

even their predictability was always uncertain (page 231) (in strong contrast to conditions in the boreal forest/taiga environment). And second, respecting reindeer pastoralism, 'natural hazards...could...sharply decrease the stock in a very short time' (page 103). In both pursuits, then, the practitioners lived with abrupt and radical changes in opportunity: the 'feast-and-famine' syndrome was present with a vengeance, strongly influencing harvesting and production practices (hunters' overkill; pastoralists' overstocking). Nor was the human population itself immune from similarly eruptive conditions — disease, fatalities at childbirth, accidents, and starvation all took their periodic toll. Settlements, hunting grounds, and pastures would be abandoned; and, yet, local populations would recover, and even exceed, their earlier numbers: abandoned settlements and territories could well be 'reclaimed' years or generations later.

With such data, Krupnik gives short shrift to notions (once powerfully fashionable) of Arctic ecology being in 'equilibrium' and of the 'ecopopulation' strategy being one of 'steady state.' To the contrary, '*high growth rate* (human and animal)...proved to be an adaptive form that yielded better results than any kind of drive toward stabilization and equilibrium with the environment' (pages 225–226; emphasis added).

Such analysis is exemplarily processual.

Regrettably, such is strikingly not the case respecting some of the *social* dimensions of the thesis. Let me address this with respect to reindeer pastoralists (chapter 3, principally), where there are repeated references to 'rich' and 'poor' owners without a word as to how this division came about or how it was maintained across generations (as references to 'stratification' might suggest) — if, indeed, it was. Answers would lie embedded in the practices of *inheritance* and *marriage partnerships* and (mentioned but in passing) *rich-poor work partnerships* of mutual benefit. In other words, in the circulation of wealth and labour, and the possible appropriation of wealth, too: was there no reindeer rustling?

In short, the processes of *life cycle* along with the nature of pastoral *competition* remain hidden from us. Here, it is regrettable that Krupnik did not look at statistical data (I assume this would be possible) within the same pastoral community or camp over a sequence of years, and, better still, look at the rise and fall of the fortunes of selected individuals through their life cycles. Of particular interest would be the entries of pastoral wealth of, say, a 'rich' household head before and after the children marry.

Returning to the book as a whole, and Krupnik's handling of statistics, I am in wonderment over what he is able to find and the arguments he is able to construct. But, I am concerned over his dependence — left largely unproblematised — on statistics collected by strangers and officials of different political regimes. There is also dissonance between, on the one hand, the 'message' from the statistical data of unpredictable change in just about all ecologic, economic, and social arrangements, and, on the

other hand, repeated recourse in his text to the 'traditional' and even the 'average.' In places this is taken to a kind of decimal-point absurdity. Thus, the number of dogs per family among the reindeer Chukchi is '3.68' — even so, 'the actual distribution by families and camps was highly uneven' (page 104).

Nevertheless, *Arctic adaptations* is a book of challenging importance for on-going circumpolar research. If only for this reason, it *deserves* critical assessments beyond the adulatory. (Robert Paine, Department of Anthropology, Memorial University of Newfoundland, PO Box 4200, Elizabeth Avenue, St John's, Newfoundland A1C 5S7, Canada.)

**QUATERNARY INSECTS AND THEIR ENVIRONMENTS.** Scott A. Elias. 1994. Washington, DC and London: Smithsonian Institution Press. xiii + 284 p, illustrated, hard cover. ISBN 1-56098-303-5. £31.25; US\$47.95.

The insects outnumber all other life-forms on the face of the Earth, at least in number of species. Indeed, the Coleoptera (or beetles) by themselves constitute more than half the total of all species, plant or animal, terrestrial or marine, all added together. Arguably, the beetles are the dominant life-form of the planet.

The zoologist Haldane is said to have been asked by a Victorian bishop what had been learnt about the nature of the Creator by studying the creation. 'The Lord Almighty,' replied Haldane, 'must be inordinately fond of beetles!'

No beetle is marine, nor has the group exploited parasitism, but with these exceptions the beetles have moved into almost every conceivable ecological niche. Modern estimates number twenty million species, all with different needs, and each filling its own environmental place.

The beetles' extraordinary diversification occurred in their almost unimaginably distant early history, and in consequence there has been little need for them to evolve new species in more recent times. The overall composition of the beetle fauna has remained virtually unchanged for many millions of years, although the abundance and distribution of individual species has varied greatly in response to local and global changes in climate.

Large insect groups need not evolve new species to meet changes in environment, for they are so diverse that there will already be existing species perfectly adapted for the new circumstances. All that changes is the abundance and distribution of extant species. Therefore, looking back across the mere million years of the Quaternary period, one finds that the same familiar beetles now alive also lived then. Their distribution and abundance accurately indicate the climates and environments then prevailing. Fortunately, beetle remains preserve well either by fossilisation or by preservation without mineralisation in bogs or ice. So it is that the beetles, more than any other insect group, have become the recorders of Quaternary climate.

Scott Elias well describes the advances in palaeoecology resulting from the study of Quaternary insect remains, and

lays emphasis on the prerequisite links between entomology and palaeontology. He writes with freshness and a sense of wonder. Perhaps this stems from a relatively recent introduction to entomology, or maybe it is an example of that endearing, slightly naive, enthusiasm so often characteristic of American scientists. Either way, it makes for a readable style that compares well with the dull, scientific writing now all too fashionable. Science should surely be human enough to show wonder, for it is wonder that ought to be its driving force.

For the rest, the book is well-researched and well-referenced, with good photographs and excellent drawings. Other workers are given their proper share of credit, a particularly pleasing feature of a pleasing publication. (John Maunder, Medical Entomology Centre, University of Cambridge, Cambridge Road, Fulbourn, Cambridge CB1 5EL.)

#### **THE BIOLOGY OF THE SOUTHERN OCEAN.**

George A. Knox. 1994. Cambridge: Cambridge University Press. xiv + 444 p, illustrated, hard cover. ISBN 0-521-32211-1. £85.00.

This large book is one of the latest products in the Cambridge University Press 'Studies in Polar Research' series. George Knox has set out to 'synthesise the available information into a coherent account on one of the most fascinating systems on the globe,' aiming the book at advanced undergraduate or graduate level and at professionals in Antarctic marine research and management. The book contains a considerable amount of information, and falls roughly into two parts. Following an introductory chapter on the Southern Ocean, including its geophysical history, the author takes a fairly conventional promenade through the pelagic ecosystem. This starts with microplankton, including ice-biota, then climbs the trophic structure, visiting zooplankton, nekton, and, finally, arriving at birds, seals, and whales. Each of the 10 chapters provides a general introduction, then goes on to describe species composition and distribution before looking at features of biology and ecology of the different groups. The second part of the book starts with an examination of benthic and ice-associated communities, and the remainder focuses on dynamic aspects, including both classical ecosystem process studies and the more applied aspects of marine living resource exploitation. There is an epilogue that offers comments on recent progress in ecological research in the Southern Ocean and raises some important contemporary issues. This is followed by a single-page appendix on approaches to ecological modelling, a 48-page bibliography, and an index.

In their description of this book in a recent catalogue, Cambridge University Press stated that marine biological studies in the Southern Ocean started with the voyages of discovery of the eighteenth century. Against this background, they noted that there has not yet been a 'comprehensive single-author synthesis of the current state of knowledge.' However, there are several recent books

dealing with either individual components of the Southern Ocean ecosystem or with data from specific expeditions or campaigns (for example BIOMASS and EPOS), which offer access to relevant information within single volumes. Clearly, a single synthesis like this book provides a convenient and relatively cheap reference, but how does the book, and thus the reader, benefit from a compilation by a single author?

On the 'plus' side, the book is readable and has a consistency of both format and writing style that would not be possible in a multi-author volume. Knox writes in a clear manner that makes it possible either to sit down and read the book cover-to-cover (sandwiches and thermos needed here), or to dip into it as a reference work. The book has a 'plot,' and its structure works towards the epilogue, which underlines the changes in perception of the Southern Ocean ecosystem, which have arisen as the result of research during the last 15–20 years. However, there are also some drawbacks in a single-author book such as this. The most worrying is the inescapable fact that no one can be expected to be abreast of modern developments across such a wide subject range. The author of such a book has to rely on the interpretation of data by other people, and, with the best will in the world, it is impossible to avoid errors. Examination of the bibliography is revealing. Knox is right to excuse himself for not covering all of the literature. Every expert would expect to differ in their choice of the seminal papers in their specialist area. However, I perceived some inclusions and omissions that I do not think can be put down solely to my personal preferences and idiosyncrasies. To take an example within my own subject area, I would have expected to see a number of recent (1991–1992) papers on critical depth and its control of phytoplankton growth, alongside Sverdrup's classical work of 1953. There are also some strange misspellings and other errors, often systematic, which suggest either that editing has been less rigorous than it should have been or that the author is working in unfamiliar territory. P.M. Glibert must be one of the most mis-cited authors in biological oceanography (as P.M. Gilbert in this book and countless other publications), but how did J. McN. Sieburth metamorphose into J. McN. Siebruth in each of six citations? There are also factual errors in the text. For instance, if phytoplankton are phosphate-limited at concentrations less than  $0.6 \text{ g-at l}^{-1}$  (page 25), then they face severe problems because typical concentrations in the Southern Ocean are  $0.5\text{--}1.5 \text{ } \mu\text{g-at l}^{-1}$ , about a million times lower. On page 186, it is stated that diving petrels feed in the top few metres — published data show that these birds dive to at least 20 m and may reach more than 40 m. These are isolated mistakes, but do nothing to instil confidence in the reader when he needs to move outside his specialist field.

Similarly, there are some surprising omissions in the subject matter. It is odd that the data from recent applications of remote-sensing techniques receive only scant mention. Thus there is almost no use of synoptic imagery