Life without Light—Advances in Research on Chemosynthesis-Based Communities

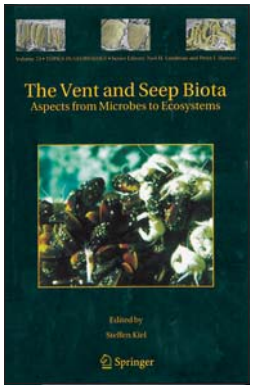
Author: Gill, Fiona

Source: Acta Palaeontologica Polonica, 56(1) : 132

Published By: Institute of Paleobiology, Polish Academy of Sciences

URL: https://doi.org/10.4202/app.2011.0012

Acta Palaeontologica Polonica 56 (1): 132, 2011



Life without light—advances in research on chemosynthesis-based communities

Steffen Kiel (ed.) 2010. The Vent and Seep Biota. Aspects from Microbes to Ecosystems. 1st Edition. *Topics in Geobiology* 33: 340 pp. ISBN 978-90-481-9571-8. Price: 149.95 Euros.

Hydrothermal vents and cold seeps are fascinating and unusual marine ecosystems which are fuelled by inorganic chemical reactions (chemosynthesis) rather than sunlight-dependant photosynthesis. The aim of this volume is to summarise key developments over the past 10 years in hydrothermal vent and cold seep research, which means that the fourteen chapters span a wide range of disciplines, from molecular phylogenetics to geochemical modelling to palaeoecology.

The volume begins with an account of the paradigm-changing discovery of hydrothermal vents and associated fauna at the Galapogos Rift (Corliss et al. 1979) and the realisation that this ecosystem was driven by chemosynthesis rather than photosynthesis. This introduction provides an essential background and context for the remaining thirteen chapters, which describe selected areas of hydrothermal vent and cold seep biology in detail.

Many of the chapters deal with aspects of chemosymbiosis—the interactions between vent and seep invertebrates and chemosynthetic bacteria which live within their body tissues (endosymbionts) or externally (episymbionts). For example, Chapter 2 describes the genetics and evolution of chemosythetic bacteria and their invertebrate hosts with a focus on the consequences of different modes of transmission of endosymbionts. This is illustrated by examples drawn from studies of vesicomyid clams, vestimentiferan tubeworms and bathymodiolin mussels. Vent and seep mussels and their multiple bacterial symbioses are the subject of Chapter 6, while Chapter 5 focuses on those chemosymbiotic bivlaves not covered in detail elsewhere in the volume, namely Solemyidae, Nucinellidae, Thyasiridae and Lucinidae. Chapter 3 is concerned with episymbiosis between bacteria and the hydrothermal vent invertebrates *Alvinella pompejana* and *Rimicaris exoculata*, as revealed by in situ measurements and microanalysis of mineralogical proxies combined with geochemical modelling.

Many chapters consider both modern and fossil fauna, but Chapters 7, 10, 11, 12, and 13 focus on the present day. Chapter 7 contains a systematic overview of vent and seep gastropods. Useful appendices are included, notably a list of all modern seep and vent gastropods described up to the end of 2009. The unusual habitats and organisms associated with the cold seeps of the Gulf of Mexico including brine pools, asphalt flows and barite chimneys and the "iceworm" *Hesiocaeca methanicola* are described in Chapter 10. An overview of biological communities at marine shallow-water vent and seep sites, defined here as less than 200 m water depth, is presented in Chapter 11. Chapter 12 investigates similarities and connectivity in megafaunal communities between modern hydrothermal vent and cold seep sites around Japan, using a statistical approach. Chapter 13 considers the role of "foundation species" in providing and modifying habitats for other species within vent and seep communities.

Vent and seep palaeontology is represented by an overview of the fossil record of vent and seep molluscs (Chapter 8) and brachiopods (Chapter 9) and a description of the "Eldorado for Palaeontologists" that is the seep-rich western part of Washington State, USA (Chapter 14).

An overview of microbial chemofossils in marine hydrothermal and cold seep settings is presented in Chapter 4. Following an overview of the biogeochemistry at vents and seeps, the biomarker concept is introduced and aspects of the structure, occurrence, stable isotope signature and utility of lipid biomarkers for elucidating geobiology are discussed. Subsequent sections are devoted to descriptions of the lipid biomarker record at modern and fossil hydrothermal vents and cold seeps, with modern cold seeps exemplified by Black Sea deposits. Throughout the volume, but for this chapter in particular, the accompanying diagrams are of great assistance to the reader in clarifying complex information.

Due to the structure of the volume and the range of different authors, there is unavoidably some overlap in content between chapters and considerable differences in writing style. Covering such disparate subjects for individual chapters, it is difficult, if not impossible, to give the book a sense of cohesion. However, since readers will most likely use this book to refer to specific chapters, rather than reading it from cover to cover, this is not a major drawback. In general, this is an excellent volume for anyone who works on or studies any aspect of hydrothermal vent or cold seep ecosystems. It will be especially valuable for specialists in a given area in search of an up-to-date summary of the state of knowledge in another area, or in vent and seep ecology as a whole. Occasionally, technical terms are used without adequate explanation, which makes the text less accessible to the non-expert in that particular field. In some chapters, lack of clear structure means that potentially interesting and useful information is not as easily available to the reader as it could be.

The aim of the Topics in Geobiology series, as described by the series editors, is to provide high quality, scholarly volumes of original research, with a focus on the interplay between the history of life and the changing environment. In this volume, this aim has certainly been achieved.

Reference

Corliss, J.B., Dymond, J., Gordon, L.I., Edmond, J.M., Von Herzen, R.P., Ballard, R.D., Green, K., Williams, D., Bainbridge, A., Crane, A., and Van Andel, T.H. (1979) Submarine thermal springs on the Galápagos Rift. *Science* 203: 1073–1083.

Fiona Gill [F.Gill@leeds.ac.uk], School of Earth and Environment, University of Leeds, Woodhouse Lane, Leeds LS2 9JT, UK

doi:10.4202/app.2011.0012