

heart rate can be used as an indicator of metabolic rate in marine mammals, behavioural and physiological options in diving seals, the behavioural implications of diving physiology, plasma and tissue lipids of the harbour seal, and the aerobic costs of diving and swimming in bottlenose dolphins.

This book is an excellent compilation of some of the most recent developments in behavioural and physiological research in marine mammals by some of the world's foremost authorities. It has a good balance of general information and original data, all presented in a comprehensive manner, and it is a book for the serious researcher rather than the general reader. It will be of interest to researchers in most fields of marine mammal studies and is highly recommended as a valuable addition to any library or collection. (E. Cruwys, Department of Zoology, University of Cambridge, Downing Street, Cambridge CB2 3EJ.)

SKUA AND PENGUIN: PREDATOR AND PREY. Euan Young. 1994. Cambridge: Cambridge University Press. xvi + 452 pp, illustrated, hard cover. ISBN 0-521-32251-0. £65.00/US\$99.95.

From the earliest days of Antarctic exploration, the skua achieved notoriety as a cruel and relentless predator of penguins, and this reputation has remained to the present. I am particularly fond of the cult film *Mr Forbush and the penguins*, which gives a recent expression of this view. In the film, a socially privileged Cambridge graduate goes off to study penguin–skua interactions living alone in a hut on Antarctica. He develops too strong bonds with his 'brave little penguins' and becomes increasingly unhinged at the activities of the murdering skuas, eventually building a medieval siege cannon to try to drive the skuas away (without success). However, this stereotyped image of skuas is misleading. Euan Young discovered in the 1960s that many skuas (*Catharacta maccormicki*: South Polar, Antarctic, or McCormick's skua) nesting near penguin rookeries (*Pygoscelis adeliae*: Adélie penguin) feed predominantly on the Antarctic silverfish *Pleuragramma antarcticum*, which they catch at sea. Only a few specialists kill penguin chicks, and even they feed extensively on fish much of the time.

This book provides a detailed account of that research, including quantitative analyses of the numbers and biomass of penguins available to skuas, the behaviour of penguins and skuas, skua diets and feeding, and the impact of penguins. These data are then used to model the energetics of skua foraging and food gain at sea and at the penguin colony, making use of recent developments providing information on BMR of skuas and energy costs of flight. The entire text is illustrated by sketches, graphs, and superb black-and-white photographs, including many remarkable shots of skua–penguin interactions.

Although the title may suggest that this book is a study in co-evolution, the author does not use that as a central theme. Rather he points out that the nesting association of the two species may be largely due to their need for a

particular habitat in short supply. Nevertheless, the colonial nesting of the penguin is clearly an adaptation reducing their vulnerability to skua attacks. Not only are central penguins less at risk than peripheral ones, but the highly territorial behaviour of breeding skuas leads to penguins nesting within a skua territory being protected from attack by other skuas. One could view this as a skua 'protection racket,' except that while some specialise on penguins, many skuas 'protecting' groups of penguins feed entirely at sea. The skua territory is clearly defended as a space for breeding and chick-rearing and not predominantly as a defended source of food. Using exclosures to stop skua access to areas of penguin colonies, Young found that the impact of skuas on penguin breeding success was generally trivial. Many penguin eggs eaten by skuas were scavenged. Indeed, penguins had a greater impact on the hatching success of skuas by trampling their eggs (by accident), perhaps further evidence that skuas only nest beside penguins because of a shortage of nesting habitat.

So why do so few skuas feed predominantly on the abundant penguins? Apparently skuas are not strong enough or well enough equipped with predatory weapons to kill adult penguins without risking serious injury to themselves. Attacking penguin chicks carries a real risk of injury to the skuas, from large penguin chicks or from the defence put up by adults. Even stealing penguin eggs is risky. Only a few skuas become skilled at these hazardous feeding techniques and many wimps opt for the easier life of catching fish at sea. This can lead to the apparently bizarre situation of skuas being unable to provision their chicks because they cannot get enough food, especially when ice at sea means long foraging flights. Most skuas lay two eggs, but the second hatched chick normally dies because there is not enough food for two. The loss of the second chick occurs as a result of sibling aggression, the older and stronger chick dominating and killing its sibling. The inability of skuas to rear two chicks despite the abundance of penguins in many territories is most easily explained by the weak link between predator and prey. This is further emphasised by the timing of breeding of the species. The skua breeding season is later than that of the penguin, leaving the skuas to feed their growing chick at a time when virtually no food remains available for skuas in the penguin colony. Feeding at sea then becomes essential rather than an option.

These arguments are put forward carefully by Young, with a most interesting estimation of the energy gains for birds feeding at the penguin colony or at sea. The evolutionary question remains unanswered. Do birds that feed on penguins do better or worse than those that feed only at sea? Apparently the two strategies lead to similar breeding success, but it would require some years of study of survival rates to determine whether birds that specialise on penguins are the 'best' birds or whether these individuals pay a cost in a higher mortality rate as a result of accumulated injuries. While reading this book I recognised many parallel features of skua–seabird interactions in the North Atlantic, and I suspect that similar generalisations apply to

the interactions of other seabird predators, such as large gulls. Young's book raises as many questions as it answers, and it will be of interest to seabird biologists from all climatic zones as well as to biologists specialising in the Antarctic. (R.W. Furness, Applied Ornithology Unit, Zoology Department, University of Glasgow, Glasgow G12 8QQ.)

ARCTIC EXPLORATION AND DEVELOPMENT C. 500 B.C. TO 1915: AN ENCYCLOPEDIA. Clive Holland. 1994. New York and London: Garland Publishing. xvi + 704 pp, maps, hard cover. ISBN 0-8240-7648-6. US\$125.00.

In 1653 the Danish Northern Company sent out an expedition to explore the Arctic waters north and east of Norway. The expedition apparently reached the Kola Peninsula, the Pechora region, Novaya Zemlya, and Spitsbergen. The only first-hand account written about the voyage was by the Frenchman Pierre Martin Bruzen de la Martinière, the surgeon on one of the three ships. His book was enormously popular, and was issued in at least six languages and 16 editions. However, it owed as much to his vivid imagination as to any semblance of reality, as he not only included a remarkably inaccurate map, but fantastic descriptions of strange fauna and native peoples never seen before or since.

More than two centuries later, the Confederate Navy ship *Shenandoah*, under the command of James Waddell, sailed through the Pacific and the Sea of Okhotsk to the Bering Sea, where Waddell and his men encountered the US whaling fleet. Within a week, they had captured and burned at least 19 whalers, despite having been told by several captains that the American Civil War had ended more than two months previously (9 April 1865). Working his way back south after being stopped by ice in the Arctic Ocean, Waddell finally received confirmation from a British ship that the Confederate States of America had indeed collapsed and hostilities had ceased. In order to avoid the US Navy, Waddell thereupon sailed around Cape Horn and on to England, having destroyed a total of 29 US whalers.

In 1901 the Russian icebreaker *Yermak*, having been restrengthened in Newcastle-upon-Tyne, headed toward Novaya Zemlya on a test-run. Stopped by heavy ice, however, Stepan Makarov, the expedition commander, turned to Zemlya Frantsa-Iosifa, and anchored at Mys Flora, his command thereby becoming the first Russian party to reach that archipelago. After conducting some oceanographic work, the expedition again headed for Novaya Zemlya, but was again halted by the ice. These failures to reach Novaya Zemlya were viewed very unfavorably by the Russian government, which removed Makarov from the icebreaker experiments and shelved plans for icebreakers for almost two decades.

These three adventures are only examples of the approximately 1900 expeditions that can be found in *Arctic exploration and development*, Clive Holland's new sourcebook for the history and exploration of the north.

With this work, Holland, who was the principal architect of the masterful chronology *The exploration of northern Canada* (Cooke and Holland 1978), has made another major scholarly contribution to northern history. Like its predecessor, this book is a comprehensive chronological record of northern expeditions, voyages, and historical events; however, the current work covers the entire Arctic. In so doing, it details a vast amount of information about which little has been known. Most notable in this vein are the accounts of expeditions in the Russian Arctic, many of which have previously been totally unfamiliar to western researchers. Of course, the book has lengthy summaries of all of the major expeditions and events as well, so that the general reader can benefit from it as much as the specialist. Hudson, Ross, Nordenskiöld, Nansen, Peary, and Stefansson are here, along with the less well-known, but equally significant, Otto Torell, Elling Carlsen, Joseph Wiggins, A.G. Nathorst, and Vladimir Rusanov. Also included are synopses of whaling, hunting, and trading expeditions, including annual accounts of whaling activity since 1624.

Arctic exploration and development is an extremely useful tool for the northern researcher. The entries are, first, chronological and, then, by geographical locations. Each entry has at least one reference, and the book has an extensive bibliography. There is an appendix of significant members of expeditions, with a complete listing of the expeditions upon which they served. The book also includes a geographical glossary, as well as approximately 30 maps. And there are two indexes, one of place-names, companies, and other entries, and one of ships that sailed into the Arctic.

Regrettably, the book does have several editorial flaws. After the proof stage, for example, a number of changes were made that resulted in a lack of consistency in the usage of fjord/fiord, which appears in a variety of forms, some correct, others not. In addition, the maps are in a random order, and one is a draft, rather than a final, copy. Fortunately, these rather minor problems are being corrected for the second printing.

Holland spent many years researching and compiling this work. It is surely destined to repay his efforts by being recognized as a classic in its field, and scholars surely will anxiously await its sequel. (Beau Riffenburgh, Scott Polar Research Institute, University of Cambridge, Lensfield Road, Cambridge CB2 1ER.)

Reference

Cooke, A., and C. Holland. 1978. *The exploration of northern Canada, 500–1920: a chronology*. Toronto: Arctic History Press.

THE ARCTIC: A HISTORY. Richard Vaughan. 1994. Stroud, Gloucestershire: Alan Sutton. ix + 340 pp, illustrated, hard cover. ISBN 0-7509-0177-2. £20.00.

To attempt to discuss the history of the entire circumpolar Arctic from a mammoth hunt on the Berelekh River in the Indigirka basin around 12,000 BP to the negotiation of the Nunavut settlement in 1993 within the constraints of 340