

Book reviews

Limnological Studies in Queen Maud Land (East Antarctica)

Edited by *J. Martin*

Academy of Sciences of Estonia, Tallinn SSR (1988).

87 pages. Rbl 1.60. ISBN 5 440 00266 0

This is a monographic study dealing with the physical, chemical, and biological properties of lakes in the Schirmacher and Untersee Oases (ca. 71°S). Oases are relatively ice-free areas located in mountainous regions near the perimeter of the Antarctic continent. While rather insignificant on an areal basis (less than 2% of the Antarctic continent is ice-free), oases provide habitats for life because of their more moderate temperatures and the availability of liquid water. The primary location for life on the Antarctic continent is within lakes found in oases.

The seven chapters in this monograph present limnological data that were collected in the Schirmacher and Untersee Oasis by Estonian, Russian, and East Germany scientists during the 1983/84 austral summer. The Schirmacher Oasis is a rocky range of hills 17 km in length 2–3 km wide, with a maximum elevation of 238 m. It contains over 50 lakes, seven of which are discussed in this monograph. The deepest (47 m) lake studied was Lagernoye, an epishelf lake (“a kind of lagoon developed in the contact area of a shelf glacier and the stony-rocky shore”), while the shallowest (2.9 m) was Lake Stacionnoye. With the exception of Lake Lagernoye, all of the lakes in the Schirmacher Oasis lose their ice cover during the austral summer. The Untersee Oasis by comparison is located in a more mountainous region about 80 km inland from the Schirmacher and contains two perennially ice-covered lakes, Untersee and Obersee. With a water depth of 146.8 m, Lake Untersee is one of the deepest lakes in Antarctica. The presence of perennial ice cover (2.2–3.8 m thick) on lakes in the Untersee Oasis is probably a result of the lower mean annual temperatures in the region (-20°C vs. -10°C for the Schirmacher Oasis). One surprising statement (p. 18) suggests that the ice cover on lakes in the Untersee Oasis is “of an age measurable in centuries”. The authors must mean that the lake has been ice-covered for centuries because the actual turnover time of the lake ice itself is certain <20 years.

In addition to nine bathymetric maps and morphometric data, other data presented in this monograph include measurements of solar radiation within the lakes, nutrient and chlorophyll *a* levels, and phytoplanktonic primary productivity. Of particular interest are the observations of oxygen supersaturation and high pH in Lakes Untersee and Obersee. These lakes have a pH ranging from 10.3–11.1 (compared with 4.9–9.0 for Schirmacher lakes) and O₂ supersaturation up to 150% for perennially ice-covered

Lake Untersee. In addition, some of the 1983/84 solar radiation and nutrient data are compared to data collected in 1976/77. A discussion on the origin and development of lakes in the Antarctic is also presented (pp. 54–56).

Overall, this monograph is a welcomed and important addition to the literature on Antarctic limnology. One improvement would have been the addition of a decent map and possibly photographs showing the locations of the Schirmacher and Untersee Oases and the various lakes.

ROBERT WHARTON

The environmental record in glaciers and ice sheets

Edited by *H. Oeschger* and *C.C. Langway, Jr.*

John Wiley and Sons, Chichester (1989).

400 pages. £50.00. ISBN 0 471 92185 8.

Over recent years, ice cores have become a prime source of information on past changes in our climate and atmosphere. In recognition of this fact, a Dahlem conference was held in 1988 to bring together the practitioners of ice core work, and representatives of the many disciplines that would like to use the data obtained. This volume is the proceedings of that meeting. It consists of the 16 background papers that were used as the starting point for the conference, along with the conclusions of four working groups that were the main business of the meeting.

The papers themselves are for the most part extremely authoritative reviews of various aspects of ice core work. Between them, they cover the entire field - both its successes and its problems - comprehensively. The four group reports cover broadly the areas of (1) how ice records environmental information, (2) dating ice cores, (3) information from ice cores on anthropogenic impact, (4) long-term ice core records. Although each report naturally has had to include the whims of all the participants, they each include very succinct summaries of the current status and future prospects within the field surveyed. They act as proof that the Dahlem Workshop Model is a very efficient way of focussing scientists' thoughts.

Overall, the volume is the best summary currently available of the many exciting discoveries made from ice cores. You will find here most of the data you would want from the Vostok (Antarctica) core that reveals 150 000 years of changing climate, and from Greenland deep cores. You will see graphic evidence of the effect that humans have had on our atmosphere. Although new cores and further insights

will make some of the papers outdated in the next few years, this volume will for some time chart the future course of ice core studies. I thoroughly recommend it to anyone interested in our changing environment.

E.W. WOLFF

The Pinnipeds: seals, sea lions and walruses

Marianne Reidman

University of California Press, Berkley, (1990).

439pp. \$29.95. ISBN 0 520 06497 0

Although the pinnipeds are a group of mammals with a history of exploitation by man, recent interest has concentrated on their conservation and nowadays most people have a passing familiarity with seals. However, few people attempt to learn about their biology which means that seals, and the conservation issues surrounding them, are often misunderstood. A reason for this has been the lack of accessible information; a gap in the literature which has now been filled by this book.

The book is structured to provide an overview of the main elements of pinniped biology with inclusion of chapters on evolution, ecology, diet and reproduction, although Reidman has also emphasized some special characteristics of pinnipeds in separate chapters such as lactation strategies, mating systems and learning. To some extent these reflect Reidman's own interests and the areas in which the scientific literature is particularly strong. The frequency of detailed examples from northern elephant seals is unrepresentative of the breadth of knowledge about pinnipeds in general and there is a particular lack of consideration of polar species.

In a volume of this size (344 pages of text) it is impossible to provide a detailed account of all features of pinniped biology and Reidman has clearly chosen to emphasize subjects requiring least technical background knowledge to understand and which may be most appealing to a lay readership. This has meant that some of the most interesting features of pinniped biology, such as their diving behaviour and physiology, have been relegated to minor subsections.

Information is presented in a clear style and scientific jargon has been minimised, but in places the reader could have been apprised of some of the uncertainties which surround some interpretations, rather than be left with the impression that there is little more to be learned about a subject. For a book on pinnipeds, there is a large amount of space devoted to cetaceans which, I feel, could have been used more profitably within the field covered by the book.

The diagrams are of a high standard and it is unfortunate that more space was not devoted to these illustrations rather than the numerous but generally poor photographs which reflect neither the variation of form and behaviour of pinnipeds nor the breadth and quality of material available.

In view of these criticisms this book has not provided the comprehensive or critical overview of pinniped biology which would have made it useful to a specialist. However, it is a useful reference text for the non-specialist.

IAN BOYD

Carbon Dioxide and Global Change : Earth in Transition

Sherwood B. Idso

IBR Press, Institute for Biospheric Research, Arizona (1989).

292 pages. \$19.95. ISBN 0 962 3489 1 0

The atmospheric concentration of carbon dioxide is believed to have been almost constant for several thousand years before 1700AD, with a mean value of about 280 ppmv (parts per million by volume). Slow growth then ensued, with the concentration increasing to about 290 ppmv by 1880. Faster growth followed, leading to a concentration of 315 ppmv in 1958. The change from the pre-industrial value has since doubled; the concentration is currently about 350 ppmv, and the rate of growth is about 15 ppmv/decade, five times the average rate for 1880–1960.

Neither symmetrical diatomic molecules such as those of nitrogen and oxygen, nor the simple atoms of the noble gases (eg. argon), interact with infrared radiation, that part of the electromagnetic spectrum in which lies much the greater part of the radiation emitted by the earth's surface. Only more complicated molecules, such as those of water, carbon dioxide, ozone, oxides of nitrogen, hydrocarbons and halocarbons, absorb and emit in that part of the spectrum. Amounting in all to less than one-thousandth of the total mass, their presence in the atmosphere nevertheless leads to a significant net trapping of radiative energy, known as the greenhouse effect. Increased abundance of carbon dioxide, or of any other of these radiatively-active gases, is expected to lead to increased trapping, to intensification of the greenhouse effect, to be manifested eventually as global warming.

How much warming and by when? The WMO/UNEP Intergovernmental Panel on Climate Change was set up to look at these and related questions. The Executive Summary of the science working group has just been published. The group endorses previous predictions that if no control is imposed on emissions of carbon dioxide (and other greenhouse gases), the global mean temperature will increase by between 0.2° and 0.5°C per decade. In contrast, a report by the Marshall Institute (Washington), published in late 1989, while accepting that global warming could be a serious problem, found nevertheless that current predictions were so fraught with uncertainty as to be useless to policy makers, and recommended that no major policy decisions on controlling emissions be taken until the implications were better

understood. It should be added that the report called for the resources available for studies of climate change to be increased, and considered that the uncertainties could be greatly reduced within five years if research were appropriately accelerated.

Sherwood Idso has extreme views on the likely effects of the growth of carbon dioxide. He argues, and has been arguing for some ten years, that the sensitivity of climate to carbon dioxide is overestimated by an order of magnitude in most studies. He believes that the increase in carbon dioxide has already produced significant increases in primary plant productivity, and that it enables plants to use water more efficiently. As in his earlier book, carbon dioxide is seen as friend, not foe. His idea of making the world 'green' is to build up the atmospheric abundance of carbon dioxide to at least three times the current value.

This book contains 292 pages, 135 for the text (with 14 occupied by figures), 100 for the references, with a subject index of 32 pages, and an author index of 25 pages. References are indicated by numerical superscripts, with a separate list for each of the eleven main sections of the book. There are 2172 references, and only a few are repeated from any earlier section (even Gaia is not unduly obtrusive). The author index points one to a page of references, the subject index does the same but also points to pages of text. This system works reasonably well, as long as one remembers to scan a page of references for others by the same author, or for others containing the same key word(s) in the title.

Does the wealth of citation make this an authoritative account of the carbon dioxide problem? No. Firstly, Idso seems to me to use citation to avoid having to write clearly about the basic issues. To anyone who is not familiar with the controversy, this book is not self-contained. Secondly, there is no guidance for the reader of the weight of the evidence. References range from chatty reports of conferences to weighty assessments commissioned by governments, from newspaper articles to the most technical of books. They are as often to the source of an opinion as to a report of detailed study.

There is a short preface, which contains the least polemical, and the clearest, statement of the problem to be found in the book. In comparison, the first section, entitled 'Defining the Problem', is largely diversionary. 54 references are given on the first page. They include 25 books, mostly concerned with the evolution of the earth's surface features and atmosphere. The ensuing discussions of the 'paradox of the faint early sun', and of the next 'imminent' glaciation, give the reader a false perspective which the sub-section on population growth and carbon dioxide emissions does little to dispel. The final sub-section occupies about a page and a half, contains 72 references, and yet still avoids giving a clear statement of the simple principles which are the real basis for concern.

Sections two and three describe climate models and their predictions, and discuss the inadequacies of current models.

The description is cursory, and gives little feel for the complexity of the problem. The criticism is lengthy, but better expressed, relying heavily on quotation from modellers.

In section four, Idso seeks to gain understanding of climate change by inferences from observations. Those who are familiar with his other writings will notice the absence of the 'surface air temperature response function', and related concepts. Of the material presented here, some sub-sections are instructive, some are absurd. His Figure 4.1 purports to show greenhouse warming plotted against the partial pressure of carbon dioxide, on logarithmic scales, for Mars and Venus, and for the early and the present conditions on Earth. He has most confidence in the points for Mars and Venus, 'being derived from actual measurements', and draws a straight line through them. He infers that the current greenhouse warming on Earth is 1.0°C, and will be 1.4°C if the abundance of carbon dioxide doubles. A little later he notices that his assumption implies that greenhouse warming does not depend on the amount of water vapour in an atmosphere, and declares this to be a proof that water vapour feedback is an artefact of climate models. Later still, he asserts that the Figure applies to a planet which absorbs all the solar radiation incident upon it, and that a correction is needed for the planetary albedo. In the course of applying this correction, it emerges that the current greenhouse warming is not 1° but 34°C. The trouble with this sort of writing is that it can only discredit the empirical approach, which is valuable if undertaken rigorously.

It is a relief to find some consistency in section five, 'Looking for the Predicted Warming'. Here there is reasonable comment on the manner in which the debate is being presented to the public, and on the difficulties of deciding what constitutes evidence of radiatively-forced climate change. He has clearly not considered the possibility that there may be no precedent for the present forcing. Palaeoclimatology is fascinating, but may not contain all the information which we now need. Despite his warnings about the multitude of factors which can influence climate, he is not averse to simplification when it suits him. His enthusiastic endorsement of the postulated climatic feedback loop, involving marine phytoplankton, dimethyl sulphide and clouds, is surely premature?

In both sections two and five, Idso devotes sub-sections to the 'CO₂-Ozone Connection'. Most workers now consider that the evolution of ozone depletion over Antarctica is consistent with the known history of CFC releases, and that there is no need to invoke trends in either temperatures or circulation patterns to explain the appearance and deepening of the ozone 'hole'. Much remains to be done before it can be said that the ozone problem is well understood, but the remaining puzzles are not those highlighted by Idso. Of more interest here is the point that these are the only sub-sections in which the prediction of stratospheric cooling is discussed explicitly. Idso seems to regard this prediction as a by-product of general circulation models, but it follows

from simple radiative theory, and is indeed the most robust of all greenhouse predictions. It is free from many of the complications which beset predictions of changes in surface temperature and in tropospheric circulation patterns, and, in particular, is largely independent of ocean/atmosphere interactions and of water-vapour feedback. Measurements show a downward trend of about 0.25°C/decade at 24km since 1965, which is consistent with the prediction. However, the record is short and it would be premature to claim that the prediction has been verified.

The second half of the book is about the 'other greenhouse effect', global vegetative stimulation. Sections seven to nine deal with the effects of increased carbon dioxide abundance on plants, the way in which these effects may mitigate environmental stresses on plants, and with the possibility that these effects can already be discerned. Section ten speculates on possible effects on animals. This is, so to speak, Idso's home ground, and whilst it is clear that he gives the benefit of the doubt to every friendly aspect of carbon dioxide (in contrast to his scepticism about the harm which it might do), these sections provide useful information.

It remains to consider sections six and eleven. The former is presented as a recapitulation of sections one to five, the latter as a 'broad synthesis of all that has been presented'. The arguments are largely rhetorical, and often repetitive. It is not difficult, I suggest, to see why. Environmental problems have become public issues. National governments and international organisations pay more heed to scientists than perhaps ever before. That is the good news. The bad news is that the pressure of providing evidence is severe, and poses threats to the ways in which science is conducted and managed. It is not surprising that rhetoric is used to answer rhetoric.

Global warming is still a contentious issue. It is not unreasonable to see as a possible outcome of further study that the warming may be small. But that, I feel, and here I take issue with Idso, is not the point. Man's activities have reached a scale where they can, in a decade or two, have effects which are not fully understood, and from which it may take many decades to recover. It seems only prudent to slow down. The argument which equates slowing down with unwarranted interference with industry and with society is ill-conceived. Is that not evident from the (still unfinished) CFC/ozon story? However, it should not be forgotten that it is not the scientist's job to change society, but to provide understanding, which may subsequently be the basis on which society may, or may not, decide to change itself.

Two misprints provided some light relief. The heading to sub-section 8.1 is 'A Tax on the Benefits of CO₂?'. One suspects that this was dictated as 'Attacks on...'. The heading of section 11 is printed as 'Wither the World?'. It is a pertinent question, even if unintended. Otherwise the book is well-produced. It is not one which I can recommend as 'a probing analysis and thorough review' as claimed by the publishers, but it has interest for the views it gives of the

hazards which arise when technical investigations spill over into public debate.

JOE FARMAN

Antarctic Scleractinia Synopsis of the Antarctic benthos, Vol. 1

Stephen D. Cairns

Koeltz Scientific Books, Koenigstein (1990)

78 pp. DM45. ISBN 3 87429 303 3

This little hardcover book on Antarctic Scleractinia is billed as Volume 1 in a new series, 'Synopsis of the Antarctic benthos'. The pelagic fauna of the Southern Ocean has long been the subject of intensive research but serious interest in the Antarctic benthos is more recent. Now, for several reasons, not least the extension of scuba techniques from warmer to polar waters, the relative neglect of the benthos is being remedied. The fauna, in many groups, is immense, and ecologists have a real need to be able to identify the animals in their collections and surveys. The fact that the Scleractinia are one of the least diverse groups (only 17 species) does not detract from the value of this model production in launching the series.

The terminology applied to the skeletal parts of corals is explained with the aid of clear, well labelled line drawings, and includes such complexities as the Pourtalès plan of septal arrangement but not the way in which soft and hard parts are related. There is a short chapter on biology: cold water corals are non-zooxanthellate, of course. I do not approve of the practice of inserting the figures without legends. While this seems not to have led to ambiguities here, it would be unsatisfactory in a larger group, especially in taxa requiring more than one figure per species.

The systematic section commences with a classified checklist and an artificial key happily laid out using the most traditional (and least confusing) format, with the additional bonus of inserting, at the commencement of each couplet, the number of that from which one has just come. This can be of real assistance in long keys when back-tracking to find the source of an apparent wrong turning and is a feature that should be preserved in future volumes. Families, genera and species are all defined, with their appropriate authorities and dates. Each species heading is followed by the briefest necessary synonymy and the account includes diagnosis, biology, and distribution, and is illustrated by a line drawing of the corallum and a map. Altogether this is a most professional publication and, with the minor exception noted, a commendable exemplar for later contributors.

JOHN RYLAND