

Serpentine mystique unravelled

Snakes: The Evolution of Mystery in Nature. Harry W. Greene, with photographs by Michael and Patricia Fogden. University of California Press, Berkeley, CA, 1997. 351 pp., illus. \$45.00 (ISBN 0-520-20014-4 cloth).

Picking up a book for the first time, I find that reading the author's preface usually provides keen insight into whom and what has shaped the author's beliefs, and what to expect from the book. Harry Greene begins *Snakes: The Evolution of Mystery in Nature* by relating the tale of his first meeting with writer Norman Maclean (*A River Runs Through It*), an encounter that resulted in a challenge to write a book explaining why Greene works with "those damned old rattlesnakes!" This tale is the first glimpse of things to come, the relating of personal experiences (especially field experiences) that deeply enrich the text and serve to keep the reader engaged. The preface goes on to list an impressive array of public figures and leading scientists (herpetologists, conservation biologists, and evolutionary biologists) that have clearly shaped Greene's thinking about life, science, nature, and, most important, snakes.

Greene, a biology professor at the University of California–Berkeley and long-time researcher of snakes in the lab and field, and Michael and Patricia Fogden, professional nature photographers, combine their talents to provide a comprehensive illustrated review of snake diversity and biology. Greene's purpose is to provide a book that is both accessible to laypeople and scholarly in nature—a book that "explores the beauty and intrigue of these animals against the backdrop of science." This is no idle task. Weaving the complementary strands of art and science, Greene uses artful prose to skillfully educate the reader on the beauty and intrigue



of these much maligned serpents. The author's approach is to frame snake biology in a historical, evolutionary context. As he rightly points out, our knowledge of the fossil record and the history of life, together with modern studies of living taxa, are complementary and help us better understand nature's mysterious ways. But most important, Greene's aim is to market snakes: to give them aesthetic value and portray their beauty and mystery in a manner that leaves the reader with a deep appreciation and better understanding of what snakes are. This goal is what sets *Snakes* apart from almost all other books on the subject.

Greene has set himself the daunting task of synthesizing the systematics, natural history, ecology, and evolution of a group of vertebrates that by his account span 18 families, 420 genera, and approximately 2700 species. He accomplishes this task by dividing the book into three sections: "Lifestyles" (six chapters on general snake biology), "Diversity" (eight chapters on the various snake lineages), and "Synthesis" (a chapter

on evolution and biogeography and a final chapter on the relationships between snakes and other organisms and on the future of snakes). In addition, a series of 13 short essays in the form of special topics are scattered throughout the text. Finally, valuable information is packed in an epilogue, an appendix, a notes section, and a bibliography containing more than 800 references. The overall emphasis of the book reflects Greene's background and his research interests: natural history, ecology, and behavioral ecology of snakes.

The photographs by the Fogdens are among the highest quality I have seen published anywhere. It takes only a few minutes of thumbing through the book's photos to appreciate the incredible beauty and variety represented by the world's snake fauna. The Fogdens traversed six continents and 18 countries in their 5-year quest for high-quality photographs of snakes. Any zoologist will tell you that animal photography is no easy business and that it requires tremendous patience and perseverance. The reader is rewarded not only with

sharp, crisp shots of snakes, but also with photos of snakes in action. Take, for example, the photos of an eyelash pitviper striking at a flying hummingbird (p. 69), and of the tongue-flicking horned adder (p. 10). Most of us can only dream of taking such shots!

Although the striking photographs go a long way in depicting snakes in their natural habitats and demonstrating biological concepts, the lack of graphs and line art is an unfortunate omission. It might be argued that graphs would add complications to a book that is aimed in part at a lay audience. However, *Australian Snakes: A Natural History* (Shine 1991) showed that, done properly, a graph is a powerful tool for illustrating simple biological concepts. The need for line drawings becomes especially apparent in the anatomy section of the first chapter. Greene's lucid writing style effectively describes the internal layout of a snake but does not come close to a simple illustration of internal anatomy. Likewise, although the snake skull is intricately described in the text, a diagram would have given the reader a clearer perspective on form and function. There are numerous other examples in which a diagram would have been appropriate and would have enhanced the value of this book as an education tool.

Given that my own recent research focuses on sexual selection and social behavior (albeit in lizards), I was anxious to read Greene's treatment of social behavior and the determinants of reproductive success in snakes. The reader quickly learns that there is a dearth of information on snake reproductive behavior in general, although the ecological aspects of snake reproduction are well known for many species. Unfortunately, review books such as Greene's are always constrained by space, and many topics are dealt with briefly. I felt that the coverage of determinants of reproductive success and mating systems in snakes fell short. With one exception (Madsen and Shine 1992), Greene ignores a series of seminal papers (Madsen et al. 1992, 1993, Madsen and Shine 1993, Olsson et al. 1994) on mechanisms of reproductive success in the European adder, *Vipera berus*. In European adders, there is strong evidence

that sperm competition promotes increased offspring viability in favor of genetically superior males. Also, recent work by Olsson et al. (1997) (postdating Greene's book) challenges the long-held notion that sperm production by male adders is energetically cheap. Madsen and coworkers have successfully dispelled the popular myth that snakes are poor subjects for studies of evolutionary processes.

Although Greene defines most scientific terms at first use, a glossary would facilitate the layperson's use of this book. It is likely that rather than reading the book from cover to cover, a reader will flip to a particular chapter and then be stymied by a technical term. Greene also occasionally forgets to define technical terms that are most likely unfamiliar to the layperson (e.g., parthenogenesis). A glossary would provide a quick way to obtain a definition. Another recommendation, possibly for a future edition, is an appendix providing a hierarchical taxonomic breakdown of the snake families and their 420 constituent genera. Although classification is dealt with capably in the first chapter and all snake families are listed, it was while wading through the chapters on snake diversity that I would have benefited from such a list. A breakdown of families, genera, and an indication of the approximate number of member species in a genus (although given in the text) would be a useful tool that would provide a "visual" overview of snake diversity. Another suggestion is to cite the page number of a color plate when referring to a species in the text. In most instances, pictures of snakes appeared close to their reference in the text. However, in some instances (e.g., black mambas), pictures appear in sections other than those in

which they are mentioned. Showing pages containing color plates in bold in the index would also be useful, allowing quick reference to a picture of a particular species.

Despite these quibbles, Greene's book is a treasure trove of information and lore about snakes. For example, an interesting vignette that emerged from one of the 13 special topics ("Pits and Rattles as Evolutionary Innovations") is that pit vipers may have evolved facial pits for defensive purposes, rather than for prey detection, as is commonly believed. Greene points out that many snakes lacking pits (e.g., puff adders) are as sensitive to thermal cues as pit vipers. He explains that subtle differences in defensive behavior (retraction versus extension of fangs) between pit vipers and other viperids are consistent with a defensive role for facial pits. Pits may allow a snake to more accurately gauge a potential predator or prey item in terms of size and shape.

Snakes are steeped in folklore, and a deep-rooted history of myth and ignorance have coevolved with the serpentine form. Greene's treatment of human perceptions of snakes and our mingled destinies gives the reader a broader understanding of the cultural significance of snakes. Having done field work in Africa among isolated rural communities, I appreciate the enormous influence snakes exert. They are a powerful symbolic force, and Africans (among other cultures around the world) tend to take extreme measures on encountering snakes. For example, many people in northern Mozambique believe that if a blind snake (*Rhinoityphlops schlegelii*) is spotted in the vicinity of your house, a relative, even if living in a distant land, is likely to die (Martin Whiting and Bill Branch, unpublished data). Superstitions regarding snakes are borne out of ignorance and the dissemination of misinformation over hundreds, if not thousands, of years.

Field studies of snake ecology and behavior are a first step toward dispelling myths. One of Greene's special research interests is diet and foraging behavior in snakes (e.g., bushmasters and rattlesnakes). His work at La Selva, Costa Rica, focuses on trophic relationships among



a community of predators. The data emerging from this work confirm that snakes are accomplished predators. Greene relates how a 29 g spiny mouse removed from a 23 g hog-nosed viper is the equivalent of his swallowing a 209 lb hamburger without using hands or utensils, in less than an hour! Another impressive example is the ingestion of a 26 kg Uganda kob (antelope) by a 47 kg African rock python. His subsequent description of a possible scenario involving the capture, subjugation, and ingestion of a woodcreeper (bird) by another hog-nosed viper helps remove some of the mystery surrounding snakes as predators. His depiction of the possible sensory perceptions and behavior of both predator and prey was riveting. I found myself completely caught up in the story and totally oblivious to my surroundings. I was momentarily transported from my office at the Transvaal Museum in the concrete maze of downtown Pretoria to the lush tropical rainforests of Costa Rica! These kinds of images will inspire budding field biologists for decades to come.

Greene's most powerful writing is undoubtedly the epilogue, in which he addresses the question: "Why snakes?" This essay is laced with anecdotes and a number of personal experiences that appear to have deeply affected the author and at the same time strongly molded his psyche and his appreciation for snakes and for life in general. It is Greene's personal touch and his ability to bring his subjects to life that makes the book interesting and appealing to a wide audience. At just \$45.00, *Snakes* is a steal and should grace the shelf, not only of every herpetologist, but also of anyone who is interested in nature and appreciates the valuable roles that snakes perform in ecosystems.

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PROBLEMS IN THE COASTAL ZONE

Coastal Waters of the World: Trends, Threats, and Strategies. Don Hinrichsen. Island Press, Washington, DC, 1997. 420 pp., illus. \$60.00 (ISBN 1-55963-382-4 cloth).

Coastal areas are facing increased environmental threat because of a combination of changing demographics, inefficient or poor land and water management, and changing global conditions, such as climate warming and rising sea level. Coastal erosion, increased surface- and groundwater pollution, declining fisheries, and coastal flooding are only a few of the litany of problems facing the coastal environment. These problems can be particularly daunting to developing countries, where they may affect both economic development and social order.

These statements are unlikely to surprise the knowledgeable reader because variations on them have been uttered with increasing frequency by an ever-growing number of scientists for more than 30 years. Consequently, any new book on this subject must be judged relative to its predecessors as well as by a set of increasingly critical standards. That is, what does the book do that previous books have not done? Does it do it successfully?

One of the most recent books on the environmental threat to the coastal zone, *Coastal Waters of the World: Trends, Threats, and Strategies*, synthesizes the problems and, as the title indicates, attempts to discuss strategies that may minimize

or even reverse adverse actions and impacts. Following three short opening chapters dealing with coastal population growth, fisheries, and coastal management, the author, Don Hinrichsen, spends the next 14 chapters (approximately four-fifths of the book) discussing regional seas: the Baltic and North Seas, the Black Sea, the Mediterranean, the Pacific and Atlantic coasts of North America, the Caribbean, Latin America, the South Pacific, the Northwest Pacific, Southeast Asia, South Asia, the Arabian Gulf, the Red Sea and Gulf of Aden, East Africa, and West Africa. The book concludes with a short (eight-page) summary that emphasizes management and future activities in coastal areas.

Unfortunately, *Coastal Waters of the World* is replete with conceptual and writing problems that far outweigh its strengths. By far the greatest problem is the lack of a targeted readership. The book's prologue ("The Kuna Indians of Panama") gives the reader advance warning because it reads as if written for *National Geographic*, but without the color photography—or any other illustrations, for that matter. For whom is this book written, and why has Hinrichsen written it?

Moreover, the author appears to lack a science background, a lack that is reflected not only by the bland science that dominates the book but also by the almost complete lack of peer-reviewed literature. The dominant sources of bibliographic citations are reports issued by the United Nations Environmental Programme (UNEP) and other governmental and nongovernmental agencies, as well as articles in the popular press (e.g., *New Scientist* and *The New York Times*). For example, one of the major literature sources for the Black Sea chapter appears to be UNEP press releases. None of the many oceanographic studies of this fascinating basin are referenced, suggesting that the author may not even be aware of them. As a result, he fails to emphasize (or show in an illustration) the uniquely large area drained by rivers discharging into the Black Sea (i.e., the greatest land-to-sea ratio by far of any coastal sea). Nor does he mention the possible shoaling of the hydrogen sulfide-rich waters in the