease, serves as an example for coral intervention decision making. This report provides complex coral management decision making tools, identifies gaps in coral biology and conservation research, and provides examples to help individuals and communities tailor a decision strategy to a local area.

### **The Ecology and Etiology of Newly Emerging Marine Diseases**

Coral reef declines have been recorded for all major tropical ocean basins since the 1980s, averaging approximately 30-50% reductions in reef cover globally. These losses are a result of numerous problems, including habitat destruction, pollution, overfishing, disease, and climate change. Greenhouse gas emissions and the associated increases in ocean temperature and carbon dioxide (CO<sub>2</sub>) concentrations have been implicated in increased reports of coral bleaching, disease outbreaks, and ocean acidification (OA). For the hundreds of millions of people who depend on reefs for food or livelihoods, the thousands of communities that depend on reefs for wave protection, the people whose cultural practices are tied to reef resources, and the many economies that depend on reefs for fisheries

or tourism, the health and maintenance of this major global ecosystem is crucial. A growing body of research on coral physiology, ecology, molecular biology, and responses to stress has revealed potential tools to increase coral resilience. Some of this knowledge is poised to provide practical interventions in the short-term, whereas other discoveries are poised to facilitate research that may later open the doors to additional interventions. A Research Review of Interventions to Increase the Persistence and Resilience of Coral Reefs reviews the state of science on genetic, ecological, and environmental interventions meant to enhance the persistence and resilience of coral reefs. The complex nature of corals and their associated microbiome lends itself to a wide range of possible approaches. This first report provides a summary of currently available information on the range of interventions present in the scientific literature and provides a basis for the forthcoming final report.

### **World Atlas of Coral Reefs**

This book summarizes what is known about mesophotic coral ecosystems (MCEs) geographically and by major taxa. MCEs are characterized by light-dependent corals and associated communities typically found at depths ranging from 30-40 m. and extending to over 150 m. in tropical and subtropical ecosystems. They are populated with organisms typically associated with shallow coral reefs, such as macroalgae, corals, sponges, and fishes, as well as specialist species unique to mesophotic depths. During the past decade, there has been an increasing scientific and management interest in MCEs expressed by the exponential increase in the number of publications studying this unique environment. Despite their close proximity to well-studied shallow reefs, and the growing evidence of their importance, our scientific knowledge of MCEs is still in its early stages. The topics covered in the book include: regional variation in MCEs; similarities and differences between mesophotic and shallow reef taxa, biotic and abiotic conditions, biodiversity, ecology, geomorphology, and geology; potential connectivity between MCEs and shallow reefs; MCE disturbances, conservation, and management challenges; and new technologies, key research questions/knowledge gaps, priorities, and future directions in MCE research.

### **A Decision Framework for Interventions to Increase the Persistence and Resilience of Coral Reefs**

Whether through loss of habitat or cascading community effects, diseases can shape the very nature of the marine environment. Despite their significant impacts, studies of marine diseases have tended to lag behind their terrestrial equivalents, particularly with regards to their ecological effects. However, in recent decades global research focused on marine disease ecology has expanded at an accelerating rate. This is due in part to increases in disease emergence across many taxa, but can also be attributed to a broader realization that the parasites responsible for disease are themselves important members of marine communities. Understanding their ecological relationships with the environment and their hosts is critical to understanding, conserving, and managing natural and exploited populations, communities, and ecosystems. Courses on marine disease ecology are now starting to emerge and this first textbook in the field will be

ideally placed to serve them. Marine Disease Ecology is suitable for graduate students and researchers in the fields of marine disease ecology, aquaculture, fisheries, veterinary science, evolution and conservation. It will also be of relevance and use to a broader interdisciplinary audience of government agencies, NGOs, and marine resource managers.

### **Coral Reefs and Climate Change**

Published by the American Geophysical Union as part of the Coastal and Estuarine Studies, Volume 61. The effects of increased atmospheric carbon dioxide and related climate change on shallow coral reefs are gaining considerable attention for scientific and economic reasons worldwide. Although increased scientific research has improved our understanding of the response of coral reefs to climate change, we still lack key information that can help guide reef management. Research and monitoring of coral reef ecosystems over the past few decades have documented two major threats related to increasing concentrations of atmospheric CO<sub>2</sub>: (1) increased sea surface temperatures and (2) increased seawater acidity (lower pH). Higher atmospheric CO<sub>2</sub> levels have resulted in rising sea surface temperatures and proven to be an acute threat to corals and other reef-dwelling organisms. Short periods (days) of elevated sea surface temperatures by as little as 1-2°C above the normal maximum temperature has led to more frequent and more widespread episodes of coral bleaching-the expulsion of symbiotic algae. A more chronic consequence of increasing atmospheric CO<sub>2</sub> is the lowering of pH of surface waters, which affects the rate at which corals and other reef organisms secrete and build their calcium carbonate skeletons. Average pH of the surface ocean has already decreased by an estimated 0.1 unit since preindustrial times, and will continue to decline in concert with rising atmospheric CO<sub>2</sub>. These climate-related Stressors combined with other direct anthropogenic assaults, such as overfishing and pollution, weaken reef organisms and increase their susceptibility to disease.

### **Coral Reefs of the Indian Ocean**

### **Ecology of Invertebrate Diseases**

This 2-day workshop is the culmination of a study of the status and future of marine biotechnology. The overall goal of this workshop is to examine what was initially called "Opportunities for Marine Biotechnology in the United States," to consider where we are now in this field of "Environmental Marine Biotechnology," to envision the field in the future, and to discuss any impediments that might be encountered along the way. Opportunities for Environmental Applications of Marine Biotechnology: Proceedings of the October 5-6, 1999, Workshop addresses the question of where the federal government should invest its limited funds and what future initiatives should be planned.

### **Proceedings of the Colloquium on Global Aspects of Coral Reefs, Health, Hazards and History**

Corals comprise a wide variety of colonial marine invertebrates belonging to the Phylum Cnidaria. Their polyps form the most colorful, complete, and diverse communities on the Earth resembling underwater cities, commonly called coral reefs, which host a wide variety of invertebrates and fish species. They are highly productive ecosystems, contribute to the health of the biosphere, and offer a good number of economic and ecological services to coastal populations and to many people around the world. However, due to a diverse number of natural and anthropogenic stressors, corals have shown a severe decline over the past few decades. Being aware of the importance and relevance of the facts described, the book "Corals in a Changing World" offers new scientific information regarding the actual status and, in some cases, the resilience state of coral reef systems. Timely information is critical for managers and decision makers to implement sustainable management measures according to the ecological condition of coral reefs. In addition, the book also discusses the use of well-maintained coral microcosms to provide a good basis for performing experiments with natural fluctuations and to present studies dedicated to the coral diversity characterization and to their importance as a source of important biological compounds, which could be converted into industrial products.

### **Our Dying Planet**

This book opens with case studies of reefs in the Red Sea, Caribbean, Japan, Indian Ocean and the Great Barrier Reef. A section on microbial ecology and physiology describes the symbiotic relations of corals and microbes, and the microbial role in nutrition or bleaching resistance of corals. Coral diseases are covered in the third part. The volume includes 50 color photos of corals and their environments

### **Life and Death Of Coral Reefs**

" Our Dying Planet is the most powerful statement on the future of life on earth I have ever read. Starting with the title, which I admire greatly, it delivers the sort of honest, accurate, no-punches-pulled assessment you would expect from a scientist who has seen the problems first hand. Coral reefs appear set to be the first major ecosystem to go extinct. Few people know more about this than Peter Sale. If every scientist were to speak as convincingly as Sale, the public might finally grasp the seriousness of the course on which we've set our planet."—Randy Olson, author of Don't Be Such a Scientist "Peter Sale's book shows us the exquisite sensitivity of ecosystems to the consequences of human activity. This is the anthropocene epoch, a time when human beings have become a force of nature, altering properties of the biosphere on a geological scale. Read this and you will know it is very late and we must act." —David Suzuki, author of The Sacred Balance and The Legacy "Disruptions such as overfishing, forest desecration, ocean acidification and pollution, and the wholesale destruction of coral reefs have already changed the earth disastrously. These problems will not fix themselves. For an articulate and crucial discussion of the mess we've made — and with some small hope for the future — you must read this book."—Richard Ellis, author of The Empty Ocean and The Great Sperm Whale "A bold and convincing explication of the forces inexorably leading to an environmental collapse, and sooner than most people think. Sale, a leading ecologist, tackles some sacred cows - including the implications of human population growth - and shows the many synergisms

between impacts that would be devastating even if they acted alone – which they don't. No one will read *Our Dying Planet* and remain complacent, but Sale sketches some promising paths out of our dilemma.”—Daniel Simberloff, coeditor of *Encyclopedia of Biological Invasions*

### **Diseases of Coral**

Coral reefs have shaped the surface of our planet far more than has any other ecosystem. They are dynamic systems, producing limestone at the rate of 400-2,000 tons per hectare per year, and influencing the chemical balance of the world's oceans. Coral reefs have been around since before the prairies or other ecosystems of flowering plants existed, yet they vanish about a million years before other groups of organisms each time there is a global mass extinction. They return after each catastrophe, however, following a long period of absence. Although coral reefs are the most productive communities in the sea, the fisheries of coral reefs are among the most vulnerable to overexploitation. Despite having the power to create the most massive structures in the world made by living creatures (including man), the thin veneer of living tissue of coral reef is particularly sensitive to natural disturbances and effects of human activities. Coral reefs are the first to go during periods of climate change, but they have always come back. This combination of attributes, creative power and fragility, resilience and sensitivity, makes management of coral-reef systems a challenge to science. Over 70% of the coral reefs in the Caribbean and Asian waters have been degraded, and perhaps a third of the 400 species of corals in Japanese waters are in danger of local extinction unless effective coastal management practices are established. This book presents what is known about factors that shift the balance between accretion and erosion, recruitment and mortality, stony corals and filamentous algae, recovery and degradation--the life and death of coral reefs. Insight into the factors controlling the direction of these processes is essential for appropriate management decisions.

### **Coral Health and Disease**

Provides photographs and text to discuss the geographic distribution and conservation status of coral reefs in the Atlantic and Eastern Pacific, the Indian Ocean and Southeast Asia, and the Pacific.

### **Coral Reefs and Climate Change**

News headlines are forever reporting diseases that take huge tolls on humans, wildlife, domestic animals, and both cultivated and native plants worldwide. These diseases can also completely transform the ecosystems that feed us and provide us with other critical benefits, from flood control to water purification. And yet diseases sometimes serve to maintain the structure and function of the ecosystems on which humans depend. Gathering thirteen essays by forty leading experts who convened at the Cary Conference at the Institute of Ecosystem Studies in 2005, this book develops an integrated framework for understanding where these diseases come from, what ecological factors influence their impacts, and how they in turn influence ecosystem dynamics. It marks the first

comprehensive and in-depth exploration of the rich and complex linkages between ecology and disease, and provides conceptual underpinnings to understand and ameliorate epidemics. It also sheds light on the roles that diseases play in ecosystems, bringing vital new insights to landscape management issues in particular. While the ecological context is a key piece of the puzzle, effective control and understanding of diseases requires the interaction of professionals in medicine, epidemiology, veterinary medicine, forestry, agriculture, and ecology. The essential resource on the subject, *Infectious Disease Ecology* seeks to bridge these fields with an ecological approach that focuses on systems thinking and complex interactions.

### **The Power of Plagues**

This book includes invited contributions presenting the latest research on the oceanography and environment of the Red Sea. In addition to covering topics relevant to research in the region and providing insights into marine science for non-experts, it is also of interest to those involved in the management of coastal zones and encourages further research on the Red Sea

### **Oceanographic and Biological Aspects of the Red Sea**

Coral reefs have shaped the surface of our planet far more than has any other ecosystem. They are dynamic systems, producing limestone at the rate of 400-2,000 tons per hectare per year, and influencing the chemical balance of the world's oceans. Coral reefs have been around since before the prairies or other ecosystems of flowering plants existed, yet they vanish about a million years before other groups of organisms each time there is a global mass extinction. They return after each catastrophe, however, following a long period of absence. Although coral reefs are the most productive communities in the sea, the fisheries of coral reefs are among the most vulnerable to overexploitation. Despite having the power to create the most massive structures in the world made by living creatures (including man), the thin veneer of living tissue of coral reef is particularly sensitive to natural disturbances and effects of human activities. Coral reefs are the first to go during periods of climate change, but they have always come back. This combination of attributes, creative power and fragility, resilience and sensitivity, makes management of coral-reef systems a challenge to science. Over 70% of the coral reefs in the Caribbean and Asian waters have been degraded, and perhaps a third of the 400 species of corals in Japanese waters are in danger of local extinction unless effective coastal management practices are established. This book presents what is known about factors that shift the balance between accretion and erosion, recruitment and mortality, stony corals and filamentous algae, recovery and degradation--the life and death of coral reefs. Insight into the factors controlling the direction of these processes is essential for appropriate management decisions.

### **Coral Health and Disease**

The interrelationship between wild animal, domestic animals and human health is appreciated now more than ever before. This is because of the recognition of the

involvement of wild animals in diseases of humans and domestic animals, the impact of disease on wildlife management and conservation biology, recognition of new forms of environmental contamination, and academic interest in disease as an ecological factor. This is the first introductory level book about disease in wild animals that deals with basic subjects such as the nature of disease, what causes disease, how disease is described and measured, how diseases spread and persist and the effects of disease on individual animals and populations. In contrast to authors of many other veterinary books, Gary A. Wobeser takes a more general approach to health in wild animals, recognizing that disease is one ecological factor among many and that disease can never be considered satisfactorily in isolation. Rather than focus on individual causative agents and their effect on the individual animal, the emphasis is on why disease occurred, and on the complex interactions that occur among disease agents, the environment and host populations. Written by a leading researcher in wildlife diseases, this book will fill a knowledge gap for those called to work with disease in wild animals who lack experience or training in the general features of disease as they relate to wild animals. Veterinarians, ecologists, wildlife biologists, population biologists and public health workers will find this book invaluable.

### **Ocean Outbreak**

This volume investigates the effects of human activities on coral reefs, which provide important life-supporting systems to surrounding natural and human communities. It examines the self-reinforcing ecological, economic and technological mechanisms that degrade coral reef ecosystems around the world. Topics include reefs and limestones in Earth history; the interactions between corals and their symbiotic algae; diseases of coral reef organisms; the complex triangle between reef fishes, seaweeds and corals; coral disturbance and recovery in a changing world. In addition, the authors take key recent advances in DNA studies into account which provides new insights into the population biology, patterns of species distributions, recent evolution and vulnerabilities to environmental stresses. These DNA analyses also provide new understandings of the limitations of coral responses and scales of management necessary to sustain coral reefs in their present states. Coral reefs have been essential sources of food, income and resources to humans for millennia. This book details the delicate balance that exists within these ecosystems at all scales, from geologic time to cellular interactions and explores how recent global and local changes influence this relationship. It will serve as an indispensable resource for all those interested in learning how human activities have affected this vital ecosystem around the world.

### **Essentials of Disease in Wild Animals**

Coral Reefs of the Gulf: Adaptation to Climatic Extremes is a complete review and reference for scientists, engineers and students concerned with the geology, biology or engineering aspects of coral reefs in the Middle East. It provides for the first time a complete review of both the geology and biology of all extant coral areas in the Gulf, the water body between Iran and the Arabian Peninsula. In summer, this area is the hottest sea with abundant coral growth on earth and already today exhibits a temperature that is predicted to occur across the tropical

ocean in 2100. Thus, by studying the Gulf today, much can be learned about tomorrow's world and the capability of coral reefs to adapt to climatic extremes. This volume provides the most authoritative and up-to-date review of the coral reefs in the Gulf. It can be used as a volume of general reference or as a textbook treating recent coral reefs. Written by local and international experts, the text is richly illustrated and will remain a standard reference for the region for decades to come. Contributions stretch from climatology through geology, biology, ecological modelling and fisheries science to practical conservation aspects. The book is useful for the technical expert and casual reader alike.

### **Coral Reefs in the Anthropocene**

The Ecology and Etiology of Newly Emerging Marine Diseases is a unique contribution to an entirely new field of scientific investigation. For the first time, material presented in this book identifies patterns and trends in the abundance and distribution of disease phenomena in the marine environment. These patterns have gone unrecognised and undetected in the past because the literature in this field is so widely scattered. The book is both interdisciplinary and synthetic. Studies in this book unequivocally link marine diseases to global climate change. The book changes our perspective on the major controls over the population dynamics of marine organisms. Papers in this volume clearly identify the intimate connection between public health and environmental health for marine-borne diseases such as cholera and human enteroviruses.

### **Coral Reef Studies of Japan**

There is a growing crisis in our oceans as rates of infectious disease outbreaks are on the rise. Marine epidemics have the potential to cause a mass die-off of wildlife from the bottom to the top of the food chain, impacting the health of ocean ecosystems as well as lives on land. Fueled by sewage dumping, unregulated aquaculture, and drifting plastic in warming seas, ocean outbreaks are sentinels of impending global environmental disaster. *Ocean Outbreak* follows renowned scientist Drew Harvell and her colleagues as they investigate how four iconic marine animals—corals, abalone, salmon, and starfish—have been devastated by disease. Based on over twenty years of research, this firsthand account of the sometimes creeping, sometimes exploding impact of disease on our ocean's biodiversity ends with a hopeful message. Through policy changes and the implementation of innovative solutions from nature, we can reduce major outbreaks, save some ocean ecosystems, and protect our fragile environment.

### **Mesophotic Coral Ecosystems**

Published by the American Geophysical Union as part of the Coastal and Estuarine Studies, Volume 61. The effects of increased atmospheric carbon dioxide and related climate change on shallow coral reefs are gaining considerable attention for scientific and economic reasons worldwide. Although increased scientific research has improved our understanding of the response of coral reefs to climate change, we still lack key information that can help guide reef management. Research and monitoring of coral reef ecosystems over the past few decades have

documented two major threats related to increasing concentrations of atmospheric CO<sub>2</sub>: (1) increased sea surface temperatures and (2) increased seawater acidity (lower pH). Higher atmospheric CO<sub>2</sub> levels have resulted in rising sea surface temperatures and proven to be an acute threat to corals and other reef-dwelling organisms. Short periods (days) of elevated sea surface temperatures by as little as 1–2°C above the normal maximum temperature has led to more frequent and more widespread episodes of coral bleaching—the expulsion of symbiotic algae. A more chronic consequence of increasing atmospheric CO<sub>2</sub> is the lowering of pH of surface waters, which affects the rate at which corals and other reef organisms secrete and build their calcium carbonate skeletons. Average pH of the surface ocean has already decreased by an estimated 0.1 unit since preindustrial times, and will continue to decline in concert with rising atmospheric CO<sub>2</sub>. These climate-related Stressors combined with other direct anthropogenic assaults, such as overfishing and pollution, weaken reef organisms and increase their susceptibility to disease.

### **Marine Disease Ecology**

"National Geographic Explorer-in-Residence Enric Sala takes readers on an unforgettable journey to 10 places where the ocean is virtually untouched by man, offering a fascinating glimpse into our past and an inspiring vision for the future. From the shark-rich waters surrounding Coco Island, Costa Rica, to the iceberg-studded sea off Franz Josef Land, Russia, this incredible photographic collection showcases the thriving marine ecosystems that Sala is working to protect. Offering a rare glimpse into the world's underwater Edens, more than 200 images take you to the frontier of the Pristine Seas expeditions, where Sala's teams explore the breathtaking wildlife and habitats from the depths to the surface—thriving ecosystems with healthy corals and a kaleidoscopic variety of colorful fish and stunning creatures that have been protected from human interference. With this dazzling array of photographs that capture the beauty of the water and the incredible wildlife within it, this book shows us the brilliance of the sea in its natural state."--

### **Infectious Disease Ecology**

#### **Pristine Seas**

The Power of Plagues presents a rogues' gallery of epidemic-causing microorganisms placed in the context of world history. Author Irwin W. Sherman introduces the microbes that caused these epidemics and the people who sought (and still seek) to understand how diseases and epidemics are managed. What makes this book especially fascinating are the many threads that Sherman weaves together as he explains how plagues past and present have shaped the outcome of wars and altered the course of medicine, religion, education, feudalism, and science. Cholera gave birth to the field of epidemiology. The bubonic plague epidemic that began in 1346 led to the formation of universities in cities far from the major centers of learning (and hot spots of the Black Death) at that time. And the Anopheles mosquito and malaria aided General George Washington during the

American Revolution. Sadly, when microbes have inflicted death and suffering, people have sometimes responded by invoking discrimination, scapegoating, and quarantine, often unfairly, against races or classes of people presumed to be the cause of the epidemic. Pathogens are not the only stars of this book. Many scientists and physicians who toiled to understand, treat, and prevent these plagues are also featured. Sherman tells engaging tales of the development of vaccines, anesthesia, antiseptics, and antibiotics. This arsenal has dramatically reduced the suffering and death caused by infectious diseases, but these plague protectors are imperfect, due to their side effects or attenuation and because microbes almost invariably develop resistance to antimicrobial drugs. *The Power of Plagues* provides a sobering reminder that plagues are not a thing of the past. Along with the persistence of tuberculosis, malaria, river blindness, and AIDS, emerging and reemerging epidemics continue to confound global and national public health efforts. West Nile virus, Lyme disease, and Ebola and Zika viruses are just some of the newest rogues to plague humans. The argument that civilization has been shaped to a significant degree by the power of plagues is compelling, and *The Power of Plagues* makes the case in an engaging and informative way that will be satisfying to scientists and non-scientists alike.

### **A Sea of Glass**

Keeping live corals has been likened to "bonsai for the cousteau generation" and "the ultimate underwater gardening experience." Beautiful, bizarre, and among nature's most colorful creations, living corals are now being successfully kept and grown in tens of thousands of home saltwater aquariums. For the first time, master aquarist Eric Borneman offers an authoritative, comprehensive, and fully illustrated guide to appropriate aquarium species, including a diversity of soft corals, as well as popular and rare large-polyp and small-polyp stony corals. World-class photographs and text reviewed by leading coral biologists and coral keepers guides the reader through the selection and husbandry of hundreds of species.

### **Corals in a Changing World**

A rapidly growing interdisciplinary field, disease ecology merges key ideas from ecology, medicine, genetics, immunology, and epidemiology to study how hosts and pathogens interact in populations, communities, and entire ecosystems. Bringing together contributions from leading international experts on the ecology of diseases among invertebrate species, this book provides a comprehensive assessment of the current state of the field. Beginning with an introductory overview of general principles and methodologies, the book continues with in-depth discussions of a range of critical issues concerning invertebrate disease epidemiology, molecular biology, vectors, and pathogens. Topics covered in detail include: Methods for studying the ecology of invertebrate diseases and pathogens Invertebrate pathogen ecology and the ecology of pathogen groups Applied ecology of invertebrate pathogens Leveraging the ecology of invertebrate pathogens in microbial control Prevention and management of infectious diseases of aquatic invertebrates *Ecology of Invertebrate Diseases* is a necessary and long overdue addition to the world literature on this vitally important subject. This volume belongs on the reference shelves of all those involved in the environmental sciences, genetics, microbiology, marine biology, immunology, epidemiology,

fisheries and wildlife science, and related disciplines.

### **Opportunities for Environmental Applications of Marine Biotechnology**

This book comprehensively introduces recent important studies on coral reefs from various research fields including biology, ecology, chemistry, the earth sciences, and conservation studies. Coral reef is one of the important ecosystems characterized by high biodiversity and the beauty. Coral reefs around Japan are located at the northern limit, composed by mainly fringing reefs along archipelago, and easily impacted by human activities. Thus, coral reef studies around Japan have provided important knowledge on basic sciences and conservation studies regarding coral reef ecosystem. This book would contribute to systematic understanding of vulnerable coral reef ecosystems due to human activities in the Indo-Pacific and Caribbean regions. The conservation efforts provide good reference to graduate and undergraduate students, and researchers in marine sciences, as well as those who are involved in coral reef studies.

### **Coral Reefs of the Gulf**

"The author makes an eloquent plea for marine biodiversity conservation."—Library Journal "Harvell seems to channel the devotion that motivated the Blaschkas."—The Guardian Winner of the 2016 National Outdoor Book Award, Environment Category It started with a glass octopus. Dusty, broken, and all but forgotten, it caught Drew Harvell's eye. Fashioned in intricate detail by the father-son glassmaking team of Leopold and Rudolf Blaschka, the octopus belonged to a menagerie of unusual marine creatures that had been packed away for decades in a storage unit. More than 150 years earlier, the Blaschkas had been captivated by marine invertebrates and spun their likenesses into glass, documenting the life of oceans untouched by climate change and human impacts. Inspired by the Blaschkas' uncanny replicas, Harvell set out in search of their living counterparts. In *A Sea of Glass*, she recounts this journey of a lifetime, taking readers along as she dives beneath the ocean's surface to a rarely seen world, revealing the surprising and unusual biology of some of the most ancient animals on the tree of life. On the way, we glimpse a century of change in our ocean ecosystems and learn which of the living matches for the Blaschkas' creations are, indeed, as fragile as glass. Drew Harvell and the Blaschka menagerie are the subjects of the documentary *Fragile Legacy*, which won the Best Short Film award at the 2015 Blue Ocean Film Festival & Conservation Summit. Learn more about the film and check out the trailer here.

### **The Holobiont Imperative**

*The Ecology and Etiology of Newly Emerging Marine Diseases* is a unique contribution to an entirely new field of scientific investigation. For the first time, material presented in this book identifies patterns and trends in the abundance and distribution of disease phenomena in the marine environment. These patterns have gone unrecognized and undetected in the past because the literature in this field is so widely scattered. The book is both interdisciplinary and synthetic.

Studies in this book unequivocally link marine diseases to global climate change. The book changes our perspective on the major controls over the population dynamics of marine organisms. Papers in this volume clearly identify the intimate connection between public health and environmental health for marine-borne diseases such as cholera and human enteroviruses.

### **Life and Death Of Coral Reefs**

Experts explore the influence of trace metals on the pathogenesis of infectious diseases. Many parts of the world in which common infectious diseases are endemic also have the highest prevalence of trace metal deficiencies or rising rates of trace metal pollution. Infectious diseases can increase human susceptibility to adverse effects of metal exposure (at suboptimal or toxic levels), and metal excess or deficiency can increase the incidence or severity of infectious diseases. The co-clustering of major infectious diseases with trace metal deficiency or toxicity has created a complex web of interactions with serious but poorly understood health repercussions, yet has been largely overlooked in animal and human studies. This book focuses on the distribution, trafficking, fate, and effects of trace metals in biological systems. Its goal is to enhance our understanding of the relationships between homeostatic mechanisms of trace metals and the pathogenesis of infectious diseases. Drawing on expertise from a range of fields, the book offers a comprehensive review of current knowledge on vertebrate metal-withholding mechanisms and the strategies employed by different microbes to avoid starvation (or poisoning). Chapters summarize current, state-of-the-art techniques for investigating pathogen-metal interactions and highlight open question to guide future research. The book makes clear that improving knowledge in this area will be instrumental to the development of novel therapeutic measures against infectious diseases. Contributors M. Leigh Ackland, Vahid Fa Andisi, Angele L. Arrieta, Michael A. Bachman, J. Sabine Becker, Robert E. Black, Julia Bornhorst, Sascha Brunke, Joseph A. Caruso, Jennifer S. Cavet, Anson C. K. Chan, Christopher H. Contag, Heran Darwin, George V. Dedoussis, Rodney R. Dietert, Victor J. DiRita, Carol A. Fierke, Tamara Garcia-Barrera, David P. Giedroc, Peter-Leon Hagedoorn, James A. Imlay, Marek J. Kobylarz, Joseph Lemire, Wenwen Liu, Slade A. Loutet, Wolfgang Maret, Andreas Matusch, Trevor F. Moraes, Michael E. P. Murphy, Maribel Navarro, Jerome O. Nriagu, Ana-Maria Oros-Peusquens, Elisabeth G. Pacyna, Jozef M. Pacyna, Robert D. Perry, John M. Pettifor, Stephanie Pfaffen, Dieter Rehder, Lothar Rink, Anthony B. Schryvers, Ellen K. Silbergeld, Eric P. Skaar, Miguel C. P. Soares, Kyrre Sundseth, Dennis J. Thiele, Richard B. Thompson, Meghan M. Verstraete, Gonzalo Visbal, Fudi Wang, Mian Wang, Thomas J. Webster, Jeffrey N. Weiser, Günter Weiss, Inga Wessels, Bin Ye, Judith T. Zelikoff, Lihong Zhang

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