Antarctic Science 8 (3): 307–308 (1996)

Book reviews

Invertebrates in Hot and Cold Arid Environments

Lauritz Sømme
Springer-Verlag, Berlin (1995).
275 pages. DM248. ISBN 3 540 58985 6

This deceptively slim volume represents the sixth in a series of publications on "Adaptations of Desert Organisms", edited overall by J.L. Cloudsley-Thompson. Further volumes are in preparation. The subject matter covered by the previous volumes (including desert animal behaviour, ecophysiology of desert mammals, reptiles and arthropods, plant nutrients and seed germination) highlights the general perception of deserts as being hot (at least seasonally), arid environments. In this respect the volume under consideration here represents a significant departure, and recognizes the importance of cold arid regions in any examination of the biology of desert organisms. Lauritz Sømme is well-qualified to write on the invertebrates of cold environments, with many years study of the physiology and ecology of species from both the Arctic and Antarctic, and also temperate and tropical alpine and other montane habitats.

Definitions of what constitutes a desert vary, but it appears to be accepted that approximately one third of the Earth's continental land area may be described as "arid", including permanently or seasonally hot tropical deserts (e.g the Sahara), cool coastal deserts (e.g. the Namib), arid temperate deserts (e.g. the Gobi) and polar deserts. In addition to the obvious constraints imposed by limited water availability, organisms living in many of these environments are faced not just with problems arising from heat, but also with rapid temperature changes and the survival of varying periods (daily to seasonal or even longer cycles) of low or negative temperatures. The biota of other areas not conventionally considered as "deserts", in particular montane and alpine regions, also experience periods of similar conditions, and are covered in this book.

The book opens with two introductory chapters, the first describing the regions to be considered, their climate, and the importance of water limitation in polar environments, and the second the fauna of these regions. These chapters set the pattern for the rest of the book which, although comparing features of both hot and cold arid environments, generally gives greater prominence to the less widely known studies of the latter, while more briefly summarizing the former and pointing the reader to follow-up material elsewhere. Chapters then follow on the tolerance of terrestrial arthropods to desiccation, and the underlying physiology, followed by a chapter on anhydrobiosis, a feature particularly well-developed in nematodes and tardigrades but also found in a small number of arthropods. Behavioural and life cycle adaptations are then examined, before moving on to detailed consideration of the problems of water balance during overwintering (of particular importance to inactive invertebrates at sub-zero temperatures) and mechanisms of cold hardiness. The book concludes with a brief treatment of the ability of hot desert arthropods to survive exposure to periods of cold and a chapter recognizing that the cold tolerance strategies of "lower" invertebrates, principally nematodes and tardigrades, may show greater flexibility than those of arthropods.

The book is clearly structured throughout, with each chapter organized into concise sections and most with a useful summarizing paragraph. This structure allows for ease of cross-referencing, but does interrupt the flow for the reader. The specialist reader will also recognize a surprising number of typographical errors within the text. These factors should not reduce the importance of the book, which fills an under-emphasized niche in the study of desert organisms. However, costing somewhat over £100, one must question who the publisher is expecting to buy the book. Although the content is of general interest, only the dedicated specialist is likely to be able to justify this investment in a single volume.

PETER CONVEY

Modern Glacial Environments. Processes, Dynamics and Sediments

Edited by J Menzies
Butterworth-Heinemann Ltd., Oxford (1995).
621 pages. £40. ISBN 0 7506 2351 9

Why study glacial environments? After all, glacial environments are chaotic, complex and geologically ephemeral and, to the uninitiated, apparently lack any underlying all-embracing pattern to their variations. Yet, as John Menzies states in the first chapter of this excellent book, beneath the chaos there *are* process-driven patterns, and the underlying theme of this book is to bring these patterns into focus. Glacial environments (and, by implication, their products) may also seem a relatively minor and exotic topic. In fact, the Antarctic ice sheet (despite its reduced size today compared to some former periods) currently locks up about 95% of the world's fresh water and Pleistocene glacial sediments may cover at least 30% of the earth's continental land masses. Moreover, with global environmental issues pre-eminent in practically all sciences today, Menzies rightly highlights the pervasive influence of glaciers on global climate and sea level. Sea level variations are linked inextricably with ice sheet expansion and decay. As new, more accurate predictions of global warming are presented to us seemingly daily, so knowledge of modern glacial conditions urgently needs to improve. Such knowledge will become acutely significant if we are to cope with and predict sea-level rise in the coming century. Questions and models of future

ice sheet stability can only be tested by resorting to the evidence preserved in the geological record, which is the only record available with a suitably long time scale. With the caveat that past and present glacial environments may have differed in some critical aspects, the underlying premise of this book is the Huttonian principle that modern glacial environments provide analogues to past glacial conditions, and are our key to understanding glacial geological (sedimentation) processes. To paraphrase loosely the volume preface, this is a comprehensive up-to-date survey of modern research and ideas on glacial environments, incorporating glaciology, glacial geology and geomorphology, and sedimentology.

It is a large book, extending to over 600 pages arranged in 15 chapters, and it forms the first of a two-volume set. Like so many of the best reference texts published in recent years, it stemmed from a university course. Because of the broad scope of the topic, Menzies has assembled experts in the complexities of ice dynamics, mass balance and hydrology, processes of transportation, erosion and deposition, glaci(o)tectonism, landforms and environments. The numerous causes of glaciations and the chronology of global glacial events are summarised by P.E. Calkin and G.M. Young. T.J. Hughes employs ice physics and glacial geomorphology to reconstruct pre-existing ice sheets in a chapter on ice sheet modelling. The following three chapters are by Menzies and form a linked package examining the physics of glaciers and ice sheets, dynamics of ice flow, and glacier hydrology from a glacial geomorphologist's perception. Glacial erosion is discussed by N.R. Iverson with an emphasis on the mechanics of the erosion process, followed by reviews of glacial transport and terrestrial deposition by M.P. Kirkbride and C.A. Whiteman in the next two chapters. These are succeeded by a chapter on processes of glacitectonism by F.M. van der Wateren, then sub- and supraglacial sedimentary and hydrological processes in terrestrial glaciers by D.E. Lawson. Sediments and landforms are described by J. Maizels (terrestrial proglacial environments), G.M. Ashley (glacilacustrine) and R. Powell and E. Domack (glacimarine). Finally, a chapter by W.C. Mahaney discusses scanning electron microscopy of quartz grains to deduce crushing, weathering and diagenetic histories.

Criticisms of this volume are hard to make and few in number. This is not a book for geologists wishing to delve into for descriptions of lithologies and landforms with which to compare and contrast with those of their own field areas. As is evident in the book title, it does not set out to fill this niche. Rather, it is a masterly summary of the principles underpinning our knowledge of glacial environments and glacial processes applied to geological perspectives. The section on "Ice mass types" essentially sidesteps the issue, although some of the classifications are referred to in passing in subsequent sections. It could have been better at least to introduce the uninitiated reader to some of the classifications ("best/worst"?), perhaps with discussion of the principles which the author regards as the best for such classifications. The chapter on quartz grain history could have benefitted by a clear introductory description of the physical characteristics of quartz grains transported by ice. Instead, we have to wait until almost the last paragraph in that chapter. The book is well illustrated by line drawings mostly culled from the literature, but the photographic illustrations are sometimes of rather poor, newsprint quality and one (Plate 5.3) is upside down. A small number of good-quality colour images are also included. Although very welcome, each colour plate rather curiously reproduces plates already present in black and white. There are few typographical errors relative to the size of the volume, and it is well organized. It must have been a major effort by the editor to ensure that all of the (numerous) mathematical symbols used in the (numerous) equations were used consistently between chapters. Do not expect to be guided through the derivations of equations. Rather, the more important equations are introduced and the reader is supplied with the relevant references to follow up on. In a volume of this scope, it is hard to see how it could do otherwise. A good feature is the inclusion, prior to Chapter 1, of a List of Symbols, amounting to 6 pages. However, it would also have been helpful to include in the same table values for some of the constants. Whereas several of these values appear in tables in some chapters (e.g. Table 6.1), others are scattered in the text and are accordingly hard to locate in a hurry, and I found myself having to annotate the List of Symbols. The book is also a major bibliographical source, with the reference list accounting for 84 pages. It includes publications up to 1993, and a small number of more recent papers "in press" or "in preparation", principally by the authors themselves. By itself, the bibliography would make this volume of immense value. Finally, I laud the inclusion, in nearly all chapters, of short summaries that include suggestions for future research to take us into the next phase of investigations.

In summary, this book successfully bridges the gap between ice physics, glacial landform geomorphology and glacial sedimentology by merging, in one text, the findings of these respective disciplines. The book is timely, topical and relevant to many fundamental geological, glaciological and environmental issues of consuming interest today. It is essential reading for all serious students of the(se) subject(s) and I look forward to reading its companion volume.

JOHN SMELLIE

https://doi.org/10.1017/S0954102096220450 Published online by Cambridge University Press