

The Indian Ocean: Images and Realities. S. Z. Qasim. Oxford & IBH Publishing Co. Pvt. Ltd., 66 Janpath, New Delhi 110 001, India. 1999. 340 pp. Price: Rs 650.

As a marine turtle biologist, the ocean fascinates me. Our brief association with these ancient reptiles seems to reflect our affair with the ocean for, like the ocean, marine turtles have charmed, mystified and yet remained tantalizingly elusive to biologists. All sea turtles come ashore for about an hour to nest, mostly at night, when they lay their eggs and then disappear. The hatchlings emerge about two months later and they too disappear into the vast expanse of the ocean. It is symbolic perhaps that the years after their emergence were till recently known as the 'lost years' because sea turtle biologists had no idea where the young turtles went. It reminds us of how much the vast ocean attracts our curiosity and how little we know about it. As creatures of the land, we are frequently awed by the vastness of oceans and their inaccessibility; the oceans have kept their counsel, guarded their secrets, while offering glimpses of breathtaking beauty and frightening power. If there is a notion of the Indian Ocean (particularly to Indians) as the Bay of Bengal and the Arabian Sea, remember that there is a vast expanse of ocean south of the Indian peninsula with just a few scattered islands to mark an otherwise watery seascape.

S. Z. Qasim, renowned marine scientist, and recipient of several awards for his contributions to research, is well qualified to undertake the task of reviewing the available knowledge on the Indian Ocean. Little is known about the Indian Ocean and the author has done an admirable job of compiling available information on the subjects he has covered. Much of the information deals with Indian coasts and is largely based on research carried out at the National Institute of Oceanography (NIO), Goa over the past thirty years. Marine science encompasses a wide variety of subjects and the author has attempted to deal with various aspects of oceans and from different perspectives.

Our interaction with oceans begins with the point of first contact, the beach. Beaches themselves are fascinating systems; the action of the surf and the sali-

nity of the water make it a very difficult environment for most living creatures. Beaches vary in shape, appearance, slope, sand and the extent of the intertidal zones. Selected beaches on the west coast (e.g. Cochin and Goa), east coast and Lakshadweep are described in detail. There is also an account of Mombasa beach, Kenya, one of the few instances where the author departs from Indian shores. Details of rainfall, salinity, and other physical and chemical characteristics are given for each of the beaches. Macrofauna of these beaches are also described. The information may not be particularly interesting to the lay reader, particularly since the significance of these characteristics is not portrayed (e.g. what do different phosphate and chlorophyll *a* levels indicate). The author briefly comments on the significance of these characteristics in relation to changes in patterns of beach use, but does not elaborate on a theme that would genuinely be of interest to most readers.

The opening chapter on sandy beaches is followed by a description on bottom communities with accounts of the estuarine benthos of selected areas on both coasts, benthos of coastal waters, shelf regions, Andaman Sea and Mauritius. There is also an interesting section on continental Antarctica here. This is followed by a brief account of nitrogen cycling and an extensive chapter on the micro-organisms of the Indian coasts. The author then moves to biofouling, which is 'the process of attachment of plants and animals to all submerged objects in the sea, such as buoys, piers, jetties and hulls of ships'. This includes fouling by microbes, boring organisms and diatom communities. There is a useful review of the control of biofouling which includes such diverse methods as antifouling paints, scrubbing, electric currents, sonics, magnetic fields, optical methods and isotope coating.

The section on genetics is interesting, particularly because this has become a major area of research in biology as well as a powerful tool in answering questions in evolution and ecology. Molecular genetic analysis can offer insights into population biology, reproductive biology, taxonomy and phylogeny, which can be critical to the conservation and management of endangered species. The studies described here use serum protein and immunoelectrophoretic analysis, which

were early techniques used in population genetic studies. Currently, more powerful methods such as microsatellite and sequencing analysis are widely used.

The following chapters would be useful for any potential student of marine sciences. A critical issue in research is the collection and dissemination of information. The NIO, Goa has taken a lead in this with its CD-ROMs on the taxonomy of prawns, crabs and mangroves of India. The author gives a good review of available databases and sources of information on marine systems and the Indian Ocean. He has addressed a pressing need of nascent disciplines in providing an account of both available information, access to that information and a description of the facilities, infrastructure and equipment that one would need to work in this field. The account of instrumentation would be particularly useful to any researcher planning a study on a marine system. The author discusses issues of coastal erosion that have got to be close to the heart of any marine biologist, and suggests methods to protect beaches and control erosion. In the chapter on engineering problems, the author deals with coastal erosion, ports and harbours, offshore oil and gas, pollution and energy utilization. This section ends with a chapter on capacity building, which has useful information on universities where marine sciences are studied/taught and a review of subjects for future research.

The last few chapters deal with varied but interesting subjects. There is an account of the horseshoe crab, a living fossil and a part of the coastal biological heritage of the country. The horseshoe crab is believed to have descended from trilobites, which existed over 700 million years ago, and is itself believed to have evolved 350 million years ago. It is found along the coast of Orissa and West Bengal and is remarkable in its biology. It is also known as the 'blue bl' as its blood turns blue on exposure to air. The horseshoe crab has gained in economic importance because of the presence of amoebocytes in its blood, which are highly sensitive to endotoxins. An extract of the blood is used as a tester in food and pharmaceutical industries. The author also recounts various interesting local myths that surround this interesting animal. Another animal that has gained in economic importance is *Artemia*, the brine shrimp, whose eggs are used as live

food for the larvae and juveniles of innumerable species in aquaculture. The author gives a detailed account of the biology and use of *Artemia*, in particular the Indian strains.

The Indian Ocean Biological Centre (IOBC) in Kochi, now a regional centre of the NIO, was started in 1961 as part of the International Indian Ocean Expedition, a multinational programme in which 19 ships from 9 countries participated. The author describes the history of the IOBC, the role of India in the international programme and its current functioning. The last chapter on sunken treasures describes marine archaeology in India, with interesting accounts of the discovery of the submerged port at Dwarka and the prehistoric remains of Somnath.

In India, apart from the scattered efforts of a few institutes such as the NIO in Goa, little work has gone into marine systems. Part of this is due to the lack of infrastructure and money to carry out marine studies. On the other hand, biology itself has been a neglected discipline, and with the advent of biology as a moneyed science, laboratory disciplines such as molecular biology and genetics have gained primacy and multidisciplinary fields such as marine biology have had little money to operate. In this backdrop, the author's efforts in this field come as a great boost to various aspects of marine biology and should inspire at least curiosity and hopefully lead to more work in the area.

Unfortunately, the book does not provide a general perspective of oceanic or coastal biology. While it may be true that such information is also available elsewhere (perhaps even in the author's earlier book which I have not had the opportunity to read), it would still have been useful to provide a general picture of oceanic science. This would have illustrated the relevance of some of the information with which the book is filled. In its current form, the title of the book does convey the impression that it is review of information on the Indian Ocean which it is not. Perhaps the title of the author's earlier book, *Glimpses of the Indian Ocean*, would have been more suitable, or maybe even *Glimpses of Indian Coasts*. The author does deny any claim to the book or its chapters being reviews, and suggests the book aims to fill certain gaps left by the previous one. However, while a vast array of informa-

tion is displayed for the reader, much of it seems disjointed and is not assembled in any fashion designed to instruct. Many things have been missed; as a wildlife biologist, I miss the mention of any marine mammals; dolphins, whales and dugongs, though poorly studied thus far deserve at least a passing mention. Many marine birds and marine turtles have been extensively studied and should have a place in any account of the Indian or any other ocean. Even as far as the other marine sciences go, too little has been said about the climatic and other general aspects of the Indian Ocean. Marine ecosystems are in peril due to a variety of reasons, and a section on conservation and the management of marine ecosystems would have been most welcome.

However, this book is undoubtedly an excellent compilation of information by a highly erudite scientist who has spent his entire career in pursuit of the secrets of the ocean. In sum, the book offers a large amount of information on a wide variety of subjects which go into the study of marine science, and on the Indian Ocean. The reading lists at the end of each chapter are also useful to students of this field of research. While it is a book that is difficult to read and assimilate from cover to cover, anyone who is involved with studies on the Indian Ocean would benefit from the information compiled here.

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Deccan Volcanic Province. West Volume. K. V. Subbarao (ed.). Mem. Geological Society of India, P.B. 1922, Gavipuram PO, Bangalore 560 019, India. 1999. 947 pp. Price: Rs 750/US \$ 50.

The Deccan Volcanic Province represents one of the largest continental flood basalt provinces of the world that erupted during India's rapid northerly drift from the Gondwanaland to raise the Himalayas. The volcanism has been related to the Reunion Plume and may also possibly be a cause for the extinction of dinosaurs

during the K-T transition. Hence, publications on the Deccan Volcanic Province should be of interest to a wide spectrum of scientists. Part 2 of the West Volume on the Deccan Volcanic Province under review commemorates the contributions made to Indian Geology, notably the Deccan Traps by the late William Dixon West (1901-1994), former Director of the Geological Survey of India and professor and founder of the Department of Applied Geology, University of Saugar, Madhya Pradesh (MP), which is celebrating the centenary of West. The volume represents in part the papers presented at a Seminar held at the Indian Institute of Technology, Mumbai during December 1996, together with selected papers by the editor that have been published previously and have greater relevance to studies on Deccan basalts. The volume aptly begins with a tribute to late K. G. Cox, who inaugurated the meet but could not live to see the volume in print due to his tragic demise in a boat accident in Scotland in August 1998. Cox recognized the importance of picrite basalts in flood basalt genesis in general and a re-study of West's bore hole sequence (paper reproduced in the Mineralogy and Petrology section) with picrite basalts in Saurashtra was taken up in the early 1970s by P. Krishnamurthy under Keith Cox for a better understanding of the parental magma and the evolution of Deccan basalts (*Contrib. Mineral. Petrol.*, 1977, **62**, 53-75). Geochemical and Sr-Nd-Pb isotopic studies on these samples by Peng and Mahoney (*Earth Plant. Sci. Lett.*, 1995, **131**, 169-185) have clearly pointed out the chemical similarity of the present-day basalts of the Reunion Plume and these early stage basalts, including picrite basalts of the Deccan.

The present volume includes a total of 28 papers, six in geomorphology, ten in Mineralogy and Petrology, eight in Geochemistry and four on the Lonar Lake. Among these, the new contributions included are only six, namely four in Petrology and Mineralogy and two in Geochemistry. The editor provides comments on all these papers at the beginning of each section and highlights the contributions in the overall perspective of understanding the genesis and evolution of the Deccan Traps in general or from a particular area. The ratio of almost 5 between the old and new contributions in the volume clearly highlights the need for