

## Book review

### Synthesising herpetology

***Herpetology: An Introductory Biology of Amphibians and Reptiles.* George R. Zug, Laurie J. Vitt & Janalee P. Caldwell. 2001. xiv + 630 pp, hardbound, second edition. Academic Press. US\$ 70. ISBN: 012782622X.**

Synthesising an entire field is a challenge in any discipline. Herpetology is no exception, especially considering the burgeoning number of herpetological papers, books, and journals. There is a rich history of herpetology texts. Grey-haired herpetologists frequently have a copy of Goin & Goin (1962) or Porter (1972), while younger herpetologists tend to have more recent texts such as Goin *et al.* (1978), Zug (1993), or Pough *et al.* (1998). Zug *et al.*'s 2<sup>nd</sup> edition of *Herpetology: An Introductory Biology of Amphibians and Reptiles* is a welcome addition to this club and is unlikely to disappoint. The three authors work in different disciplines and on different taxa (Zug: morphology, systematics, biodiversity and general herpetology of all herps, but especially chelonians; Vitt: ecology and life histories of lizards and snakes; Caldwell: behavioural ecology of amphibians). Having said that, all authors have conducted studies in various areas of herpetology and taxa not necessarily confined to the above. They constitute a well balanced team for reviewing a very broad discipline. Without doubt, as a reviewer, I could write pages extolling the virtues of this book. My job however, is also to identify shortcomings and areas of possible improvement for future editions which we can in all likelihood expect.

The book is divided into six areas including *Evolutionary History, Reproduction and Life Histories, Physiological Ecology, Behavioural Ecology, Population and Community Ecology*, and *Classification and Diversity*. The above

general areas are listed in order of appearance. Although this is a minor point, I feel that *Classification and Diversity* should logically follow *Evolutionary History*. Individual chapters are well organised into a series of interconnecting themes which are outlined at the start of each chapter. The book is also crammed with useful references. Each chapter ends with both a list of cited references and a separate list of "additional reading". A complete list of all citations is given at the end of the book. Finally, there is a relatively brief glossary (new for this edition) that should probably be expanded in future editions.

Because this is a second edition, it is worth comparing it to its predecessor (Zug 1993). The first edition was considerably smaller (23.5 x 15.5 cm vs 28.5 x 22 cm) and has 527 vs 630 pages (second edition). Factoring in size, the second edition is therefore greatly expanded (almost double the first edition). The most significant improvement is the extensive coverage given to ecology and behavioural ecology as a result of Vitt and Caldwell's addition as co-authors. This immediately makes the book appealing to a wider audience that should include non-herpetologists using amphibians and reptiles in their research.

The book begins by discussing tetrapod relationships and asks why two distinct clades (amphibians and reptiles) have been united into a single discipline. For example, in a single lab it is not uncommon to find lab members working on both amphibians and reptiles. The

authors ascribe this to, in part, tradition, but also because in many cases similar field techniques are used for both groups. This only partly answers the question and we are left asking what caused the unification in the first place (before tradition)?

In the United States, herpetology is frequently offered as an undergraduate course. As such, many readers of this book will be undergraduate students, notorious for not reading prescribed works! One way to make reading and herpetology more appealing to students is to add colour and to perform simple tricks with layout. For example, many books now have special boxes to illustrate case studies and concepts (e.g., Green 1997; Solomon *et al.* 2002). These are frequently visually appealing and quick to read—two essential ingredients for students—this may also make the material more memorable. This approach does have the unfortunate consequence of raising the book's price, but the trade-off may be worth investigating for future editions. Having said that, the remaining seven chapters (*Classification and Diversity*) are all illustrated with high quality colour photographs. Also, the book is filled with graphs, illustrations and black and white photos that all tell a story. Another way to make the book more appealing to students and to promote herpetology at the same time, is to have a brief section near the front explaining career options in herpetology, and perhaps show-casing some former and current herpetologists as examples. Of course that would make for the unenviable task of deciding on whom to include?!

A general constraint of all textbooks is that any one theme can only be superficially covered. Given my interest in animal signalling, I was hoping for a more comprehensive treatment of the *Anolis* system, but sympathise with the space constraint issue. For example, Leo Fleishman and more recently, Manuel Leal,

have done some pioneering work on *Anolis* visual ecology and signalling that demonstrated the following: 1. Anoles see in the UV (Fleishman *et al.* 1993); 2. The physical form of anoline displays are a product of the motion detection properties of the visual system combining with environmental influences (wind-blown vegetation) (Fleishman 1988, 1992); 3. These same influences (visual system, environment) likely drove the evolution of vine snake prey (anole) searching behaviour such that snakes adopt cryptic oscillatory movements similar to moving vegetation that are not easily detected by anoles (Fleishman 1985, 1992); 4. *Anolis cristatellus* make use of predator deterrent signals to snake predators, which is an honest signal of their performance capacity, in a system analogous to a gazelle stotting in the presence of a lion (Leal and Rodríguez-Robles 1997; Leal 1999). And since the publication of this book, Leal and Fleishman (2002) have demonstrated that habitat partitioning in two species of sympatric anoles is likely due to properties of the visual system and the environment. Specifically, *Anolis cooki* lives in a UV rich environment and has a dewlap that reflects little UV while *A. cristatellus* lives in a UV poor environment but has a dewlap that reflects strongly in UV. Both species therefore have signals that provide strong contrast to their environment, but in different ways that result in resource partitioning of a different form: the light environment. Although some of the above has only recently been published (post book publication), I hope sensory ecology gets a more extensive treatment in future editions because these are truly exciting findings for behavioural ecologists interested in signalling. Furthermore, this work underscores the potential of lizards in studies of sensory ecology.

While on the theme of behavioural ecology, about two pages are devoted to “sexual dimor-

phism and sexual selection". Sexual dimorphism is frequently a product of sexual selection. As such, I think it should be a subheading under sexual selection. Further, sexual dimorphism is discussed in the context of body size and no explanation is offered for the spectacular colouration seen in many lizards, although it was briefly treated under "communication". Sexual selection includes a wealth of mechanisms such as scrambles (mentioned elsewhere in book), sperm competition, endurance rivalry, cryptic female choice (mentioned under lizard mating systems), coercion, male contests (mentioned in several other places) and mate choice. It may be worth rearranging parts of the behavioural ecology section to include an expanded section on mechanisms and models of sexual selection (see Andersson 1994; Andersson & Iwasa 1996). Finally, inclusion of Barry Sinervo's work on *Uta stansburiana* would have strengthened the section on alternative mating tactics. Sinervo & Lively (1996) demonstrated that three colour morphs are locked into a game of paper-rock-scissors in which orange-throated males are aggressive, territorial, and beat blue-throated males which are more monogamous and mate guard; in turn, orange-throated males are beaten by yellow-throated males which adopt a sneaker strategy; finally, yellow is beaten by blue. This amazing system has recently been verified by molecular studies (Zamudio & Sinervo 2000; post book). The criticisms above notwithstanding, the behavioural ecology section is greatly revised from the previous edition and I found the section on mating systems to be particularly useful. And likewise, the ecology sections (including the conservation biology chapter) add great value to this edition and make it an extremely useful reference to those working on any aspect of reptile or amphibian ecology and conservation.

So who should own this book and is it worth the money? The answer to the latter is yes, the answer to the former is any herpetologist (undergraduate, graduate student, amateur and professional) and anyone using an amphibian or reptile as a model organism to answer a question of interest. This book has raised the bar for all future herpetology texts.

## LITERATURE CITED

- ANDERSSON, M. 1994. Sexual Selection. Princeton University Press.
- ANDERSSON, M. & Y. IWASA. 1996. Sexual selection. TREE 11: 53-58.
- FLEISHMAN, L.J. 1985. Cryptic movement in the vine snake *Oxybelis aeneus*. Copeia 1985: 242-245.
- FLEISHMAN, L.J. 1988. Sensory and environmental influences on display form in *Anolis auratus*, a grass anole from Panama. Behav. Ecol. Sociobiol. 22: 309-316.
- FLEISHMAN, L.J. 1992. The influence of the sensory system and the environment on motion patterns in the visual displays of anoline lizards and other vertebrates. Am. Nat. 139: S36-S61.
- FLEISHMAN, L.J., E.R. LOEW & M. LEAL. 1993. Ultraviolet vision in lizards. Nature 365: 397.
- GOIN, C.J. & O.B. GOIN. 1962. Introduction to Herpetology. W.H. Freeman, San Francisco.
- GOIN, C. J., O.B. GOIN & G.R. ZUG. 1978. Introduction to Herpetology. 3<sup>rd</sup> ed. W.H. Freeman, New York.
- GREENE, H.W. 1997. Snakes: The Evolution of Mystery in Nature. University of California Press, Berkeley.
- LEAL, M. 1999. Honest signalling during prey-predator interactions in the lizard *Anolis cristatellus*. Anim. Behav. 58: 521-526.
- LEAL, M. & J.A. RODRÍGUEZ-ROBLES. 1997. Signalling displays during predator-prey interactions in a Puerto Rican anole, *Anolis cristatellus*. Anim. Behav. 54: 1147-1154.
- LEAL, M. & L.J. FLEISHMAN. 2002. Evidence for habitat partitioning based on adaptation to environmental light in a pair of sympatric lizard species. Proc. R. Soc. Lond. B 269: 351-359.
- PORTER, K.R. 1972. Herpetology. W. B. Saunders Co., Philadelphia.
- POUGH, F.H., R.M. ANDREWS, J.E. CADLE, M.L. CRUMP, A.H. SAVITZKY & K.D. WELLS. 1998. Herpetology. Prentice-Hall, Inc., Upper Saddle River.

- SINERVO, B. & C.M. LIVELY. 1996. The rock-scissors-paper game and the evolution of alternative male strategies. *Nature* 340: 240-246.
- SOLOMON, E.P., L.R. BERG & D.W. MARTIN. 2002. *Biology*. 6<sup>th</sup> ed. Brooks/Cole.
- ZAMUDIO, K. & B. SINERVO. 2000. Polygyny, mate-guarding, and post-humous fertilizations as alternative mating strategies. *Proc. Natl. Acad. Sci. USA* 97: 14427-14432.
- ZUG, G. R. 1993. *Herpetology: An Introductory Biology of Amphibians and Reptiles*. Academic Press, San Diego.

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