

BOOK REVIEWS

Taxonomy and Biogeography of Macquarie Island Seaweeds by R. W. Ricker. British Museum (Natural History), London. 1987. 344 pp. £40. ISBN 0 565 00998 2.

Remarkably little has been written on the seaweeds of either the sub-Antarctic or Antarctic biomes. The most detailed accounts of the benthic marine algae of an Antarctic region are those of Skottsberg (1941) and Lamb and Zimmermann (1977), while the most complete catalogue and bibliography of southern circumpolar marine algae was provided by Papenfuss (1964). Ricker's treatise is the first comprehensive taxonomic treatment of the marine macroalgae of a sub-Antarctic region. However, its value extends far beyond the shores of Macquarie Island for the Southern Ocean distribution is given for each species described. It will thus be of great value to marine biologists working anywhere around the Antarctic. The concept and planning of this intensive study at such an isolated island was perhaps unusual. Whereas most taxonomic studies of this magnitude are based on assessments of collections already held in herbaria, the author's four-man team, including scuba divers, selected Macquarie Island for a particular purpose (Lowry and others, 1978). This was primarily because it is located close to the Antarctic Convergence (although perhaps Ile Kerguelen would have been a better choice from this point of view?), some previous work on the island's seaweeds had been made and the island is readily accessible by means of the Australian Antarctic Division's charter ships. The survey had three principal aims: to provide a taxonomic and floristic account of the marine algae of Macquarie Island, to elaborate on particular biogeographic elements of the flora, and to speculate on the origin of the island's marine flora.

The book comprises three sections. The first (16 pages) provides an introduction to Macquarie Island and its biogeographic setting, a review of sub-Antarctic and Antarctic marine alga research, a history of the island with particular regard to the species of seaweeds previously reported, the habitats for benthic algae and the materials and methods employed in this study.

Section two forms the bulk of the book (278 pages), being an exceptionally detailed and well-illustrated systematic account of the benthic macroalgal flora. This is based on 75 collections composed of about 3000 specimens taken from seven main sites around the island. Following meticulous taxonomic treatment these yielded 103 species representing 81 genera and 43 families. Thirty-nine pages are devoted to the Chlorophyta (15 species), 76 to the Phaeophyta (28 species), and 163 pages to the Rhodophyta (60 species). Brief details are provided for each order, family and genus with particular regard to their Southern Ocean distribution. The taxonomic accounts of each species are given in considerable detail and each is accompanied by a series of high quality black and white photographs ranging from the entire plant to various microscopic features.

The third section deals with the characterization and analysis of the flora. Several biogeographic elements are recognized. Cosmopolitan species comprise 17% of the flora (19 species), 4% (5 species) are distributed throughout southern high latitudes and occasionally in Cold Temperate, sub-Antarctic and Antarctic waters, 9% (10 species) grow in the Cold Temperate and sub-Antarctic zones while 15% (17 species) occur in both the sub-Antarctic and Antarctic zones. Forty-one percent (46 species) are restricted to the sub-Antarctic zone and 11% (12 species) appear to be endemic to Macquarie Island. A further four species were inadequately represented to permit specific identification.

A very comprehensive 19-page bibliography is followed by two appendices; one describes the collection sites and the second being an artificial key to the Macquarie Island seaweeds. A taxonomic index concludes the book.

This is an excellent volume, clearly presented and superbly illustrated. The author is to be congratulated on his masterly treatment of a little-known flora. It will be invaluable to marine phycologists working in any sector of the Antarctic or sub-Antarctic, and is likely to remain the standard reference for the Southern Ocean for a long time. My only criticism is that a glossary would have been beneficial. It has been well edited and contains few typographic errors. The price, unfortunately, is high, but not unreasonable, for a book of this quality.

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R. I. LEWIS SMITH

Seabirds – Feeding Ecology and Role in Marine Ecosystems edited by J. P. Croxall. Cambridge University Press, 1987. 408 pp., 64 figs, 47 tables, 2 appendices and index. £30.00 (US \$59.50). ISBN 0 521 30178 5.

One great difficulty in safeguarding marine ecosystems over extensive areas of the oceans of the world with their rich diversity of living things has always been the absence of an integrated approach to examining the marine environment as a whole. Instead of constructing management plans and policy on a carefully developed knowledge base derived from interdisciplinary and multi-species study programmes, management of marine waters has customarily been formulated through the examination of only a small part of each system, usually in relation to a single 'target' species of economic importance. This management practice of treating things in isolation places existing marine food webs and their living components at great risk, particularly the higher trophic feeders such as marine birds and mammals. Quite understandably, this deficiency has led to bitter disagreements and arguments between representatives of fishery agencies, who often reason that the influence of fisheries under their authority on ecosystems in the vast ocean regions is surely minimal, and conservation-orientated organizations, within and outside government, who call for a more fully integrated research effort by fisheries, marine mammal, seabird and other marine biologists. Although this wise management approach has not yet evolved in any full form, there has been a strong and persistent push by seabird researchers in recent years to have fishery managers and biologists recognize the existence of seabirds and the role they play in marine systems. This book, by 22 contributors whose combined expertise covers a wide variety of marine ecosystems and their seabird components, represents a very fine effort to do this.

The book is the outgrowth of a symposium on seabirds and nutrient cycles held at

the XVIII International Ornithological Congress in Moscow, USSR, in August 1982. Its theme was enlarged to provide a broader range of geographic regions – from arctic to boreal, tropical/subtropical, south temperate, sub-Antarctic – to provide a better sample of the variety of marine ecosystems that exist, their general features, and the roles of seabirds within them. Overall, the volume is an attempt to bring together, review, summarize and synthesize the available information on the feeding ecology and behaviour of seabirds in different ecosystems, and interactions with marine processes. Indeed, the task was formidable, but the result is an outstanding compendium of existing knowledge that will be invaluable for reference for many years to come, both as a source book for information on natural components of marine systems and for focussing attention on research needs relevant to the management of commercial fisheries and our marine waters *per se*.

The book comprises 16 chapters that clearly separate into three parts. The first consists of two short, but vital, chapters by J. P. Croxall, one at the start (Introduction) and end (Conclusions) of the book, that serve to put the contents of the other 14 contributions into perspective and to create a volume whose value as a whole far exceeds that of its individual parts. The second section (chapters 2–9) begins with an enlightening overview of the diversity and dynamics of scale-dependent biological processes in marine environments (by G. L. Hunt, Jr. and D. C. Schneider). This stimulating introduction to seabirds and their marine environments is followed by reviews of certain adaptations displayed by birds for an oceanic existence (flight, by C. J. Pennycuik; diving, by G. L. Kooyman and R. W. Davis) and by summaries of the feeding ecology of the four main seabird groups (Sphenisciformes, by J. P. Croxall and G. S. Lishman; Procellariiformes, by P. A. Prince and R. A. Morgan; Pelecaniformes, by R. W. Schreiber and R. B. Clapp; Alcidae, by K. Vermeer, S. G. Sealy and G. A. Sanger) including an important review of the significance of food robbing (kleptoparasitism, by R. W. Furness).

The remaining section (chapters 10–15) depicts the successful application of the quantitative study of trophic levels, relationships, and energy dynamics of seabirds in different systems. Energy flux is compared in two boreal shelf systems (Bristol Bay and Georges Bank) based on at-sea shipboard surveys (by D. C. Schneider, G. L. Hunt, Jr. and K. D. Powers), and in a coastal system off California using a combination of extensive ship/air surveys (by K. T. Briggs and E. W. Chu). Community structures, trophic relationships, and food usage of seabirds in the Gulf of Alaska (by G. A. Sanger), Hawaiian Islands (by C. S. Harrison and M. P. Seki), Humboldt and Benguela currents (by D. C. Duffy and W. R. Siegfried), and South Georgia (by J. P. Croxall and P. A. Prince) are also described.

Seabirds – Feeding Ecology and Role in Marine Ecosystems is a timely and important book. I recommend it to all ecologists interested in marine systems, and consider it essential for those who specialize in seabirds and fishery management. Clearly, this volume illustrates how wise management of marine waters can only be achieved through a fully integrated research effort by fisheries, marine and seabird biologists. It is now up to scientists, their agencies, institutions and organizations, and the general public at large, to urge governments responsible for the protection of the marine environment to take appropriate action.

D. N. NETTLESHIP

Beyond the Frozen Sea: Visions of Antarctica by Edwin Mickleburgh. The Bodley Head, London, 1987. 256 pp. + xvi £16.00. ISBN 0 370 31027 6.

Perhaps nearly all who know the Antarctic would agree that it has a value to humanity beyond the science which comes out of it or the material resources which it might yield. What this value may be is difficult to define. Stephen Pyne in his recent book, *The Ice*, sees the greatest of the continent's resources as its preternatural emptiness and the revelations it evokes for those who stare into it. A theologian would express much the same idea by saying that Antarctica has a numinous quality. Most of us would sum it up by saying simply that it is one of the few places remaining on Earth where one can still feel really in contact with the natural world. That Antarctica has a vital part to play in maintaining this contact is the theme of this book by Edwin Mickleburgh.

The Rime of the Ancient Mariner, in which Coleridge used the killing of the albatross as an allegory of man's divorce from nature, is the very appropriate leitmotif running through the story of four waves of human incursion into Antarctica. The first wave started with James Cook, whose astronomer on the Antarctic voyage, William Wales, one learns, had the teaching of the young Coleridge. He was followed by the sealers and an account of their discoveries leads to a sketch of the physical nature of the continent. The second wave was that of the heroic age, which provided high drama and introduced science as a dominant influence – a well-worn story this but told with freshness. Thirdly came a wave of exploitation and politics, beginning with the whalers, continuing in conflicting territorial claims and now running into the confusion of mineral exploitation *versus* conservation. The fourth wave is yet to gather force but the landing of Greenpeace on the continent is seen as the portent of its coming. All this is presented in a very readable text accompanied by maps, illustrations from the archives and the author's own splendid colour photographs. The account of the scientific background is clear and, generally, the facts are accurate although it was a hydrogen balloon, not a hot-air balloon as stated on page 193, that bore Scott aloft over the Ross Ice Shelf in 1902. Appendices set out the Antarctic Treaty (of which there are now ten reprints within my modest collection of books on Antarctica), various other pronouncements on conservation and the Antarctic Declaration of Greenpeace of 1984.

Famine in Africa and Bangladesh, pervasive pollution and the malaise of great cities all indicate that mankind is up against the ecological limits to its population growth. Beside this, the fate of Antarctica may seem of little consequence but, both for the key position it holds in the physical functioning of our planet and for its spiritual value as the last great wilderness, it is of supreme importance. There can be no doubt that Antarctic affairs are approaching a watershed – any day now the discovery of an economically attractive mineral deposit may put a cat among the conservationist pigeons and, more insidiously, the blight of tourism continues to spread so that in 1988, as the newspapers tell us, tourists will outnumber polar professionals in Antarctica by two to one. Greenpeace advocates the establishment of Antarctica as a world park, within which should be prohibited all military activity, mineral exploitation, unregulated harvesting of marine resources, and, by implication but not explicitly, over-exploitation by tourism. Were it properly implemented this would be a major step towards restoration of balance between man and the natural world and a pause in the destruction of wilderness. Whether the tactics of demonstration and confrontation adopted by Greenpeace provide the best way of achieving this is debatable. Even in Antarctica things are more often grey than clearly white and black. Whaling has become a deplorable business but to condemn it as

utterly evil is to forget that master-whaler William Scoresby, his loving understanding of the polar seas, their living inhabitants and the men who sailed on them, and to ignore the fact that much of our knowledge of the Antarctic has come from such as he. Action and reaction, one was taught, are opposite and equal. To set up a base on the continent and carry out research, which from the nature of things is unlikely to be of great importance, might lead to the recognition of Greenpeace as an Antarctic power but, on the other hand, it certainly exasperates those already established there who would feel morally obliged to go to its aid if anything went wrong. To write a persuasive introduction to the Antarctic such as this seems a more effective way of going about things.

G. E. FOGG

Antarctic Psychology by A. J. W. Taylor, Science Information Publishing Centre, New Zealand, 1987. US \$41.00. ISBN 0 477 025 080.

Practically all who have been involved in Antarctic work have views or at least a strong interest in the psychological aspects of life in the Antarctic and in selection procedures for those who wish to become involved. This very well written book will thus be of great interest to the polar community as a whole.

It is written in an authoritative manner and it is clear that the author has a deep knowledge of his subject. The presentation is clear and interesting – almost gripping in parts. Even those sections which are experimental and technical are described in terms such that a layman, not involved in the subject, can clearly understand the results and associated discussion. Perhaps, the book's main strength is the way in which the author combined literature review, data presentation and his own very personal observations with his considerable first hand knowledge of Antarctic living. This gives the work profundity and makes his ideas acceptable. The main weakness of the approach is that it is overly eclectic and though it may be reasonable to eschew grand theories, the lack of any unifying theoretical stance may limit the studies. There are, of course, omissions such as the effect of the environment on such areas as sleep patterns, circadian rhythms etc. He makes a good case for the need for careful and scientifically rigorous selection of personnel and this is a topical subject at a time when there seems to be an expansion of interests in polar regions – both scientific and commercial.

So, overall a timely and useful book which describes some of the psychological research which has taken place in the Antarctic, but which serves principally to indicate the urgent need for concentrated (possibly international) research on selection, training, social structuring, task requirements, recreational needs etc. of future Antarctic personnel. The book will be of interest to all those who have an interest in the Antarctic and will also be useful recommended reading for those considering or preparing themselves for work in the Antarctic.

J. N. NORMAN

Natural History of the Antarctic Peninsula. Text by Sanford Moss with illustrations by Lucia deLeiris. Columbia University Press, New York. 1988. 208 pp., illustrated. US \$27.50. ISBN 0 231 06268 0.

Each time a new popular book on the Antarctic appears, I derive considerable personal satisfaction from preparing a mental critique. I marvel at the wealth of

knowledge so many of these summer visitors believe they have amassed during their few weeks in the Antarctic. So often they are repetitive and frequently inaccurate. It was therefore with some scepticism and cynicism that I read Sanford Moss's book. Was this to be yet another tourist's impression of Antarctica? In fact, *Natural History of the Antarctic Peninsula* is different on several scores.

The author and illustrator have produced a book on Antarctica unlike any other, inasmuch as it provides a lucid yet succinct account of the natural history of an Antarctic region in terms of 'the intricate, interconnecting chain that makes life possible on this land of superlatives and extremes.' The book's solid scientific grounding makes it a useful guide for scientists and students. This information on the dustcover is a fair statement. I found this a well-written, authoritative and accurate account of a highly complex subject, charmingly illustrated by Lucia deLeiris' black and white line drawings – a brave departure from the now customary high-quality colour photographs reproduced in most modern accounts. The book comprises 10 chapters, a glossary and index. The first two chapters deal with the physical characteristics of the landscape and the Southern Ocean. (A more detailed map of the region under discussion than the one provided would have been helpful to the unfamiliar reader.) The biological sections include Green Plants (the primary producers), Herbivores, three chapters on Secondary Consumers (fishes, squid and benthos; birds; mammals), Secondary Producers (birds), and Secondary Carnivores (mammals). Within these latter chapters there is some overlap and difficulty in distinguishing between secondary consumers, predators and carnivores. One of Miss deLeiris' drawings illustrating the intricacies of the marine food web would have been useful in clarifying some of this confusion. The final chapter on The Future brings together Man's concern for the Antarctic environment and the changes for which he is responsible. Political issues are outlined in relation to marine and mineral resources, tourism and territorial claims and to the future of the Antarctic Treaty. Each chapter is provided with a useful list of references which include many of the most authoritative works published in recent years (up to 1986). A glossary of terminology is a valuable addition (although some definitions are not too accurate, for example bryophytes are not 'vascular plants known as mosses').

What I found puzzling was that while mention is made of Miss deLeiris' four months at Palmer Station and on board ship along the Antarctic Peninsula creating drawings reproduced in the book, no mention is made of Professor Moss actually visiting the Antarctic. In fact, there is nothing in the text to indicate his personal observations or involvement in scientific research. The impression given is that it was the illustrator who did the fieldwork while the author carried out a comprehensive literature search in the comfort of his library. The outcome of his endeavour, though, is a highly informative account of life and biological systems in Antarctica, derived from many of the recent literature sources. This has been admirably achieved, although much of the text is not specific to the Antarctic Peninsula but to the Antarctic in general. In fact, many of the scientific findings referred to and attributed to the region come from Signy Island in the South Orkney Islands, well beyond the Antarctic Peninsula. The format of the book frequently leaves one-third of each page blank; what a pity these spaces could not have been filled with more illustrations. The support of Miss deLeiris by the National Science Foundation's Division of Polar Programs to undertake such an illustrative project worries me a little. While scientists have to submit intricately researched project proposals to attract funding by NSF, and even then many are not successful, it seems strange to me that they are prepared to fund a project which, on the face of it, is only of aesthetic value.

Notwithstanding these criticisms, Professor Moss has given us a valuable and

accurate consolidated account of the Antarctic environment, the composition of the biota and its adaptations for survival, and of the nutrient and energy pathways through the biological food chains of this inhospitable part of the world. As such, the book will serve as a fascinating and informative introduction to the physical and biological processes which interact to create this unique biome. A dustcover review states that this book is a compendium of facts for the scientist but also a highly readable tome for the lay person; I would be inclined to reverse the order, as it is really aimed at the level of the lay person and student; it lacks the detail of interpretation and illustration to be a major source of reference for the professional scientist. However, the text does frequently lapse into a more technical discussion which may confuse the layman, although many of the terms are adequately defined in the glossary. Nevertheless, the author's refreshing style and competence in condensing facts into an easy flowing text makes this a highly readable book, which I would recommend to anyone who is interested in how biological systems function in the Antarctic.

The book is reasonably priced, but no doubt the cost could have been reduced by having a more conventional and less wasteful format. The text has been well edited and typographical errors are very few, as are factual errors.

R. I. LEWIS SMITH

Status, Biology, and Ecology of Fur Seals—Proceedings of an International Symposium and Workshop, Cambridge, England, 23–27 April, 1984 edited by John P. Croxall and Roger L. Gentry, NOAA Technical Report NMFS 51, US Department of Commerce, 1987. Pp. v+212, illustrations, figures and tables (paperback). £5.00.

In April 1984 an important international meeting on fur seal biology was held at the British Antarctic Survey. The objectives were to review behavioural, ecological and physiological research; to review present status of species, recent population trends, the history of exploitation, and the rates of recovery from exploitation; to compare demographic, behavioural and ecological traits that may be related to recovery; and to identify important needs and opportunities for research. The meeting was well structured and organized, and this publication could serve as a model for the product of such meetings. The editors have achieved a remarkable cohesion and standard of presentation in the published papers. The format is attractive and the many illustrations are very well designed and unusually clear. In short this is a milestone publication in the literature on seal research and summarizes very comprehensively the present state of knowledge on fur seal biology and ecology.

For each species the account reviews: history of harvesting, population size and trends, influences (space, food, competitors, predation, survivorship), reproductive parameters, reproductive ecology, growth, food, current research and citations. In addition to the species summary papers there is an interesting selection of papers on varied aspects of fur seal research. A number of round-table workshops were held and informative reports by the rapporteurs for five of these are included. There is a comprehensive bibliography of recent research (since 1976).

It is invidious to single out individual contributions in a publication which achieves a uniformly high standard. The comments which follow merely represent a personal and incomplete sampling of some of the highlights.

The Antarctic fur seal represents a success story of a species rapidly increasing

under protection at up to 17% a year, from near extinction at the beginning of the century to an estimated 1.2 million in 1984. If the rate of increase is sustained, this implies a population of more than 2 million in 1988, a greater abundance than recorded for any eared seal species. Density-dependent adjustments to pup mortality and female behaviour have been studied at Bird Island. Exceptionally high pup mortality in 1978/79 and 1983/84 was probably related to scarcity of food (krill) over the normal foraging range of the lactating cow.

The northern fur seal in contrast, formerly the most abundant species, has been declining. The greatest influence on its abundance in the past 30 years was the herd reduction through harvesting the females. The mechanisms causing population decline are still unexplained and the subject of controversy; speculation is avoided here. A new cause of mortality due to entanglement in debris arising from human activities has been up to 5% a year. Age at first reproduction and juvenile survival are negatively correlated and pelagic sampling has produced the best data, for any species, on age-specific fecundity.

The Galapagos fur seal is by far the smallest fur seal and has been actively studied only since 1976. A strong El Niño in 1982–83 killed at least three youngest year classes and affected the survival of adult females. There is an unusually long suckling period, so yearlings may not be weaned when the next pup is born, resulting in sibling competition. The total maternal effort to raise one offspring is calculated to be 300 foraging trips at sea and 3000 hours of nursing. The South American fur seal off Uruguay has been exploited since 1515, it has been harvested continuously and yet is probably near the original population size. The Juan Fernandez fur seal was rediscovered in 1965 and has increased at 21.4% annually since 1978/79.

The South African fur seal was nearing extinction by the beginning of this century, having been exploited for four centuries. Since then it has been rationally managed and over 2.5 million pups and bulls harvested in the period 1900–83. The total population is about 1.1 million, making it one of the more abundant species. Despite intensive exploitation (a recent harvest of 75,000 pups a year) the net annual growth of the population since 1971 has been 3.7%. Harvested colonies are increasing faster (mainland) or declining more slowly (on islands) than unharvested colonies. The closely related Australian fur seal population seems to have stable since 1945 and is much smaller than it was before European harvesting. Factors contributing to this may be competition with fishermen in an ecosystem of low productivity and increased mortality from interactions with fishermen.

The species accounts include a wealth of biological information. Some of this is expanded in more detail by a series of twelve contributed papers. In the sub-Antarctic fur seal experiments on individual recognition of the pup by the female are described. In interactions between the Guadalupe fur seal and California sea lions the fur seal is seen to be dominant. Individual females of the northern fur seal were followed over seven seasons to obtain data on age-specific reproductive behaviour. In another paper a general age-structure model is presented, as a tool for examining the interrelationship of the vital parameters and understanding the magnitude of compensatory effects of small changes in these parameters. A lengthy paper models the population dynamics of the South African fur seal. The three species occurring at Macquarie Island are discussed; there are no specimens of the original species which was hunted to extinction; 'the possibility remains that it was another, extinct species of fur seal'. There is much of value in these and other contributed papers.

Finally, the short Workshop Reports cover: behaviour, male tenure, female attendance behaviour, vocalizations and diving behaviour. Because the attendance at the meeting included the majority of leading fur seal biologists, the state of

knowledge, gaps in information and missing comparative data were identified. There is no doubt that the meeting has successfully promoted communication and collaboration, one of the aims of the organizers.

I have no criticisms, only praise, for this excellent publication, which will be influential in promoting the further development of fur seal studies and of great interest to mammalogists, ecologists and ethologists. It is required reading for all seal biologists.

R. M. LAWS