

BOOK REVIEW

A Bonanza of Boas and Pythons

Biology of the Boas and Pythons. 2007. Edited by Robert W. Henderson and Robert Powell. Eagle Mountain Publishing, LC, Eagle Mountain, Utah. x + 438 pp. Hardback – ISBN: 978-0-9720154-3-4. \$100.00.

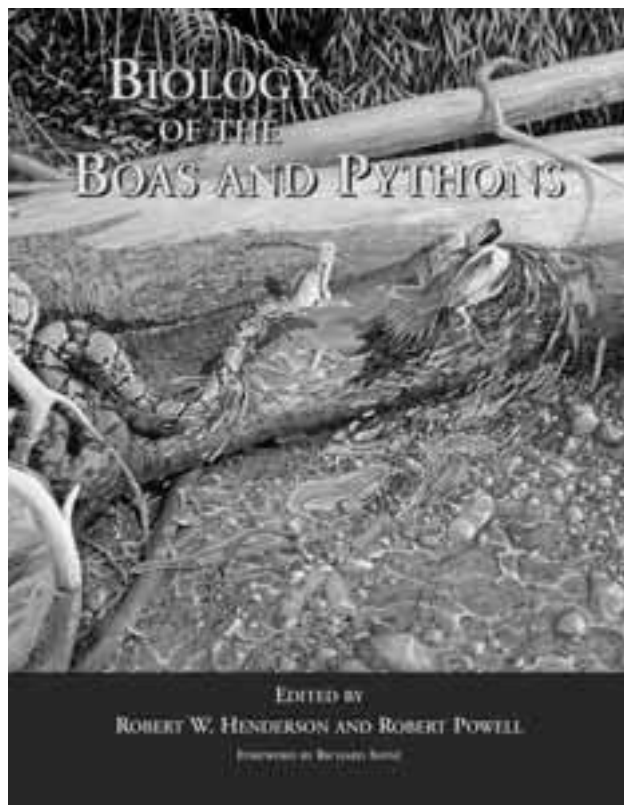
This sumptuous book is the result of a symposium entitled *Biology of Boas, Pythons, and Related Taxa* conducted at the 2005 joint meetings in Tampa, Florida, USA, and sponsored by the Society for the Study of Amphibians and Reptiles. This symposium represented the first effort to assemble researchers working on some aspect of the biology of boas and pythons.

An impressive and exquisitely produced volume, *Biology of the Boas and Pythons* (BBP) contains 29 chapters authored by 79 contributors. These chapters follow a Foreword by Richard Shine, in which he notes the paradoxical situation in which many laypeople envision a large boa or python when the word “snake” is mentioned, yet herpetologists have generally ignored these “spectacular” animals — until the present volume.

The main portion of the book is organized into five sections. The first section is the introduction, and the remaining four sections deal with “Ecology, Natural History, and Evolution,” “Behavior,” “Physiology, Neurology, and Reproductive Biology,” and “Conservation.” Thirty-four taxa of boas and pythons are addressed, with many chapters dealing largely with members of the genera *Python* (three chapters), *Boa* (six), and *Eunectes* (five).

The book’s editors, the two Bobs, Henderson and Powell, wrote the book’s masterful introduction, which provides a short summary of the book’s contents, but mostly serves as a review of the literature on these basal macrostomatans prior to the 2005 symposium. This review is divided into a series of sections dealing with early publications on pythonid biology, various overviews of boid and pythonid biology, checklists of taxa, studies of basal macrostomatan phylogeny, and works on ecology and behavior, on morphology, physiology, and reproductive biology, and on conservation. Two tables and one appendix, all very useful, summarize the taxa of basal macrostomatans and the conservation status of a number of species. This chapter is graced with photographs of several herpetologists who study these creatures. The literature cited section is expectedly lengthy, containing 196 entries, five from 2006.

Instead of following the sections of the book, we have chosen to review the bulk of this volume from a taxonomic standpoint, grouping chapters dealing with the same taxon, which leaves us with a group of six chapters dealing with more than a single taxon. Five deal with multiple higher-level macrostomatan taxa. The first of these, by Nicolas Vidal and coauthors, addresses higher-level alethinophidian relationships, splitting this clade into two new entities, the Amerophidia, of hypothesized South American origin, which includes the families Aniliidae and Tropicophiidae, and the Afrophidia, of presumed African origin,



which contains the remaining alethinophidians. They further hypothesize that this deep split is the result of the separation of South America from Africa in the mid-Cretaceous, which infers that the clade that contains almost all snakes, save for the ameroophidians and the scolecophidians, had its origin on the emerging African continent. The authors acknowledge that the “phylogenetic status of ‘Henophidia’ (all Afrophidia, excluding Caenophidia) remains uncertain.” A second such chapter, by Pizzatto and coauthors, addresses the evolution of ecomorphology in boine snakes, primarily of South America. By comparing morphological features (body size and shape) and macrohabitat use (arboreal to terrestrial to aquatic) to the two most complete boine phylogenies of Kluge and Burbrink, the authors hypothesize that the ancestral boine was a stout, short-tailed snake of moderate head length, but note that further characterizations differ between character optimizations based on morphology and those based on molecular data. Grace and Matsushita examine the interplay between vision and infrared imaging in guiding complex behavior in boas and pythons and concluded that infrared-imaging systems can be used alone to target prey, but almost certainly function in conjunction with vision when visible light is available. Other possible uses of infrared imaging in boas and pythons, such as predator avoidance, defense, and loca-

tion of refugia, are almost completely unstudied in these snakes. Goris et al. begin their summary of current knowledge of the anatomy and physiology of infrared imaging in snakes with a frank discussion of the stumbling blocks involved in their research. Their summary indicates that facial pits in snakes "appear to represent an ideal form of infrared eye." Finally, Ott and Secor studied the specific dynamic action (SDA), the amount of energy involved in the processing of a meal, in four species of boas and four species of pythons. They demonstrated that SDA responses vary according to differences in meal size, meal type, body temperature, body size, and, perhaps, with type of foraging behavior, i.e., ambush foraging versus active foraging.

This book also has something for those interested in aspects of the anatomy, mechanics, and physiology of feeding and constriction in boas and pythons. Cundall and coworkers studied aspects of the biomechanics of feeding in 15 species of boas and pythons in nine genera through a series of recorded feeding trials. In this exemplary study, the authors identify three patterns of strike kinematics evident in boids, which can be preliminarily associated with the phylogenetic patterns evident at the subfamilial level. Secor and Ott explore the adaptive regulation of digestive function and intestinal physiology in boas and pythons, and the correlation between feeding habits and digestive performance. In a chapter measuring and comparing the constriction strength in 12 species of snakes, including eight boas and pythons and one tropidophiid, Moon and Mehta demonstrate that snake diameter and the number of coils employed in constriction strongly influence the pressure exerted during constriction, and that the crushing power employed by many species is enough to kill many prey items by crushing the spinal cord or stopping the heart, rather than by suffocation alone.

No single species is as well represented in this volume as *Boa constrictor*, with six chapters devoted entirely or almost entirely to this widespread Neotropical boa. While *Boa constrictor* is currently considered a single widespread species, the variation demonstrated by this large snake across its range is apparent in the breadth of its coverage in the volume. Two chapters are devoted to insular populations of *Boa* in Central America, including Boback and Carpenter's study of the ecomorphology of boas from islands off Belize. While insular *Boa* populations are well known for generally being much smaller than their mainland conspecifics, Belizean island boas also have longer heads and larger eyes, traits apparently inherited in this population. Reed and coworkers provide an assessment of the microhabitat, distribution, and conservation of another dwarf island race of *Boa*, from Cayos Cochinos, Honduras, and indicate that initial population size estimates for these small islands are alarmingly low. These boas, called "Hog Island Boas" in the live animal trade, have been and continue to be heavily exploited since at least 1979, yet this volume presents the first detailed study of this species in its natural habitat. This is one of the strengths of BBB, providing well-researched data on wild populations of species that are among the most heavily exploited snakes in the pet trade and simultaneously among the most poorly known snakes in their native environs. Two complementary chapters deal with the Argentine Boa Constrictor (*Boa constrictor occidentalis*): Chiaraviglio and Bertona's contribution examines factors influencing the ecological distribution of this subspecies, whereas

Cardozo and coworkers use landscape modeling and population-level genetic markers to elucidate the effects of habitat loss and fragmentation on gene flow. These studies have important implications for the conservation of *Boa constrictor* in the wild, as does Holtzman and coworkers' chapter on the movement patterns and microhabitat selection of experimentally displaced boas in Nicaragua, which were shown to move more frequently and over greater distances than resident boas.

The widespread popularity of *Boa constrictor* and other large snakes in the pet trade has had negative impacts other than overexploitation of wild populations, as exemplified by the final chapter in the book, by Snow and coworkers. In this chapter, the distribution and ecological impact (existing and potential) of introduced populations of *Boa* and the Burmese Python (*Python molurus bivittatus*) in southern Florida are revealed. While the established *Boa* population seems restricted to a relatively small natural area along Biscayne Bay that is surrounded by suburban development, *Python molurus bivittatus*, which can readily exceed 4 m in length, is now well-established and reproducing throughout Everglades National Park. The impact of such a large predator in the Everglades is demonstrated by interactions between pythons and native alligators (*Alligator mississippiensis*), illustrated in three dramatic color photographs.

Two other chapters deal with species of *Python*, and both serve to further enlighten us about the natural history of heavily exploited pet-trade species. Perhaps the most popular of all pet boas or pythons is the Ball or Royal Python (*Python regius*), and a comprehensive ecological study of this species and the syntopic Central African Rock Python (*Python sebae*) in the Niger Delta, Nigeria, is provided by Luiselli and coworkers, and represents one of the most complete studies on wild populations of these two species. A chapter on the thermal biology of the Southern Rock Python (*Python natalensis*), formerly considered a subspecies of *Python sebae*, by Alexander is another data-rich and detailed analysis of a poorly known taxon, this time using modeling and field studies to evaluate the distribution of *P. natalensis* in relation to its thermal requirements.

A couple of contributions deal with habitat utilization of Caribbean boids in the genera *Corallus* and *Epicrates*. Sylvia



Epicrates monensis occurs on the Puerto Rico Bank and on Isla Mona. This small, largely arboreal boid is listed in Appendix I of CITES. *Epicrates m. monensis*, such as this subadult emerging from a bromeliad (*Tillandsia utriculata*), is endemic to Isla Mona.

Powell and coworkers examine habitat utilization of two Caribbean treeboas, *Corallus cookii* and *C. grenadensis*, and indicate that treeboas are more commonly encountered in orchards and other disturbed habitats that contained edge microhabitats than in higher elevation "pristine" habitats that had few or no edges. Tolson and coworkers provide our first look at habitat use and natural history in one of the most poorly known extant members of the genus *Epicrates*, *E. monensis monensis*, which is endemic to the small limestone island of Mona in the strait between Hispaniola and Puerto Rico. These boas appear to be habitat generalists on their xeric island, but larger individuals tend to be found only among limestone boulders or high in the canopy. All three of these Caribbean boids are under threat from habitat disturbance and destruction, as well as introduced species like the mongoose, feral goats, and feral pigs. These contributions represent important additions to the body of data available to influence the conservation and management of remaining critical habitat.

Five chapters are concerned with features of the biology of two of the four species of *Eunectes*. Two chapters deal with *E. murinus* and three with *E. notaeus*. Rivas et al. examined the natural history of *E. murinus* in the Venezuelan Llanos. In what is one of the significant chapters in this volume, these authors note the need to consider natural history to be "good science," especially for the purposes of conservation and sustainable management, but that funding agencies may not support work that does not involve easily formulated and quickly testable questions. They also note that funding support may depend on such non-biological features as the degree of "charisma" of the research subject. Four of these authors also studied sexual size dimorphism and the mating system of this species, demonstrating that females are more than 4.5 times the size of the males, one of the largest sexual size differences known, and that prolonged breeding-ball polyandry is the principal mating system. Young demonstrated that *E. notaeus* responds to aquatic acoustic stimuli, allowing snakes to locate prey swimming on the surface. Waller et al. studied the conservation biology of *E. notaeus* in northeastern Argentina, in an area where this snake is heavily exploited for the skin trade. They concluded that due to biological trait plasticity, habitat inaccessibility, and rudimentary local hunting methods, this species is capable of being sustainably managed. Finally, Mendez et al. investigated the management implications of the genetic population structure of *E. notaeus*, concluding that demonstrated genetic isolation of Yellow Anaconda populations in northern Argentina require these populations to be treated as distinct management units.

One chapter each deals with some aspects of the biology of *Charina*, *Liasis*, and *Ungaliophis* and two chapters deal with species of *Morelia*. Dorcas and Peterson tested the coadaptive relationship between thermoregulatory behavior and thermal physiology in *Charina bottae*, and found that a tight relationship between the two cannot be applied to this snake. Carmichael et al. examined geographic variation in pheromone-trailing behaviors among island populations of *Liasis mackloti*, concluding that pheromone-trailing discrimination parallels the relationships demonstrated by morphological and genetic means, and supports the recognition of three clades. Burger and Ford examined aspects of the reproductive biology of poorly-known *Ungaliophis*

continentalis, finding that males use two distinct types of courtship behavior, one passive and the other assertive. The latter, which involves continuous tail-biting, is unique to the species. When combined with coiling, it allows males to adjust their behavior for successful copulation through sexual coercion. Wilson investigated the foraging ecology and diet of *M. viridis*, a sit-and-wait ambush predator. This species is largely arboreal and adopts either a feeding or resting posture in sites that can be maintained for up to 14 days, making it possible to time-lapse videotape radiotelemetered individuals. Wilson determined that this species' foraging behavior and diet are affected by both ontogeny and sexual differences. As such, they demonstrate "an ontogenetic change in their diet from invertebrates and diurnal skinks to primarily nocturnal mammals as they increase in size. This dietary change happens in conjunction with a change in hunting time from primarily diurnal to nocturnal and an ontogenetic color change from yellow to green." Freeman and Bruce studied habitat use in two species of *Morelia* (*M. kinghorni* and *M. spilota*) in North Queensland, Australia, using data derived largely from roadkills. By this means, they demonstrated that *M. kinghorni* is primarily restricted to closed rainforest habitats, where they use large epiphytic ferns for basking, and is no longer found in cleared rainforest locales. In contrast, *M. spilota* is commonly found in cleared/mosaic areas, including agricultural and urban areas. For differing reasons, neither of these snakes is considered currently in danger of extirpation.

This book is a hugely important contribution to our burgeoning knowledge of the biology of this fascinating group of diverse, beautiful, and phylogenetically significant basal snakes. It takes its rightful place alongside the earlier compendia on the biology of pitvipers and vipers in general, also available through Eagle Mountain Publishing. In a number of ways, this volume actually stands ahead of its brethren. It is full-color throughout (with more than 200 color images) and the layout and production values are impressive, attesting to the skills of its editors and publisher. This book is a classic out of the gate. This is also a book that cries out for a sequel, so we can hope the editors and publisher will consider such for the near future. Any herpetologist will be seriously embarrassed if this book is not on the shelves of his or her library. Instead of filling up the gas tank two or three times, we recommend buying this book, curling up under a reading lamp in your favorite chair, accompanied by something soothing, and learning about the biology of some of these really nice animals. Better options may exist, but we have forgotten how ... and why.

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