Ecology and Evolution in the Tropics: a Herpetological Perspective

Donnelly, Maureen A., Brian I. Crother, Craig Guyer, Marvalee H. Wake, and Mary E. White, editors. 2004. Foreword by Luis Diego Gomez. 584 p., 14 color plates, 10 halftones, 124 line drawings, 47 tables.

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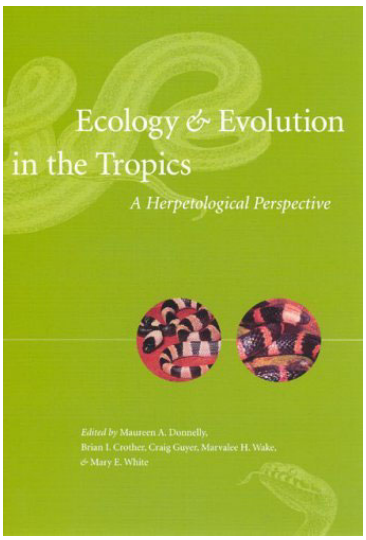
Ecology and Evolution in the Tropics: A Herpetological Perspective is a series of papers originally presented in a symposium at the herpetological conference in La Paz, Mexico in 2000. This symposium was dedicated to Jay Savage, as a celebration of the publication of his enormous book *The Reptiles and Amphibians of Costa Rica*. As is typical of a symposium, it seems that authors were invited to give talks on a broadly defined subject, and so each got to not only talk about, but then write sometimes very long papers about, their favorite topic. These papers were organized as best they could be into the two parts of this book. In a demonstration of how difficult it was to sort these out, the first part is called Evolution and Biogeography, and the second is called Ecology, Biogeography, and Faunal Studies. Yes, biogeography is in both parts.

The first chapter in the book is an exhortation by Arnold Kluge on systematic organization. This long chapter has a lot of big words in it, and the passion Kluge feels on this subject is expressed openly, for example: "Paradoxically, it is both nomothetic and ideographic!" In this paper, Kluge proposes a new taxonomic system to replace the Linnaean one of kingdom, phylum, etc. It seems that almost everyone in biology recognizes that there are problems with this system, and Kluge traces those problems back to the fact that Linnaeus was a creationist, so of course his system does not accurately reflect evolutionary patterns. From there, however, the opinion of Kluge diverges from that of most of the scientific community, evidenced by his extensive criticism of the work of many of today's leading evolutionary biologists. Kluge writes: "The classification of geckos provides insight into how difficult it will be to completely eliminate the practice of evolutionary systematics." The writing style and choice of words made this chapter very difficult for me to understand, and I know what monophyly and paraphyly are offhand. Luckily, the readability of the chapters increases after this.

In contrast to the opening chapter, the second chapter by Marvalee Wake et al. on what is known about caecilian relationships is packed with data. For anyone studying caecilians, this is the state-of-the-art summary from the world's expert. For anyone not studying caecilians, it is concise and includes an interesting discussion about how many times live-birthing evolved in this group, as well as an appeal to continue the search for these rare and secretive animals before they go extinct due to habitat destruction. In the following chapter, David Wake similarly gives a summary of what is known about the evolution of tropical salamanders from the world's expert. He discusses both the "common but erroneous impression that most tropical salamanders are rare" and the fact that "large areas of Costa Rica remain from which salamanders are virtually unknown, even though they are almost certain to be present." This of course makes me feel like exploring, and fast, considering the declines he also discusses.



The fourth chapter, on the relationship of *Leptodactylus silvanimbus* by Heyer et al., focuses on systematic relationships using molecular and non-molecular characters and looks to see if patterns are consistent with biogeographic hypotheses. Next, Shyh-Hwang Chen takes on the unenviable task of summarizing the history of systematic rearrangement in the Craugastor subgenus of *Eleutherodactylus*, which includes my favorite, the barking frog (*Eleutherodactylus augusti*). Although the author leaves the range of the barking frog out in describing the range of this group, this study is thorough and a landmark in elucidating species relationships. The author proposes several new species, including parts of those currently known as *E. bransfordii* and *E. diastema*, based on chromosomal variation. The sixth chapter is about how male frogs evolved to look sexy for female frogs. It has some cool descriptions of spikes coming out of frog's heads, and aside from that focused on physiology and development.

The final three chapters in the first section focus on many herpetologists' favorite: snakes. White et al. try to use 28S rDNA to look at deep snake phylogenetics, and find that it is not a great marker for the question

they are trying to ask. However, they synthesize their data with morphological information and results that have been previously published to point out the consistencies and inconsistencies in our current knowledge of this difficult subject. Slowinski and Lawson examine relationships among Elapids using both mitochondrial and nuclear markers. In the closing chapter of this first section, Greene and McDiarmid review the history of mimicry theory in relation to snakes, including a rich litany of personal observations. They highlight the contributions of Alfred Wallace and Jay Savage to this field, and coin the "Savage-Wallace" effect, describing macroevolutionary patterns exhibited by venomous snake mimicry. They also suggest that snakes may be mimics of toxic invertebrates, such as centipedes and flatworms.

In the opening chapter of the second part of this book, Karen Lips writes about the reproductive ecology of a population of *Hyla calypsa* that is now likely extinct. Not very long ago, this would have seemed strange, but considering the rate at which amphibians are disappearing in the tropics, the remarkable thing here is that this research was done at all before declines occurred at this site. After looking at correlations of personal and territorial attributes of males, Lips found that the longer the males stuck around to breed, the higher their breeding success. Considering that the breeding season is nine months long, and it takes a lot of energy to defend a territory and call to attract mates, that represents a lot of stamina. Next, Guyer and Donnelly examine 63 weeks worth of hylid breeding data at a wetland in La Selva (a research station in Costa Rica). They found that species bred when the weather was right, regardless of what other species were making noise. They also provide a great baseline from the early 1980's for someone to see if breeding times have changed over the last 20 years.

Scott and Aquino write about predation, one of my favorite topics, in the third chapter of this section. They look at which frogs eat which in the Chaco region of Paraguay. Their work included both watching frogs eat each other naturally as well as tethering small frogs, including some toxic species, and offering them to other frogs to eat. They discovered that frogs do not stick well to other frogs' tongues, as well as gaining insight into the evolution of this system where so many frogs eat other frogs, producing what I found to be the most entertaining chapter of this book.

On a very different note, the next chapter discusses setting up a monitoring program in Papua New Guinea, involving the training of local people. The detailed discussion of training people from an indigenous culture to monitor frogs was very interesting and would be helpful to anyone trying to train local people to do this kind of work.

Getting back to the subjects visited in the first part of the book, the next chapter covers the current state of phylogenetic, and resulting biogeographic, disagreement over the origin of *Norops* lizards in the Caribbean. Kirsten Nicholson reviews the existing data and presents her hypothesis on which events were vicariant (islands drifted away with lizards on them) and which were due to dispersal (after the genus evolved on Cuba, it dispersed to Jamaica and from there to the mainland). Following this is a very thorough chapter by Steven Werman reviewing what is known about the biogeography of bothropoid pitvipers (no rattlesnakes here). At 60 pages, this is the longest chapter in the book (not including appendices). It is followed by a summary of herpetofauna in the Rincón area of the Osa Peninsula of Costa Rica by McDiarmid and Savage that includes a short discussion of each species, a review of errors in species lists over the years, and an analysis of the differences and similarities among this and other other Central American field stations.

The final two chapters cover diversity of amphibians and reptiles in the Guyanan lowlands (Donnelly et al.) and highlands (McDiarmid and Donnelly). The patterns and lists from the fieldwork presented in the former of these chapters represents a wealth of new information. The latter chapter ends the book in fine form, with a synthesis of what is known about the herpetofauna of the Guyana highlands. The descriptions of the tepuis (flat-topped mountains) were especially intriguing, and the pictures of them look surprisingly like some of our sky islands. So the Guyana highlands are made up of what is on top of these tepuis, which any Arizona herper knows has got to be really interesting stuff. The authors found that plant diversity was highly correlated with amphibian and reptile diversity, and that these mountains have a very high level of endemism (existing on only one tepui), higher for amphibians (77.3%) than for reptiles (54.8%). Unfortunately, the binding of the book makes it difficult to see some of the important parts of the map in this chapter, but if the area sounds as interesting to you as it does to me, you just might go buy your own map for planning your expedition.

Overall, this is a volume of expert work on tropical herpetofauna, with chapters that will be invaluable to researchers doing work in the fields and regions described. The focus on biogeography will be useful to people interested in biogeography of these areas, but there is no synthesis of all these patterns; their scales and focuses are too disparate for that. As a read for fun, some chapters are more fun than others, and I don't suggest trying to read it all through if you are only interested in some of the subjects. However, if you think you might want to do some research in Central or South America, this gives a broad sampling of the many subjects available for study.