

# The Ecology of Deep-Sea Hydrothermal Vents



CINDY LEE VAN DOVER

# Ecology Of Deep Sea Hydrothermal Vents

**Charles B. Miller, Patricia A. Wheeler**



## **Ecology Of Deep Sea Hydrothermal Vents:**

*The Ecology of Deep-Sea Hydrothermal Vents* Cindy Lee Van Dover, 2021-11-09 Teeming with weird and wonderful life giant clams and mussels tubeworms eyeless shrimp and bacteria that survive on sulfur deep sea hot water springs are found along rifts where sea floor spreading occurs The theory of plate tectonics predicted the existence of these hydrothermal vents but they were discovered only in 1977 Since then the sites have attracted teams of scientists seeking to understand how life can thrive in what would seem to be intolerable or extreme conditions of temperature and fluid chemistry Some suspect that these vents even hold the key to understanding the very origins of life Here a leading expert provides the first authoritative and comprehensive account of this research in a book intended for students professionals and general readers Cindy Lee Van Dover an ecologist brings nearly two decades of experience and a lively writing style to the text which is further enhanced by two hundred illustrations including photographs of vent communities taken in situ The book begins by explaining what is known about hydrothermal systems in terms of their deep sea environment and their geological and chemical makeup The coverage of microbial ecology includes a chapter on symbiosis Symbiotic relationships are further developed in a section on physiological ecology which includes discussions of adaptations to sulfide thermal tolerances and sensory adaptations Separate chapters are devoted to trophic relationships and reproductive ecology A chapter on community dynamics reveals what has been learned about the ways in which vent communities become established and why they persist while a chapter on evolution and biogeography examines patterns of species diversity and evolutionary relationships within chemosynthetic ecosystems Cognate communities such as seeps and whale skeletons come under scrutiny for their ability to support microbial and invertebrate communities that are ecologically and evolutionarily related to hydrothermal faunas The book concludes by exploring the possibility that life originated at hydrothermal vents a hypothesis that has had tremendous impact on our ideas about the potential for life on other planets or planetary bodies in our solar system

Ecology of deep-sea hydrothermal vents Jonathan Timothy Peter Copley, 1998

**The Ecology of Deep-sea Hydrothermal Vents** Cindy Van Dover, 2000 Teeming with weird and wonderful life giant clams and mussels tubeworms eyeless shrimp and bacteria that survive on sulfur deep sea hot water springs are found along rifts where sea floor spreading occurs The theory of plate tectonics predicted the existence of these hydrothermal vents but they were discovered only in 1977 Since then the sites have attracted teams of scientists seeking to understand how life can thrive in what would seem to be intolerable or extreme conditions of temperature and fluid chemistry Some suspect that these vents even hold the key to understanding the very origins of life Here a leading expert provides the first authoritative and comprehensive account of this research in a book intended for students professionals and general readers Cindy Lee Van Dover an ecologist brings nearly two decades of experience and a lively writing style to the text which is further enhanced by two hundred illustrations including photographs of vent communities taken in situ The book begins by explaining what is known about hydrothermal

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**Trace Metal Biogeochemistry and Ecology of Deep-Sea Hydrothermal Vent Systems** Liudmila L. Demina, Sergey V. Galkin, 2016-07-26 This volume synthesizes the relevant data that is fundamental to our understanding of trace metal biogeochemistry and the ecology of biological communities of deep sea vent systems It presents the combined results of biological and geochemical research and analyzes the microdistribution of animals and the spatial structure of vent communities Careful consideration is given to the export of iron and other trace metals from hydrothermal vents The environmental conditions to be found in deep sea hydrothermal community habitats along with the trace metal behavior in biotope water are characterized and the sources and forms of trace metals taken up by dominant hydrothermal vent animals are discussed Special attention is paid to the poorly investigated deep biosphere of the sub seafloor igneous crust The book is illustrated with a wealth of exceptional deep sea photos taken by the manned submersible Mir and a dedicated chapter focuses on the role of deep manned submersibles in ocean research The book will be of interest to researchers and students in the fields of oceanography geochemistry biology the environmental sciences and marine ecology

**The Vent and Seep Biota** Steffen Kiel, 2010-09-21 Oases of life around black smokers and hydrocarbon seeps in the deep sea were among the most surprising scientific discoveries of the past three decades These ecosystems are dominated by animals having symbiotic relationships with chemoautotrophic bacteria Their study developed into an international interdisciplinary venture where scientists develop new technologies to work in some of the most extreme places on Earth This book highlights discoveries developments and advances made during the past 10 years including remarkable cases of host symbiont coevolution worms living on frozen methane and a fossil record providing insights into the dynamic history of these ecosystems since the Paleozoic

*Handbook of Deep-sea Hydrothermal Vent Fauna* Daniel Desbruyères, Michel Segonzac, 1997

**The Ecology of Deep-sea Hydrothermal Vent Communities** J. Frederick Grassle, 1986 Vent communities are important because of the use of geothermal energy as an alternative to radiation from the sun the many new families of unusual animals and kinds of microorganisms the unique physiology and

biochemistry of animals with bacterial symbionts the contrast of rates of metabolism growth and reproduction with deep sea animals elsewhere and the interactions of species in a system based on bacteria Vent communities occupy discrete points separated on more than one spatial scale along a linear ridge system encircling the globe Initial studies of population genetics in a single species indicate remarkably well defined populations connected by passive dispersal of larvae These findings suggest that hydrothermal vent oases will prove to be even better material than oceanic islands for studies interrelating ecology genetics evolution and zoogeography

**International Law and the Genetic Resources of the Deep Sea** David Kenneth Leary, 2007 Deep sea genetic resources and the interest of the biotechnology industry in their exploitation are emerging as a significant challenge for international oceans governance This book is the first comprehensive examination of this issue and explores its relationship with marine scientific research and other activities in the deep sea As well as a detailed survey of the state of industry interest in this new field of biotechnology it also sets out proposals for future sustainable management of these resources utilizing many existing international law and policy regimes

*Thermophiles: Biodiversity, Ecology, and Evolution* Anna-Louise Reysenbach, Mary Voytek, Rocco Mancinelli, 2012-12-06 These are indeed exciting times to be a microbiologist With one of the buzzwords of the past decade Biodiversity and microbes are reveling in the attention as they represent by far most of the biodiversity on Earth Microbes can thrive in almost any environment where there is an exploitable energy source and as a result the possible existence of microbial life elsewhere in the solar system has stimulated the imaginations of many Extremophiles have taken center stage in these investigations and thermophiles have taken on the lead roles Consequently in the past decade there has been a surge of interest and research in the Ecology Biology and Biotechnology of microorganisms from thermal environments Many of the foundations of thermophile research were laid in Yellowstone National Park primarily by the research of Professor Thomas Brock's laboratory in the late 1960s and early 1970s The upper temperature for life was debated the first thermophilic archeum discovered although it was only later shown to be an archeum by ribosomal cataloging and the extremes of light temperature pH on the physiology of microorganisms were explored Interest in thermophiles increased steadily in the 1970s and with the discovery of deep sea hydrothermal vents in 1977 thermophilic research began its exponential explosion The development of Taq polymerase in the polymerase chain reaction PCR focused interest on the biotechnological potential of thermophilic microorganisms and on the thermal features in Yellowstone National Park

*Introduction to the Biology of Marine Life* James L. Sumich, John Francis Morrissey, 2004 This textbook examines selected groups of marine organisms within a framework of basic biological principles and processes With attention to taxonomic evolutionary ecological behavioral and physiological aspects of biological study the book contains chapters on habitat patterns of association phytoplankton marine plants protozoans and inv

**Biological Oceanography** Charles B. Miller, Patricia A. Wheeler, 2012-04-11 This new edition of Biological Oceanography has been greatly updated and expanded since its initial publication in 2004 It presents current understanding

of ocean ecology emphasizing the character of marine organisms from viruses to fish and worms together with their significance to their habitats and to each other The book initially emphasizes pelagic organisms and processes but benthos hydrothermal vents climate change effects and fisheries all receive attention The chapter on oceanic biomes has been greatly expanded and a new chapter reviewing approaches to pelagic food webs has been added Throughout the book has been revised to account for recent advances in this rapidly changing field The increased importance of molecular genetic data across the field is evident in most of the chapters As with the previous edition the book is primarily written for senior undergraduate and graduate students of ocean ecology and professional marine ecologists Visit [www.wiley.com/go/miller\\_oceanography](http://www.wiley.com/go/miller_oceanography) to access the artwork from the book

**Whales, Whaling, and Ocean Ecosystems** James A. Estes, 2006 A must read for anyone interested in the ecology of whales this timely and creative volume is sure to stimulate new research for years to come Annalisa Berta San Diego State University

*The Microbiology of Deep-Sea Hydrothermal Vents* David M. Karl, 1995-07-14 The Microbiology of Deep Sea Hydrothermal Vents is the first comprehensive treatment of the microbiology of these unusual deep sea ecosystems It includes information on microbial biodiversity ecology physiology and the origin of life It is the first volume available on the subject All chapters are written by leaders in their respective fields who have made substantial contributions to the current understanding of these novel deep sea habitats Much of the book's material is entirely new and forward looking Individual chapters examine the geologic setting and chemistry of deep sea hydrothermal vents growth at high temperatures microbe metal interactions and mineral deposition stable isotopes and more This reference presents a unique interdisciplinary approach to the study of hydrothermal vents Because of its thorough coverage of the subject the book will continue to be a valuable resource for researchers in this field for the next decade

Environmental Issues of Deep-Sea Mining Rahul Sharma, 2019-05-07 This volume discusses environmental issues associated with deep sea mining with an emphasis on potential impacts their consequences and the policy perspectives The book describes the methods and technologies to assess monitor and mitigate mining impacts on marine environments and also suggests various approaches for environmental management when conducting deep sea mining The volume brings together information and data for researchers contractors mining companies regulators and NGOs working in the field of deep sea mining Section 1 highlights the various environmental issues and discusses methods and approaches that can help in developing environmentally sustainable deep sea mining Section 2 details the results and outcomes of studies related to impact assessment of deep sea mining and proposes methods for monitoring Section 3 discusses the need and means for developing data standards and their application to deep sea mining Section 4 discusses the policies approaches and practices related to deep sea mining suggests formats for developing environmental impact statements EIS and environmental management plans EMP and describes national and international regulations for environmental management Section 5 concludes the text by putting deep sea economic activities into an environmental context and conducting techno economic

analyses of deep sea mining and processing      *Handbook of Molecular Microbial Ecology II* Frans J. de Bruijn, 2011-09-27

The premiere two volume reference on revelations from studying complex microbial communities in many distinct habitats

Metagenomics is an emerging field that has changed the way microbiologists study microorganisms It involves the genomic analysis of microorganisms by extraction and cloning of DNA from a group of microorganisms or the direct use of the purified DNA or RNA for sequencing which allows scientists to bypass the usual protocol of isolating and culturing individual microbial species This method is now used in laboratories across the globe to study microorganism diversity and for isolating novel medical and industrial compounds

*Handbook of Molecular Microbial Ecology* is the first comprehensive two volume reference to cover unculturable microorganisms in a large variety of habitats which could not previously have been analyzed without metagenomic methodology It features review articles as well as a large number of case studies based largely on original publications and written by international experts This second volume *Metagenomics in Different Habitats* covers such topics as Viral genomes Metagenomics studies in a variety of habitats including marine environments and lakes soil and human and animal digestive tracts Other habitats including those involving microbiome diversity in human saliva and functional intestinal metagenomics diversity of archaea in terrestrial hot springs and microbial communities living at the surface of building stones Biodegradation Biocatalysts and natural products A special feature of this book is the highlighting of the databases and computer programs used in each study they are listed along with their sites in order to facilitate the computer assisted analysis of the vast amount of data generated by metagenomic studies Such studies in a variety of habitats are described here which present a large number of different system dependent approaches in greatly differing habitats

*Handbook of Molecular Microbial Ecology II* is an invaluable reference for researchers in metagenomics microbial ecology microbiology and environmental microbiology those working on the Human Microbiome Project microbial geneticists and professionals in molecular microbiology and bioinformatics      **OCEANOGRAPHY- Volume II** Chen-Tung Arthur Chen, Jacques C. J. Nihoul, 2009-04-16

Oceanography is a component of Encyclopedia of Earth and Atmospheric Sciences in the global Encyclopedia of Life Support Systems EOLSS which is an integrated compendium of twenty one Encyclopedias These volumes deal with the oceans as an integrated dynamic system characterized by a delicate complex system of interactions among the biota the ocean boundaries with the solid earth and the atmosphere This set of volumes is designed to be a very authoritative reference for state of the art knowledge on the various aspects such as Physical Oceanography Chemistry of the oceans Biological Oceanography Geological oceanography Coral Reefs as a Life Supporting System Human Uses of the Oceans Ocean Engineering and Modeling the Ocean System from a Sustainable Development perspective These volumes are aimed at the following five major target audiences University and College students Educators Professional practitioners Research personnel and Policy analysts managers and decision makers and NGOs      *Life at Extremes* Elanor Bell, 2012

From arid deserts to icy poles outer space to the depths of the sea this exciting new work studies the remarkable

life forms that have made these inhospitable environments their home Covering not only micro organisms but also higher plants and animals such as worms fish and polar plants this book details the ecological biological and biogeochemical challenges these organisms face and unifying themes between environments Equally useful for the expert student and casual scientific reader this book also explores the impact of climate change rapid seasonal changes and pollution on these extraordinary creatures

**The Silent Deep** Julian Anthony Koslow,2007 Publisher description [Sulfur Biogeochemistry](#)  
Jan P. Amend,Katrina J. Edwards,Timothy W. Lyons,2004

**Life in the World's Oceans** Alasdair McIntyre,2011-06-09 Life in the World's Oceans Diversity Abundance and Distribution is a true landmark publication Comprising the synthesis and analysis of the results of the Census of Marine Life this most important book brings together the work of around 2000 scientists from 80 nations around the globe The book is broadly divided into four sections covering oceans past oceans present oceans future and a final section covering the utilisation of the data which has been gathered and the coordination and communication of the results Edited by Professor Alasdair McIntyre Marine Life is a book which should find a place on the shelves of all marine scientists ecologists conservation biologists oceanographers fisheries scientists and environmental biologists All universities and research establishments where biological earth and fisheries science are studied and taught should have copies of this essential book on their shelves A true landmark publication One of the most important marine science books ever published Contributions from many world leading researchers Synthesis of a huge amount of important data Represents the culmination of 10 years research by 2000 scientists from 80 countries



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