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## BOOK REVIEWS

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### *Natural History of West Indian Reptiles and Amphibians*

Robert W. Henderson  
and Robert Powell  
2009, University Press  
of Florida, 495 pp.



If you like the idea of putting your feet up on a dull British evening, skimming through some colourful pictures of exotic herps and reading easily digestible snippets of Caribbean natural history – then you would be advised to pass by this book.

This solid feeling, quality book, is a serious work, condensing a huge amount of knowledge accumulated not just by the authors themselves but also a vast range of contributors that spans decades of research and observations. Other than the colour cover pictures and one black and white full-page photo to accompany the title page there is a distinct lack of visual impact to this book. In fact it is limited to one black and white figure per family. Those that are featured are good and depict interesting features or behaviours.

The book begins with a species list and this alone is enough to fill the reader with wonder.

The West Indies is home to a herpetofauna of over 700 species. The introduction tells us that this amounts to 3% and 6.3% of the world's reptiles and amphibians respectively – in just 0.15% of the world's landmass. The variety is enough to make a British herper mad with envy, ranging from the genus *Allobates* with a single representative to *Eleutherodactylus* and *Anolis* with an amazing 161 and 157 species respectively.

A couple of much needed maps are included, one showing the West Indies and their proximity to north, south and central America, with the other showing on a larger scale, the chain of islands that make up the Lesser Antilles. Both maps are vital if one is to try and make any sense of the distribution of animals in the area.

A very interesting introduction follows which builds on the maps by clearly defining exactly what is classed as the West Indies (a surprising 600 islands) and then discussing exactly what was included and omitted from the information provided in the species accounts that follow. An overview of West Indian herpetology is provided followed by a discussion of the 'Threats to the Herpetofauna'. These include the now ubiquitous habitat loss that is of concern globally, the evermore worrying introduced species problem and the more localised problems of hurricanes and even volcanic eruptions. The 'Current Overview' section reinforces the variety of habitats utilised by reptiles and amphibians across the region before briefly covering the need and scope for future research.

The species accounts naturally take up the majority of the book and they really are comprehensive. The level of detail included is just staggering at times and goes far beyond the obvious distribution, habitat and conservation status that might be expected. Additional information provided for some species includes; parasites, longevity, foraging and diet, salinity tolerance and water hole fidelity. In the 'Introduction' the authors apologise for presumed omissions but with a citations list running to 80 pages that includes information from approximately 2,600 publications the authors cannot be accused of being anything less than thorough.

It is apparent that for some species there is a wealth of information available while for many others almost nothing is known. Even within well studied genera such as *Anolis* there can be a huge disparity between species. The authors have estimated that only 12% of the herpetofauna of the West Indies had been studied by 1999. This lack of knowledge regarding many species (resulting in Conservation Status of either 'unknown' or 'not assessed') is cause for concern and hints at the direction that future research needs to take. I have no doubt that the authors, with their vast experience of this part of the world, have some very clear ideas of which areas or species should be prioritised and I found it surprising that the 'Future Emphases' section was not firmer in tone with more direct exposure of particular problems (although forgivingly the authors perform a wonderful job of enticing the reader to the islands!). The book in its entirety is perhaps the best indication of where future directions should lie and I suspect that is how the authors intend it to be read.

Nomenclature and systematics are kept to a minimum throughout the book and recently adopted or proposed changes are mentioned in the 'Remarks' section of each species account. For example the cane toad account remains faithful to *Bufo* but mentions the fact that this species has been placed in both *Rhinella* and *Chaunus* in recent years. This seems a wise approach given the furious rate at which nomenclature is changing at present.

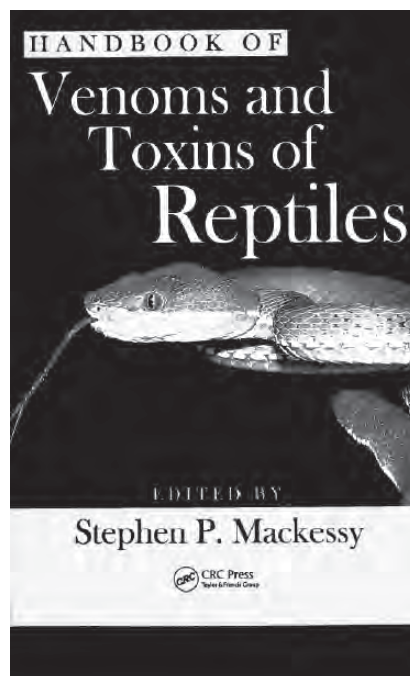
It is difficult to get a feel for any one island from this book and an overview of some of the larger, more species rich, or perhaps most threatened, may have been of value. While this is not a book that I could say every herpetologist needs in their library it is certainly a resource that would be essential if research work or even serious herpetofauna observation is to be undertaken in the West Indies. It is also an incredibly ambitious and admirable work and the authors should be highly commended for it.

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## *Handbook of Venoms and Toxins of Reptiles*

Stephen P. Mackessy  
2009, CRC Press, Boca Raton,  
Florida.



The *Handbook of Venoms and Toxins of Reptiles* comfortably fills an existing hole in the literature for toxinologists, biochemists, physicians and herpetologists interested in natural toxins. Representing the most comprehensive review of reptile venoms for a number of years, this book provides a thorough and attractive exploration of the field of toxinology, with numerous colour (an eight page insert) and black and white figures supporting detailed text which primarily describes the molecular, structural and functional aspects of the toxic components that make some reptile venoms so potent.

As with a number of biological research areas, a rise in DNA and proteomic technologies over the past decade has led to substantial advances in the field of toxinology, with scientists utilising these techniques to provide comprehensive overviews

of the toxic components present in the venoms of animals – a number of which have been of particular interest for use as tools for understanding human biological pathways or rational drug design. As a result of the recent exponential rise in scientific studies on natural toxins, the *Handbook of Venoms and Toxins of Reptiles* is a welcome addition to a relatively sparse collection of toxinology textbooks. In fact this book represents the most thorough update of reptile venoms for a number of years. Consisting of four sections and 24 chapters written by some of the most eminent toxinologists from across the world, this book represents a thorough review of the enzymes and toxins present in reptile venoms, and also describes how venoms have evolved, how venomous species are related and how envenomation can be prevented and treated in different regions of the world.

The first section of the book, entitled 'Reptile toxinology, systematics, and venom gland structure', is headed by the editor's introduction to reptile venoms – defining the venoms and their components and also describing the variation in venom that exists between species. Subsequently, an interesting overview of the recent advances in venomous snake taxonomy describes how species classification can affect the field of toxinology. Perhaps more importantly, this chapter also details how reptile venoms have evolved – correcting a surprising omission from the introductory chapter. The final chapter in this section provides a detailed description of the anatomical and functional workings of different venom delivery systems.

The following two sections detail the enzymatic and toxic components that are present in the venoms of reptiles. These sections make up the centre piece of the book and consist of 17 chapters penned by different experts from across the world, describing the biological activity, evolution, structure and function of individual protein families present in different venoms. The coverage of toxins described by these chapters is impressive, with chapters detailing a number of barely studied toxin families alongside well characterised pathological components. Some authors also discuss how to experimentally isolate the protein of choice in the lab and carry out studies to identify their function – a nice touch that may encourage new researchers

into the field. The only slightly disappointing aspect of these sections is that there is little information regarding how different venom components may work together – descriptions of individual toxin families are detailed but there is little reference to how mixtures of these components may combine to kill or immobilise prey in a real world situation.

The final section 'Envenomation: occurrence, prevention, treatment', consists of four absorbing chapters that detail the consequences of reptile envenomation in Australia, Africa and north and central America. Each of these chapters is written by clinical and toxinological experts from these geographical regions, describing the animals that present a risk to humans, the epidemiology of envenomation in the area and an overview of treatment that follows cases of envenoming. These chapters nicely summarise the book and provide a fascinating description of the human consequences that arise due to the action of the toxic components described elsewhere.

There are a few minor problems with the book – the inevitable result of different authors writing separate chapters leads to some reproduction of introductory text, whilst more considerable redundancy exists on occasions between adjacent toxin chapters – I found these particularly frustrating. There are also some issues with factual consistency, with different authors citing, deriding or ignoring recent important advances in the field, leaving the reader confused as to what is readily accepted by the toxinological community – particularly if they are new to the subject.

In summary, I enjoyed reading this book, but would suggest it is primarily aimed at toxinologists and biologists interested in venomous animals – the biochemical complexity of chapters describing the toxins and enzymes present in reptile venoms may present a challenge to the more general readership. However, introductory chapters detailing the systematics of venomous snakes and anatomy of venom delivery systems will make interesting reading for everyone, whilst the final four chapters on the prevention and treatment of envenomation provide a fascinating insight into the medical implications that arise from reptile venoms. Overall, this book is a valuable addition to the shelf of anyone interested in venom biology

– the compilation of thorough reviews of toxic venom components will make it the first stop in search of a quick reference. Although the more general readership may have to ‘read its way in’, and other introductory texts (such as JP Chippaux’s *Snake Venoms and Envenomations*) may be initially more suitable (and slightly cheaper), the comprehensive scientific detail present in this book ensures the *Handbook of Venoms and Toxins of Reptiles* will stand the test of time as a worthwhile investment.

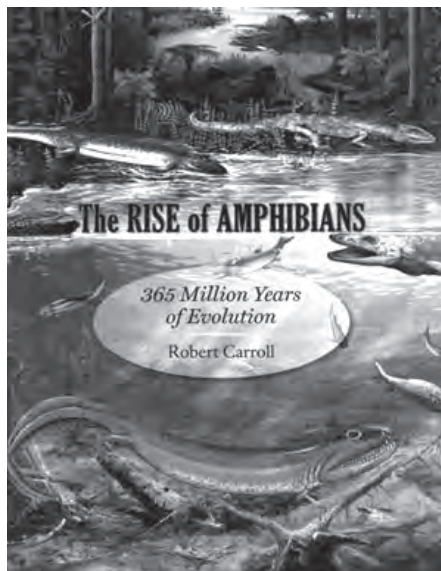
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***The Rise of Amphibians:  
365 Million Years of Evolution***

Robert Carroll  
2009, The Johns Hopkins  
University Press, 392 pp.



With its bold and stylised depictions of early amphibians on its cover, ‘*The Rise of Amphibians*’ will stir the imagination or innate interests of any lover of the animal kingdom. Additionally, a read through the preface provides an enlightening insight to the fascinating information the book holds.

The book is compiled in 14 orderly chapters with appropriately nested subsections. It begins with the chapter ‘History of the Earth and Life’. A brief introduction is given with a detailed figure (1.2) that illustrates the evolutionary history of terrestrial vertebrates. A plethora of information within the first chapter highlights the universe and Earth’s beginning, with interesting examples of dating ancient meteorites for accurate time scales. The whole time scale is simplified within the very informative figure (fig.1.3) on page four, which is worth a look at if you are rusty on that subject area. Plate tectonics is briefly mentioned, however, the bulk of the chapter is taken up by the eukaryotes and the rise of multicellular animals.

Chapter 2 brings together pertinent information on the origins of multicellular and vertebral life, with didactic illustrations and dioramas (figures 2.2 and 2.7) of species found in the infamous Chengjiang and Burgess Shale faunas. The homeobox, hox genes, neural crest and placodes are heavily integrated throughout the chapter and are highlighted for their importance in the evolution of complex body forms and their conceivable effects on primitive chordates emerging onto land. This makes for a very insightful read that is supported with informative diagrams (figures 2.5, 2.8). More than half of the chapter is taken up by the radiation of bony fish of the upper Devonian and their plausible connectivity to the primitive tetrapods, naming *Euthenopteron* as a candidate.

Chapter 3 ‘The Origins of Amphibians’ follows on from chapter two within the upper Devonian, however, the author proceeds throughout to discuss and evaluate the conceivable morphological changes achieved to produce the primitive amphibian state. Covered is a multitude of characteristics from evidence of the oldest known tetrapods *Acanthostega* and *Ichthyostega* with addition of other co-analysed tetrapod genera *Tikaalik*, *Panderichthys* and *Eusthenopteron*.

Some of the more fascinating characteristics

include transition of skull roof (dorsoventrally flattened), loss of medial dorsal and anal fins, greater articulation of the neck, ossification of the vertebrae, and changes in locomotion, including many more. Some interesting propositions for the movement onto land are put forward within the chapter. Genetic basis of change is covered, with fascinating insights into additional fish and tetrapods from the late Devonian and their geographic diversity to conclude.

The fourth chapter 'The Radiation of Carboniferous Amphibians' propels the reader forward to the carboniferous. This is by far the largest and most important of the chapters due to the background information that this chapter offers for good foundation knowledge for the following chapters. The sheer amount of information will take more than one sitting to complete.

The reader is taken through a compelling journey, with specimens from the Horton Bluff locality of the Lower Carboniferous (Whatcheeriidae) to the Nýřany locality of the Upper Carboniferous (Nectridea). Robert Carroll excels himself by compiling such descriptive patterns of interrelationship information of the early amphibians throughout the Carboniferous. The chapter includes tantalizing information of the skull, limb structure and vertebral differentiation to name but a few; these can be linked to portray the lifestyle of the specimens and/or evolutionary adaptations. The information is coupled with very informative and detailed annotated skeletal diagrams. If the reader has no background in tetrapod anatomy, primarily of the skull, they will be forced to constantly flick to the back of the book to the abbreviations page, however, this will become easier as the reader progresses through the book.

Chapter five 'Adaptation, Radiation, and Relationships' is a brief but informative chapter, highlighting the difficulties in producing conclusive interrelationships. The author puts forward that it is due to the incomplete knowledge of the fossil record such as the 30 million year gap (Romer's Gap) during the beginning of the Carboniferous. Robert Carroll exposes the inconsistency and limitations of using Phylogenetic Analysis Using Parsimony (PAUP) due to the above. The chapter

proceeds to define the uncertainties of tetrapod relationships, beginning with the Upper Devonian tetrapods (*Acanthostega* and *Ichthyostega*) through to Amniotes. The chapter is brilliantly concluded with the author's thoughts of new discoveries enabling a true and conclusive knowledge of tetrapod relationships.

Chapter 6 covers the amphibians of the late carboniferous and early to late Permian. The chapter is full of excellently annotated and informative diagrams showing the major diversity of the skulls of the early amphibians, including the Gharial like skulls of *Platyposaurus* (Archegosauroids) and the spiked skulls of *Zatrachys* (Zatracheidae). One of the most interesting parts of this chapter involves the branchiosaurid species, which showed plausible neotentic physiology and possible links to the ancestry of modern day salamanders. The end of the chapter covers a few later Permian and Triassic Temnospondyls, with mention to the decline and near total extinction of terrestrial amphibians by the end of the Paleozoic.

The flamboyantly portrayed plates and plate notes are found amidst pages 192 and 193; these are linked with text throughout the book to give the reader a good idea of early and modern amphibian morphology.

Robert Carroll explains at the end of chapter 6 the need for chapter 7 'The Origin of the Amniotes'. This is the most effortless chapter to read so far, and even though amniotes are mentioned, primarily in the Joggins locality (chapter 4, p117-121) and chapter 3 (p160), this chapter fills in the gaps. The chapter emphasises the advantages of amniotes over the other early tetrapods/amphibians. These include the evolved pterygoideus muscle, allowing for greater prey diversity, their ability to live in fully terrestrial habitats and their unique reproductive behaviour and many more. Additionally, the author briefly explains their early radiation and divergence into birds, reptiles (Diapsids) and mammals (Synapsida/Therapsids).

Chapter 8 is one of the more important chapters; it explains the timings of the abrupt extinctions of many species, including a substantial amount of the terrestrial amphibian lineages and plausible catastrophes to have caused them. One of the more

significant ones is the increase of temperature due to rise in CO<sub>2</sub>, causing the loss of the coal swamps, a major habitat for the early amphibians. The chapter moves onto explaining the rise of Stereospondyls, an amphibian lineage with some impressively large specimens, some growing to lengths estimated at 7 metres (Brachyopidae). There is a very informative figure (8.16) that shows their dominance through to the Lower Cretaceous.

Chapter 9 'The Enigma of Modern Amphibian Origins' is the first time modern amphibians (Lissamphibians) are mentioned. The chapter highlights that the three present amphibian body forms (Anurans, Urodela and Caecilians) were not recorded until the Lower Jurassic in the fossil record. The author proceeds to examine and compare the anatomy and lifestyles of the present day amphibians, with some plausible connections to primitive tetrapods. This informative chapter prepares the reader to link information together for the up and coming chapters 10, 11 and 12 where the author tries to shed some light on the possible ancestor/s of the modern amphibians.

Chapter 10 'The Ancestry of Frogs' is a short but concise chapter. The author begins with the explanation of the oldest known frog *Prosalirus bitis* and its common and differing features that link it to modern Anurans. The chapter continues to put forward early ancestors such as Triassic Salientians, *Triadobatrachus massinoti* and *Czatkobatrachus polonicus*, both from the Lower Triassic, by cross-examining the anatomy and lifestyles. Furthermore, with the use of synapomorphies (character traits shared by two or more taxa) the author, in a logical manner, tries to link as far back as the earliest Temnospondyls for putative antecedents of anurans, these include characteristics of metamorphosing, the skeleton and larvae stages. This is a very nice chapter, but leaves the reader wanting more.

Chapter 11 'The Ancestry of Salamanders' begins with the author stating the difficulties of tracing the ancestry of salamanders, due to the sheer diversity of life styles and body forms present. I thought this chapter was rather more complicated to grasp than chapter 10. However, Robert Carroll brings together exquisite information reinforced by informative diagrams for the possible ancestor/s of the modern salamanders. I found the section on the

'Modern Salamander Families', very interesting; Robert Carroll briefly but informatively sums up the modern families extremely well. The chapter is slightly confusing towards the end the flow seems to be hindered by the mention of modern day families then propelling the reader back in time, then forward in time once again.

Chapter 12 '*Eocaecilia* and the Origin of Caecilians' encapsulates a great deal of information on the skeletal anatomy and lifestyles of the 6 modern caecilian families. All the information is coupled with extremely detailed diagrams; however, the information is intense and may leave any beginner to the subject puzzled.

The reader is taken back to the fossil record of caecilians, and the limited horizons ranging from the Lower Jurassic. The definitive early caecilian is named as *Eocaecilia micropodia*. The reader is taken through the anatomical similarities and differences of *Eocaecilia* and modern caecilians. The author proceeds to pinpoint a plausible ancestor with reference to the skeletal characters of *Eocaecilia* as a model and how they differ from ancestral anurans and urodeles. Many Paleozoic tetrapods are mentioned however, Lepospondyls, especially the microsaure Rhyconkos is selected as an ancestor due to common derived characters with *Eocaecilia* and caecilians. Furthermore, the author states that skeletal anatomy of Lissamphibians shows closer affinities between anurans and urodeles than either has to caecilians.

Chapter 13 'The Success of Modern Amphibians' provides the reader with more information on the evolutionary history of the modern Amphibians. Specifically on Urodeles, that holds extensive information on the modern families' fossil records. The reader will be enlightened with fascinating information on amphibians' present and historical distributions, with distinctive figures such as 13.1A that shows anuran families and how they have increased/decreased in distribution. The latter part of the chapter covers the 'New' amphibians, incorporating sexual reproduction, changes in salamander and caecilian feeding and respiration, genome size and the most intriguing area of tadpoles with bony tails.

The final chapter 'The Future of Amphibians' is a great ending to this fine book, it expertly sums

up the earlier chapters, with explanations of how amphibians have survived for so long and their advantages over many other vertebrates. The most significant part of this book is encapsulated within this chapter; this is the informative facts of problems faced by amphibians and their modern day declines. Plausible causes emphasized are exotic predators, pollution and chytridiomycosis (*Batrachochytrium dendrobatidis*) plus many more. All are explained in a factual way, with for and against arguments. However, Robert Carroll puts forward that not all amphibians are declining and that some may outlast humans due to the catastrophes they have already faced in their long ancestry.

Robert Carroll has excelled himself by putting together such magnificent piece of work, with information that is balanced efficiently. However,

‘The Rise of Amphibians’ is not without a few minor omissions. On page 19, figure 2.2 showing the Burgess Shale fauna, number 12 is missing within the list, but present on the diorama and there is a spelling error on page 102 where *Balanerpeton* is spelt *Balenerpeton*. Even so, this book is a massive feat and this review cannot come close to showing how much of a magnificent book it is. With an average RRP price of £34, it would be a worthy buy for anyone doing a degree entailing vertebrate evolution and by no means should this book be left off a university library shelf.

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